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THE ELECTRICIAN

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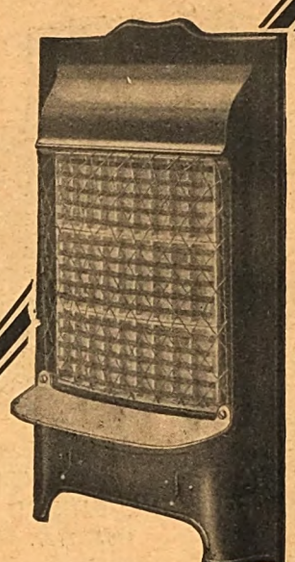

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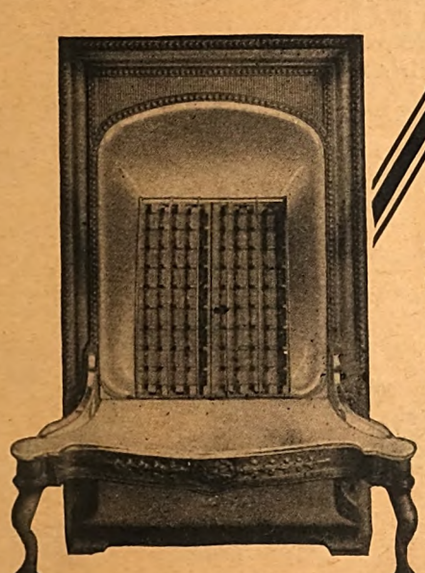

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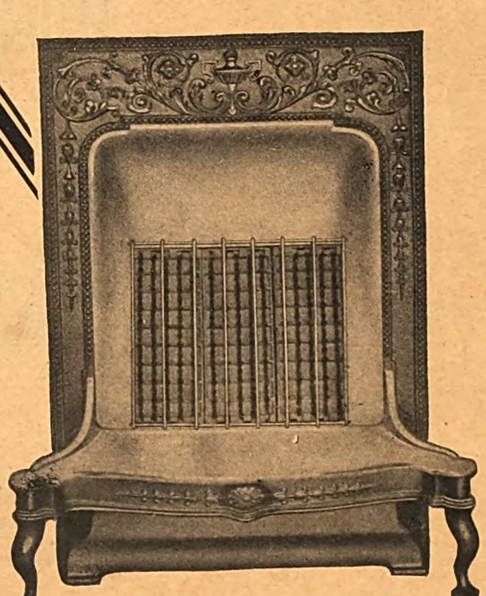

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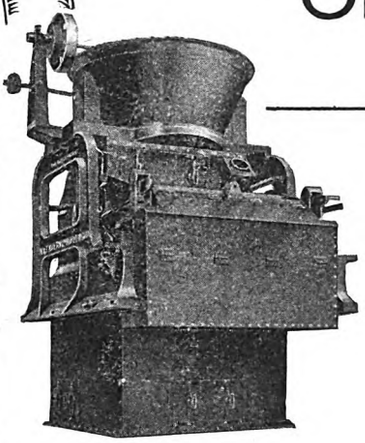

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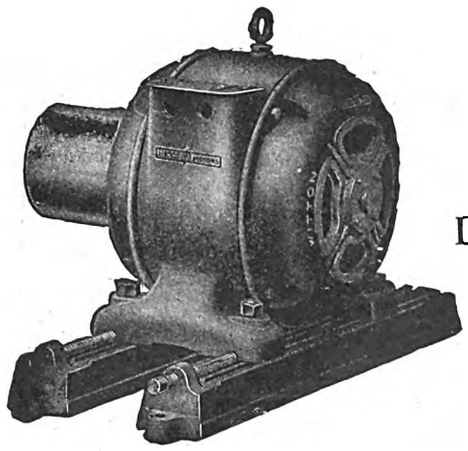

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Current Topics.

East African Development.

ELSEWHERE in this issue we are able to give particulars of an important hydro-electric undertaking which is about to be put in hand in Tanganyika Territory. It would appear that the value of the project to the economic position of the Territory would be materially enhanced by the inclusion of the Dar-es-Salaam district in the area of the concession. We hope that the reluctance of the local government to withdraw from the field, by disposing at a fair valuation of the inefficient plant which it now operates departmentally at Dar-es-Salaam, will shortly be overcome. Meanwhile the uncertainty is causing some delay in placing orders for the necessary plant for the Pangani Falls development.

Use of the Victoria Falls.

NEARLY a quarter of a century ago the company now known as the Victoria Falls and Transvaal Power Co. obtained a concession for 75 years from the British South Africa Company, which then administered Northern and Southern Rhodesia, for the development of 250 000 H.P. from the Victoria Falls of the Zambezi. Later, the exclusive right to deliver electricity from the Falls to the Transvaal was obtained. Lack of intermediate demand and the long distance separating the Victoria Falls from the Rand goldfield caused the postponement of development at the Falls and the company busied itself with the supply of steam-generated power to portions of the Witwatersrand mining zone. Ample supplies of cheap coal are mined immediately to the east of the goldfields and the transmission of power from the Zambezi to the chief centres of population in the Transvaal is not likely to become an economic proposition. Even in Southern Rhodesia there is not much prospect of any sufficient demand to justify expensive development at the Victoria Falls, for the Wankie colliery can supply coal at a very low price, and the larger towns, such as Bulawayo and Salisbury, are a long way from the Falls. Attempts to make a grievance of the inaction of the concessionaires, although somewhat unreasonable, appear to have induced the company to initiate negotiations with the Northern Rhodesian Government for a fresh agreement, and the Chief Secretary recently stated that a dispatch had been sent to the Southern Rhodesian Government containing specific proposals upon which full technical and legal advice from England had been obtained. As far as the company was concerned, the Northern Rhodesian Government had now arrived at almost complete agreement in regard to a further contract should such be entered into. The Chief Secretary added that the Victoria Falls and Transvaal Power Company had engaged an engineer at their own expense to report on the feasibility of a small installation at the Falls (apparently to supply current to Livingstone), and his report was expected very shortly.

Travelling Demonstration Kitchens.

VALUABLE publicity for electrical cooking is being obtained in France by means of a motor van fully equipped as an electric kitchen which has been placed on the road by the Compagnie Ouest-Lumière. The van is fitted with cooker, kettles, coffee pots, and other small apparatus. Samples of food cooked on the van and printed matter are distributed to the crowds of housewives who gather round the vehicle in the squares and market places of the towns and villages where demonstrations are given. Large dials are provided so that the consumption of current can be observed, and a supply of the smaller types of apparatus is carried for sale on the spot. Current is taken from the nearest low tension main by means of a long lead. The plan is worthy of attention by supply undertakings in this country, though there are certain difficulties to be overcome, such as the possible absence of points from which to tap the mains at places where a crowd would be permitted to assemble.

America Slowing Down.

FIGURES relating to the output of electricity in the United States during November are significant. They indicate that although there was a substantial

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gain over the corresponding month of 1928, the rate of development has slackened. The actual increase is below the figure of normal growth as determined by past experience and reflects the slowing down of industrial activity which has followed the recent Wall Street collapse. Those parts of the country which gave evidence of the greatest increase in industrial activity during the past year now show the largest relative decline. It is in the Middle West, between the Alleghanies and the Missouri, that the recession of activity is most marked, and it is specially noticeable in the centres concerned with the automotive, steel and associated industries. The worst drought ever recorded in the Pacific Coast State of Washington persisted up to the beginning of the winter, and the diminished stream flow restricted the output of hydro-electric plants, thereby curtailing industrial activity at several centres where supplementary steam-generating plant was not available.

40 000 000 H.P.

THE National Electric Light Association estimates the production of electricity for public use in the United States during 1929 at 97 000 000 000 kWh, equal to that of the rest of the world combined. During the past seven years, 13 500 000 kW have been added to generating capacity, nearly 50 000 miles of transmission lines above 22 000 V have been built, the output of energy has doubled, and more than 11 000 000 new customers have been secured. At the end of 1929 the total generating capacity was nearly 40 000 000 H.P. These figures are a challenge to this country, and upon the manner in which it is taken up the industrial future of Britain largely depends. The Report of the Electricity Commissioners for 1928-29, which is summarised on another page, shows that real progress is being made.

Electrical Transmission in America.

CONTRARY to popular opinion in this country that America is the home of long transmission lines, the N.E.L.A. points out that reports received from 400 supply companies show that 89% of the total amount of energy is consumed in the state where it is generated. Of the remainder, 7% is sold direct to consumers outside the state where generation takes place, and 4% consists of bulk supply from one state to another for company distribution. It may, of course, be argued that American engineers are wrong, but since this short line distribution method is more or less common practice in this country also, those who look to America for enlightenment on the subject of long distance transmission are likely to look in vain, particularly when it is remembered that, in spite of the progress in interconnection which has been made in America, the average distance traversed by the average kilowatt-hour in its path from power house to consumer is only about 22 miles and, excluding the State of California, as short as 18 miles. These figures are interesting for they show that, in spite of the large area of the country, rural and industrial electrical developments are still more or less centred round the power plants and not, as many would have us believe, a good many hours' journey away from the source of supply.

World Power Conference.

IT is interesting to note that the papers which have been received for the second World Power Conference, to be held this year in Berlin, include no less than fifty of British origin. These are sponsored by such leading bodies as the Central Electricity Board, the B.E.A.M.A., the I.E.E., and others, while the list of authors includes such prominent members of the industry as Dr. RUDOLF LESSING, Sir CHARLES PARSONS, Mr. C. W. MARSHALL, and Dr. C. H. LANDER. A certain proportion of the papers will deal with the utilisation of solid, liquid and gaseous fuels in power economy, while modern steam power plants, considered as the basis of cheap power development, will also be discussed. Papers on the subject of hydro-electric systems and others devoted to the problem of electrical distribution are also anticipated. The preliminary work attaching to the Conference, in so far as this country is concerned, is in the able hands of Mr. D. N. DUNLOP, the chairman of the International Executive Committee. The fact that the British electrical industry is to be so well represented at Berlin is particularly encouraging, for with Britain in the second place of honour at the last E.H.T. Conference in Paris, the Continental impression that British electrical engineering is somewhat behind the times received a mild correction; let us hope that at Berlin it will be altogether removed.

"Light's Golden Jubilee."

WE have written so much about the unfair way in which Sir JOSEPH SWAN'S work was ignored by those responsible for the organisation of the recent celebration of "Light's Golden Jubilee" that we are glad to read in our Canadian contemporary, "Electrical News and Engineering," quite the fairest statement about the incandescent lamp invention that has yet been made public on the other side of the Atlantic. It points out that EDISON and SWAN both invented a carbon filament lamp, Swan's being the first, and then goes on to show that while SWAN was the pioneer, EDISON was the commercialist, a view which is largely borne out by the facts as we know them. It must have required no small amount of moral courage for a paper published on the American continent to champion so unpopular a cause. Congratulations to our Canadian friends on their share in doing justice to the memory of a great British inventor.

A Bad Example.

ELECTRIFIED railways ought surely to set a good example in the matter of lighting of passenger trains. The London Underground system certainly does so, but this cannot be said of either the Metropolitan or the Southern. There is a great difference on the Metropolitan between the newer coaches and some of the older stock of both compartment and vestibuled types. Worn-out bulbs of insufficient wattage, glowing a dull orange colour, make reading a severe strain on the eyesight. In the newer coaches, dazzling naked lights, which are equally bad for the eyes, are used. It would cost a comparatively small sum to fit adequate bulbs giving a diffused light, and the companies concerned would earn a large measure of public approval by doing so. Station lighting is also far from satisfactory in many cases. Inability to read a time-table owing to lack of illumination is a source of irritation which could be removed with advantage to all concerned. Stations exist at which the lights, far from good at their best, dwindle to half their normal lustre when a train enters the station section of track —just when they are most needed. This is lamentable publicity for railway travel.

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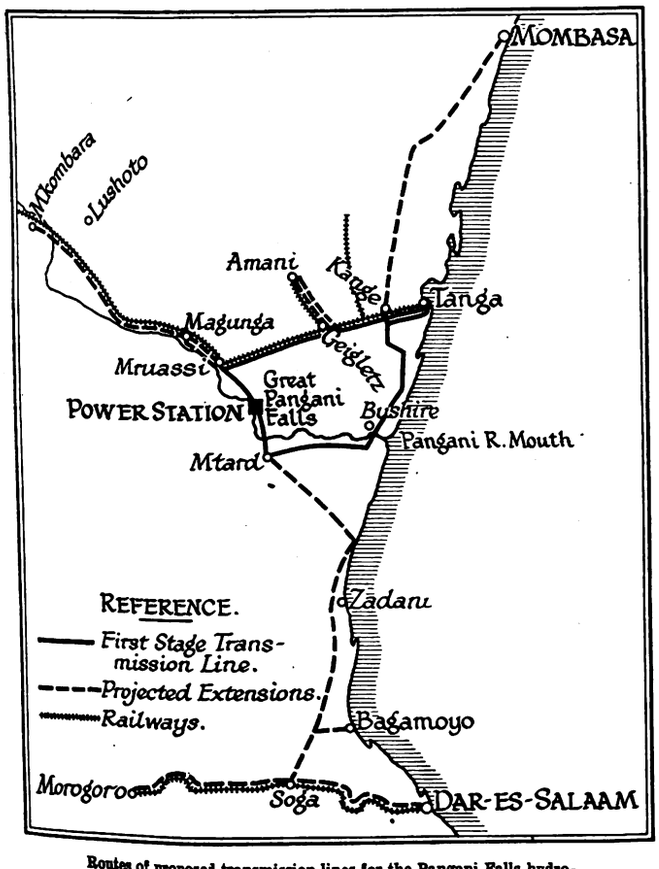
PANGANI FALLS DEVELOPMENT.

East African Hydro-Electric Undertaking—Power for Tanganyika Sisal Estates—Ring Transmission Main over 100 miles long—Future Extensions to Mombasa and Dar Es Salaam—Coming Orders for British Firms.

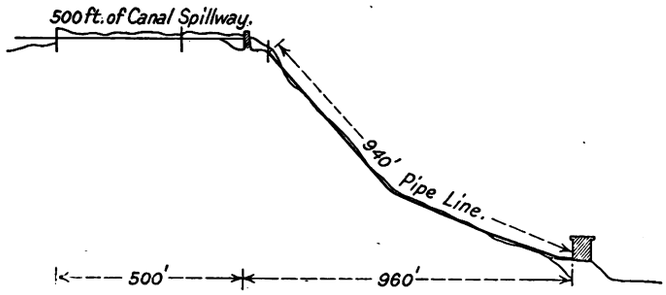
AFTER negotiations lasting for several years the Tanganyika Territory Government has accepted the tender of a British company called Power Securities Corporation for the development of electricity from the Great Pangani Falls to supply the numerous sisal estates in the immediate neighbourhood of the Falls and the port of Tanga. There is no reason why current from the Pangani Falls should not also be transmitted to Dar es Salaam and Mombasa. In the latter case no difficulty is anticipated in coming to an arrangement with the East African Power and Light Company, which operates a steam-driven plant to supply the town and port, for the linking up of the Mombasa area with the Pangani undertaking.

The position in regard to Dar es Salaam is still uncertain as the Tanganyika Government appears to have some predilection for dealing with the capital district on the basis of supplying current from a Government steam-driven plant. The present installation at Dar es Salaam is an inefficient station originally established by sappers and miners during the war to replace the destroyed German power station. Apart from the objection that it is hardly an economical policy for a Government electricity department to be maintained in such circumstances as exist at Dar es Salaam, an attempt to modernise a generating station driven by costly imported fuel when electricity produced by the use of local water power is available in the neighbourhood does not seem well advised. There is also the point that a Government scheme would involve the use of funds from the Colonial Development Loan, whereas the supply of Dar es Salaam from the Pangani development would be carried out entirely by private enterprise. The interests associated with the Pangani scheme are ready to extend their transmission lines to Dar es Salaam, and are delaying the final decision as to the size of the initial generating plant to be installed in the hope that it will be possible to reach an agreement with the Government about the Dar es Salaam district.

Great Pangani Falls are about 50 miles from the mouth of the river, which rises on Mount Kilimanjaro, and flows roughly parallel to the railway from the Kilimanjaro highlands to the port of Tanga, entering the Indian Ocean about one-third of the way from Tanga to Dar es Salaam. The average flow at Pangani Falls is estimated from actual measures at approximately 1 500 cubic feet per second with an absolute minimum of 975 cu. secs. during low water periods. The available head would vary according to the length of the canal but the maximum is 390 feet. On this basis the total quantity of power obtainable from the falls is 38 000 kW, with a minimum of 24 000 kW.



Routes of proposed transmission lines for the Pangani Falls hydro-electric undertaking.



Intake canal, penstocks and power house.

There are some 25 sisal estates in this area, and their immediate requirements of current are estimated at 4 000 kW, to which 1 000 kW may be added to cover the needs of Tanga. To meet this initial demand it is proposed to construct the necessary works for a continuous output of 7 500 kW. This would provide sufficient margin for any increase in the demand for power likely to occur in the near future.

Subject to the possibility of utilising an alternative site at Haupt Falls after final surveys have been completed, the plans provide for the construction of the generating station on the right bank of the river at Great Pangani Falls. The intake would be at a point immediately above the falls, and at this point the water would be diverted by a series of dams across the existing islands. The headworks would consist of a forebay dam at the top of riveted steel penstocks of 7 feet internal diameter and a total length of 960 feet.

The power house would be built to contain three units each, consisting of three Francis type spiral turbines direct driving electric generators having an output of 2 500 kW at 11 000 V, 50-period, three-phase current. The power station would be equipped with the necessary control gear and transformers for transmission at 33 000 V.

Transmission Routes.

For the first stage of distribution the transmission line will form a complete ring main of single line with a capacity of 5 000 kW. At suitable points sub-stations will be provided stepping down to 10 000 V for transmission to other sub-stations on consumers' premises, where the current will be again stepped down to the required voltages. There will be double circuit extensions from Kange to Tanga, and from Mruassi to Magunga, with a possible branch from Geigletz to Amani if sufficient demand exists at the latter point. Later extensions of the transmission mains would lead from Kange to Mombasa, Magunga to Mkombara (in the direction of Mount Kilimanjaro), and from Mtard via Zadani to Soga, on the railway from Dar es Salaam to Lake Tanganyika, with a short spur into Bagamoyo on the coast. From Soga the line would run east to Dar es Salaam and west to Morogoro, but this southern extension is, of course, dependent on a satisfactory arrangement being reached between the Power Securities Corporation and the Tanganyika Government for the acquisition by the power of the Dar es Salaam plant. The initial ring main will be over 100 miles long.

The Pangani Falls undertaking will involve the raising of a capital of about £500 000. It will be carried out entirely by private enterprise, and no call will be made on Colonial Development Loan funds. Orders for the plant and equipment required will be placed in Great Britain. It is expected that construction will occupy from two and a half to three years. Messrs. Balfour, Beatty & Co., Ltd., are the consulting engineers associated with the scheme.

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LARGE TURBO-ALTERNATOR SETS.*

Increased Efficiency—Parallel to the Development of the Steam Engine—Size of Future Units—Peripheral Speeds—Warming Up and Cooling.

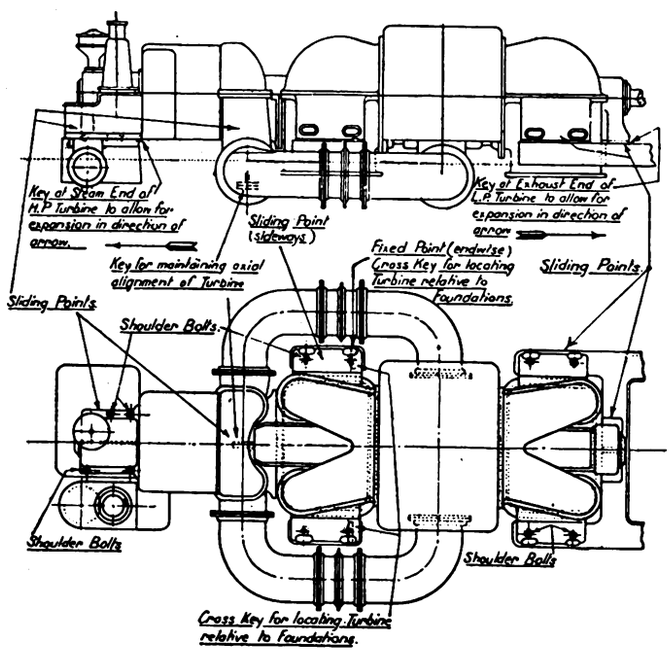
By R. LIVINGSTONE, A.M.I.E.E., A.M.I.Mech.E.

IN speaking of large turbo-alternator sets one may have in mind a machine with a large output or one of great physical dimensions, but engineers instinctively couple the two factors together when they speak of large machines, and are mainly interested in large output, and with an added interest if the output is obtained at a high speed. As the large outputs of to-day become average figures in a few years' time, the few remarks I have to make will apply mainly to machines of 20 000 kW to 100 000 kW.

That enormous progress has been made during the last 20 years in turbo-generating sets is generally admitted. As, for instance, during this period working temperatures have been almost doubled, pressures have increased nearly ten-fold and outputs a hundredfold, and the Rankine cycle has been departed from by the introduction of feed heating and re-heating, the combination of which has about halved the quantity of coal required to produce the same amount of electricity.

Progress in the manufacture of the alternators coupled to steam turbines has not been so spectacular as the progress made in turbine design during the same period. Nevertheless, the improvements effected have been sufficient to enable the output of the alternator to keep pace with the rapid growth in turbine output. At the same time the alternator efficiency for the same output has increased, and although the increase may appear small, it nevertheless represents a very considerable reduction in the total losses.

It is interesting to note that the general trend of progress is following very closely the history of the steam engine, and continuing the development started by James Watt when he separated the condenser from the engine cylinder. With



Two-cylinder double-flow turbine, showing provision for expansion.

regard to the question of distortion of large cylinders, the Serial Report of the Prime Movers' Committee of the National Electric Light Association of America of August, 1929, on page 27, gives a record of the starting cycle of large impulse turbines ranging in output from 20 000 kW to 60 000 kW, and it can be seen that the single-cylinder type of machine ranges from about 40 minutes for the smaller sizes up to as much as 180 minutes for some of the larger sizes, and the rate of loading, thereafter, is about 1 000 kW per minute in all cases. There is only one example of a tandem compound machine in the table, but general experience in this country with the multi-cylinder machine is that the starting time for 2-cylinder high-speed units is much shorter than the above figures. This indicates that the heat distortion of the high-speed two-cylinder machines is less than the large single-cylinder type.

The coal consumption required to bring large slow-speed units into full commission must be an appreciable amount, and this loss is undoubtedly diminished by the use of the smaller multi-cylinder type of turbine.

Bearing in mind the tendency towards increased pressures and temperatures, the increase in the amount of steam bled for feed heating, and the possibilities in the way of providing parallel paths at the exhaust end of a turbine, it is difficult to put a limit to the maximum size of unit at 3 000 r.p.m., even with the materials at present available. As reliability is of vital importance in large units, it is unlikely that any great departure from present-day practice will be made, but the increase in pressure, temperatures, and output may advance the three-cylinder turbine with three or possibly four flow exhaust. In this case the layout of the plant becomes almost as important as the design of a power station, and operating considerations become of even greater importance than they are with the simpler two-cylinder machines. The cross-compound arrangement, as an alternative to the tandem arrangement, has features which should be considered, but it is difficult to say at this stage of development which arrangement will prove the most suitable for the largest units.

Provision for Expansion.

Expansion of the cylinder casings must be allowed for in all sizes of turbines, and the only difference between the large turbine and the small one is that greater care is necessary in the large than it is in the small machines, because of the increased expansion. It is necessary in allowing for expansion of turbine cylinders to maintain unchanged the general alignment and running clearances.

That the forces to be taken care of are considerable can be shown by taking the very simple case of a straight pipe fixed at one end and having a forced movement at the other. With a pipe thickness equal to the bore ÷ 50 plus 1/10 inch, the minimum free length to permit of a forced movement of $\pm \frac{1}{4}$ inch with a bending stress of 10 000 lb. per square inch is $33\frac{1}{2}$ times the root of the outside diameter. The benefit of dividing the main steam pipe into two is most marked in the case of the larger areas. In the case of the smaller areas the forces acting are not greatly affected, although the free length is still considerably reduced. For large machines, therefore, the main steam connection to the turbine can well consist of two or more steam pipes in parallel. Such a device as the Aiton pipe can of course be used to reduce expansion forces. In addition to the expansion forces from the steam pipe, the weight of the pipe and steam chest is considerable and tends to distort the turbine casing. This can be overcome by spring supports under the chest, or, preferably, by a balance weight. In coupling up the steam pipe to the turbine, allowance for expansion must be made. This allowance is more than is generally realised. Taking a normal engine-room temperature of 80 deg. Fahr., and steam temperature of 700 deg. Fahr., then a pipe or bend will expand $\frac{1}{2}$ in. in 10 ft., and allowance at this rate must be made in each leg of the bend when springing the pipe into position.

On single-cylinder machines a point is reached in output when it is no longer possible to have the critical speed above the running speed. In this case the clearances must be sufficient to allow for the shaft vibration. On the multi-cylinder machine, with shorter bearing centres, the effect of this is smaller than on single-cylinder machines. It is necessary, however, to provide flexible couplings between the turbine rotors so as to prevent one rotor reacting on the other to give a combined critical speed lower than either.

In the early days of the turbo-alternator the need for close voltage regulation imposed serious limits on the design. Regulation was obtained by large air gaps and lengths of nearly saturated iron in the magnetic circuit and the stator loading was kept low. These limitations made the size coefficient $\frac{D^2lN}{KVA}$ much higher than it is to-day. With the increase in size of power systems and power units, helped to some extent by automatic voltage regulation, the need for close inherent

* From a paper read before the London Technical Group of the Electrical Power Engineers' Association. Owing to Mr. Livingstone's absence abroad, the paper was read by Mr. Law.

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regulation has disappeared and the designer is free to choose that relation between electric and magnetic loading which will utilise the whole of the material to the best advantage. The result is that the ratio of stator ampere turns per pole to rotor ampere turns is to-day higher than was the practice even ten years ago.

Cooling Problems.

Concurrent with this change the problems associated with the cooling of the machine have become prominent. The various methods of solving this problem are clearly shown in Mr. Kuyser's recent paper.* There are still some difficulties to be overcome in the manufacture of large units, and these are mainly mechanical.

The mechanical design of the rotor makes it difficult to add very much to the surfaces for the dissipation of heat. The rotor losses consists of I^2R losses in the windings, fan power and air friction and pole-face losses. The copper losses can only be reduced by an increased section of copper, and the limit to this is the permissible stress in the rotor teeth and end bells.

In this country a peripheral speed of 28 000 ft. per minute has not been exceeded, although slightly higher figures are possible with the qualities of steel available. Higher peripheral speeds are used by some continental makers with alloy heat-treated steels, but in this country makers have confined themselves to the use of the lower alloy steels for large forgings which do not require any drastic heat treatment and are less liable to suffer from contraction stresses. Rotors of large diameter and with large variations in section are of course more liable to suffer from contraction stresses than small rotors of nearly uniform section. The safe peripheral speed depends to a large extent on the soundness of the forging and its freedom from initial stress, so that the factor of safety should be higher in forgings of large diameter than it need be in smaller forgings. In other words, if the safe peripheral speed for a 3 000 r.p.m. rotor is 29 000 f.p.m., the limit for a 1 500 r.p.m. rotor is about 27 000 f.p.m. for the same proportions.

As the size of ingot necessary for the production of a rotor plays a large part in the manufacture of the rotor, the approximate weights of ingots for a given output at 3 000 r.p.m. and at 1 500 r.p.m. are given in the following table :—

kVA Output	Approx. Weight of Ingot. 3 000 r.p.m.	1 500 r.p.m.
20 000	25 Tons	51 to 55 tons
30 000	32 ,,	62 to 66 tons
40 000	39 ,,	73 to 80 tons
50 000	46 ,,	85 to 95 tons
60 000	53 ,,	95 to 110 tons
70,000	60 ,,	
80 000	67 ,,	
90 000	75 ,,	
100 000	82 ,,	

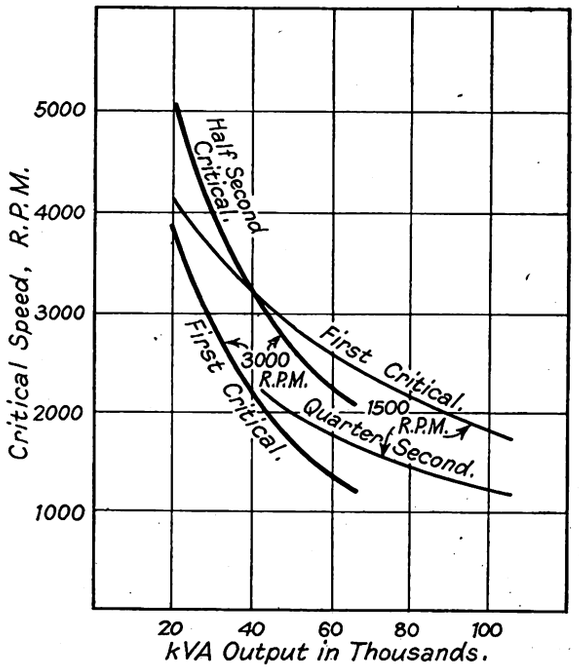
A built up rotor such as that described by Professor A. B. Field in his paper before the I.E.E. in 1915 can be used when a solid forging is impossible. This rotor was successful with a peripheral speed of 24 000 f.p.m., even with fairly deep ventilating ducts under the field coils. The built-up rotor described by Mr. Kuyser in his recent paper† before the I.E.E. is another construction which has promising features.

The forging difficulty applies only to 1 500 r.p.m. machines. In the case of 3 000 r.p.m. machines the possible output is not governed by the forging but by the critical speed and deflection of the rotor. A two-pole alternator rotor has two slightly different values for the moment of inertia of the body and a fundamental critical speed corresponding to this inertia. When the body of the rotor is short, the deflection of the shaft ends is the important factor in determining the critical speed, but with long rotors body deflection is the most important. The condition for a second critical speed higher than the fundamental is vibration with a node in the centre of the rotor.

Critical Speed Curves.

A magnetic impulse twice the normal speed for two-pole machines and four times normal speed for four-pole machines is set up when the rotor is eccentric to the stator, so that in 3 000 r.p.m. rotors the first critical speed or half the second critical should not coincide with the running speed, and in 1 500 r.p.m. alternators the running speed should not be equal to the first critical or one-quarter of the second critical speed. The critical speeds depend largely on the stiffness of the shaft ends, and the variation with output is shown graphically below for a series of rotors having the maximum rigidity of body and shaft ends, and the shortest possible bearing centres. The curves for 1 500 r.p.m. are based on solid forgings, but the actual built-up rotors have a critical speed of a value depending on the particular construction and dimensions.* In actual practice the critical speeds of both 1 500 and 3 000 r.p.m. rotors are lower than the maximum attainable on account of the presence of fans on the rotor and overhung exciter.

With regard to the high-speed rotors, at outputs under 30 000 kVA, the shaft ends are made more elastic than they



Critical speed curves for a series of rotor tests.

could be to keep the first critical above 1 500 and well under 3 000. From 30 000 to 40 000 kVA the maximum stiffness can be maintained, but above 40 000 kVA the shaft ends must again be made flexible enough to bring half of the second critical under 3 000 r.p.m. While these figures are approximate and vary with the actual design in each individual case, it is evident that so far as critical speed is concerned no new problems are encountered in the high-speed rotors with solid forgings up to about 40 000 or 50 000 kVA, and the problem of avoiding the multiples of the second critical is no more difficult than the problem of avoiding the first critical itself. 1 500 r.p.m. curves above 50 000 kVA are only of theoretical interest.

Core lengths of 220 in. are in use to-day in large American units. Such a core length would be necessary for the large 3 000 r.p.m. machines.

It is generally recognised that when starting up a steam turbine it is necessary to warm it up carefully before putting it on load, but it is not so generally recognised that the cooling-off after taking a machine off load is just as important. An important American committee has studied this subject and gives the following rules to guide the operating staffs :—

(1) That overloads in excitation be avoided.

(2) That such arrangements of ventilation be adopted as will permit as little cooling down of rotor when at rest as possible, and on no occasion permit the entrance direct of outdoor air.

(3) That a practice be established of determining temperature of field windings at stated intervals by observing volts at collector rings and comparing with that at same load conditions when generator was first put in service.

(4) That insulation resistance be measured at the same stated intervals.

(5) If for any reason at any time the rotor at rest has become very cold, run it at low speed with excitation sufficient to

* "Journal Inst. Elect. Engineers," Vol. 67, No. 393.
† Vol. 67, No. 393, p. 1112.

* Dr. Pohl gives values for rotors with laminated belts in the "Electrotechnische Zeitschrift," February 10th, 1927.

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bring the temperature up to 75° C. in about one-half hour before raising speed to normal.

Discussion.

Mr. A. SICHELL, urging the necessity for paying very careful attention to matters of detail during erection of large plants, pointed out that problems which, in the case of the smaller machines, were of comparatively small importance, became of very great importance in the case of the large machines in use to-day. The proper alignment of the rotating elements was a matter of very great importance. Another was that of making sufficient provision during erection to allow for the expansion which must take place. The larger the cylinder, the larger its movements, and the expansion movements of cylinders were very much larger than most people imagined. Quite serious troubles had arisen as the result of insufficient clearance having been allowed for expansion. No matter how well a plant was designed, its success as a running unit depended to a very large extent indeed upon the care exercised during erection and a proper appreciation, on the part of those responsible for its erection, of all the forces which would operate when the plant was running and was heated up. Again, if the steam pipes, and particularly the closing lengths, were fitted when the machine was cold, it was highly probable that a very heavy force indeed would be thrown upon the cylinder or steam chest when the set was heated up. Very often the closing length of pipe, when in the cold condition, was 1 in. or 1½ in. short of the length required, but when the temperature was raised to the working temperature the gap was filled by the lengthening of the pipe due to expansion forces. Again, it was not always appreciated by users that the manufacturers had to run great risks in the making of large machines as for instance, in the making of large forged rotors. Progress in the design of large machines depended entirely on the progress of the steel maker, and if the steel makers could produce steels of the necessary homogeneity and physical properties, the manufacturers of plant could produce machines having larger capacity, but of reduced size.

Mr. J. C. CALLANDER emphasised the tremendous effect of temperature upon the mode of vibration of turbine wheels, and referred to a case in which a sudden reduction of temperature in a superheater of a turbine had wrecked the machine, due to the mode of vibration having bent the wheel until it had interfered with the diaphragm.

Mr. LAW said that temperature effect, of course, was one of the things that could be predicted, because the change in the modulus of elasticity of steel due to temperature change was known very accurately. He wondered whether the trouble mentioned by Mr. Callender was really due to ordinary mode of vibration ; it appeared to him that it might have been due to a tight rim.

Mr. CALLANDER said that probably the change in temperature had started the deflection ; then the disc had touched, causing very heavy heating, which had given rise to the permanent deflection.

Mr. R. POWELL asked why marine turbines had to be turned over for eight hours with a turning engine in order to warm them up, whereas land turbines could be warmed up in about two hours ; he had heard recently of one which was ready for operation in three-quarters of an hour.

Mr. LAW replied that the old type of marine engineer was often a slave to custom ; he had been accustomed to turning his reciprocating engines slowly for hours before starting, and still continued that practice in the case of his turbines. The marine engineer, however, had not to deal with superheats anything like those that had to be dealt with by the land engineer. Some of the modern marine engineers did not adhere so slavishly to old customs, and were very fine engineers. Modern turbines in power stations had frequently to be run up and to carry full load in a very short time. If one ran them up to speed when dead cold he did not think much harm would be done, but starting up when half warm and half cold was very trying.

Mr. F. F. ELLIOTT, referring to blade vibration, asked if there were available means for predicting accurately the period of vibration of a group of blades, as distinct from an individual blade, and if it were possible by the manner of fixing to ensure that the critical vibration of that group would occur between, say, a pair of harmonics fairly well away from the fundamental vibration causing the trouble. It seemed to him that it would be almost impossible to calculate it accurately.

Mr. LAW replied that it was very difficult to predict the period of vibration of a group of blades, and it was the practice of his company to experiment on groups of blades continually. He considered that the principal value of the grouping of blades was not to alter the period, but simply to introduce some sort of damping. That was evidenced by the fact that when trouble occurred it was found nearly always to be due to the end blades.

A SPEAKER asked what was Mr. Law's view with regard to allowing large sets to run on atmosphere.

Mr. J. A. JEFFERY said he believed every designer looked with apprehension upon allowing machines to go over to atmosphere. It was a foolish thing to do.

The CHAIRMAN (Mr. W. J. Oswald) asked what was the highest superheat at which modern turbines should run.

Mr. LAW said that the limiting factor was the boiler, and not the turbine. Whatever the temperature of the steam, the turbine was always a little cooler than the steam, whereas the boiler and superheater tubes must always be a little hotter.

Mr. W. WILDE asked what were the respective merits of claw couplings and solid couplings. With regard to oil, he asked what had been done to overcome the difficulties of sludging, emulsifying, etc.

Mr. LAW, replying to the question with regard to couplings, said that each case should be decided on its merits. On the whole he considered that generally there was room for the claw couplings, and in high-class machinery it was better to have a claw coupling, at any rate between the turbine and alternator. There was a good deal to be said for the use of the solid coupling between the individual shafts of a turbine, however, because the thrusts could be distributed. The emulsifying of oils was one of the mysteries of the art. The real bugbear was the occurrence of acid in the oil ; when water got into the oil it caused it to become acid, and electrolysis could have the same effect. He referred to two old turbines at a particular station, in one of which the oil always contained an enormous quantity of water, whilst in the other there was always very bad electrolysis, but not the slightest trouble had been experienced due to the oil for many years. Three large turbines, of two different makes, had since been installed, however, and, although there was no water in the oil, and no electrolysis, all of them were producing acid at a considerable rate. Neither of the makers had yet arrived at a solution of the problem, and the oil suppliers had not been able to solve it, although the difficulty had been mitigated to some extent.

Temperature Limits.

Mr. PERCY RYCROFT, proposing a vote of thanks to Mr. Livingstone and Mr. Law, said he had been rather surprised by Mr. Law's statement that the limitation with regard to the temperature attained in turbines was not so much a matter for the turbine designer as for the boiler maker. It seemed not long ago that engineers were asked to be particularly careful not to exceed a certain temperature in these plants because the turbine builders were experiencing a certain amount of difficulty with the casings. Presumably that difficulty had been overcome, but he would be interested to know what temperature the turbine designer would like in order to give the best possible efficiency. He believed the new machines to be installed at Battersea would attain a temperature of something like 830 deg. F. If that were not enough, he could assure Mr. Law that the turbine builders had only to ask for what they wanted and the boiler makers would undoubtedly give it to them.

Mr. LAW, responding, said that no one yet knew what was the limitation with regard to temperature. A temperature of 800 deg. was being used in many power stations, and his company had made a turbine which, it was believed, would be able to stand 900 deg., by the use of special steels. This was a matter in regard to which close co-operation was necessary.

BIRMINGHAM ELECTRIC CLUB.

The report and balance sheet for the twenty-fifth session of the Birmingham Electric Club, presented at the annual general meeting on December 20th, records that further progress has been made and membership increased to 263.

During the year covered by the report six lectures, other than the Presidential Address, were delivered, attendances in all cases being good. The annual dinner was held on March 8th, some 200 members and friends being present. The annual summer outing was made to the cable works of Standard Telephones and Cables, Ltd., North Woolwich. At the Ladies' Night, held on October 18th, the President and Mrs. Forrest welcomed some 415 members and friends.

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ELECTRIFICATION IN GREAT BRITAIN.

Commissioners' Report for 1928-29—Foreign Capital Interested—Increased Output of Energy—Developments under Consideration—Supply of Rural Areas.

THE ninth annual report of the Electricity Commissioners for the year ended March 31st, 1929, was published this week (Stationery Office, 3d.). It recalls that three further regional schemes prepared by the Commissioners for Central England, North-West England and North Wales and for Mid-East England were adopted with certain modifications by the Central Electricity Board. The five schemes adopted by the end of March last cover about 43 per cent. of the area and 75 per cent. of the population of Great Britain. They embrace the area of supply of some 450 authorised undertakers who accounted for over 80 per cent. of the total sales of electricity to consumers in 1927–28.

Contracts placed by the Central Board at March 31st last in respect of primary and secondary transmission lines, associated transforming stations and other works amounted to approximately £8 150 000.

In the twelve months under review the total number of units generated was 10 878 980 925, of which 9 473 201 134 were produced by authorised undertakers and the balance by railway and tramway stations and certain non-statutory undertakings. The output showed an increase of more than 9·5 per cent. on the figures for 1927–28. Since 1920–21 the production of electricity at the stations included in the returns has increased by upwards of 110 per cent., representing an average of 13·8 per cent. per annum during the past eight years. The figures also show that there has been an all-round increase of about 60 per cent. in the amount of electricity produced per ton of coal and coke consumed as compared with 1920–21. The total consumption of coal and coke in 1928–29 was 9 526 868 tons, an increase of 3·7 per cent on 1927–28, and the oil fuel consumption was 35 241 tons, a decrease of 4 800 tons.

Stations numbering 178 with individual outputs of 10 000 000 units or over were responsible for the generation of 94·7 per cent. of the total output. The remaining 386 stations collectively generated only 5·3 per cent. of the aggregate production.

Sales of Electricity.

In 1928 there was an increase of nearly 4 per cent. over 1927 in the sales of electricity by authorised undertakers and a total increase of over 108 per cent. during the six years since 1922 (an average of 18 per cent. per annum). On the basis of estimated population at the end of 1928 the sales of electricity from public sources of supply in that year represented an average consumption of 171 units per head of population. The total sales in 1928 were 7 603 240 446 units, compared with 6 850 162 808 units in 1927. It is of interest to find that the curve of estimated growth in the years up to 1940–41 prepared by the Commissioners as a preliminary to the formulation of the new Regional Schemes, forecasted the sale of about 7 500 000 000 units in 1928, compared with the actual figures of 7 603 000 000 units.

It is pointed out in regard to the sale of electricity in rural areas that one of the most important problems of the next few years will be to ensure that the additional facilities thus rendered available are utilised to the best advantage in providing an electrical service for as large a proportion of the rural population as the economic circumstances of the supply will permit. This matter has been receiving considerable attention by undertakers. The present report gives an indication of the various steps which are being taken to carry out or to secure the carrying out of supply powers and obligations; of the scope of the more important proposals and schemes for the establishment or extension of supplies in rural areas dealt with during the year or in course of preparation; and of other action in progress with these objects. It is shown that, apart from other developments not specifically mentioned, the question of providing supplies of electricity for communities located in a number of large areas in different parts of the country, covering an aggregate nearly 16 000 sq. miles of territory is actively engaging attention.

With regard to the technical and financial aspects of the development of large rural and composite areas, the particulars given in the Report serve to demonstrate that :—

1. The establishment of the "grid" system will play an important part in rural electrification by providing and facilitating the provision of additional points of supply;

2. Rural development if carried out by authorised undertakers on a reasonably comprehensive basis will involve the provision of a large amount of secondary transmission lines in the areas concerned, and

3. The prospects of a public supply being afforded to the smaller communities are likely in many cases to be dependent upon the presence of a secondary transmission line within sufficient proximity to constitute an economic source of supply.

The two last considerations point to the necessity for devoting special attention to the lay-out of and capital expenditure on secondary transmission if the sparser population and load are to be catered for on a remunerative basis. The situation cannot be adequately dealt with on the basis of sporadic and irregular extensions as and when demand arises, but only by careful planning, at the outset, of a system for the area as a whole.

Extensive Developments.

Up to the end of March last, proposals had been submitted for the development of about 3 400 sq. miles of territory, with a population of about 460 000, involving an estimated capital expenditure of over £1 000 000 over a short period of years. These proposals were either on the point of being approved by the Commissioners or were then under consideration.

Distribution developments in rural areas for certain undertakings, as at March 31st, 1929, were as given below :—

Undertakers (and number)	Rural Parishes Supplied. No.	Rural Parishes Supplied. Distributing Mains Provided * Miles.	Rural Parishes not Supplied. (Number).
Local Authorities (95) ..	521	1 198	876
Companies (135)	914	2 417	2 171
Total (230)	1 435	3 615	3 047

* These figures are inclusive of compulsory mains provided in the parishes at present supplied.

The Commissioners propose to continue a systematic review of the progress made in the provision of distributing mains in rural areas with a view to encouraging and facilitating the establishment of supplies. As a result of recommendations by the Conference convened by the Commissioners in June, 1928, two small committees were appointed last March (1) to consider the various kinds of charges and tariffs offered by authorised undertakers and to make definite proposals to secure a greater measure of uniformity, and (2) to consider what steps could be taken to ensure that facilities for assisted wiring and for the hire and/or hire purchase of apparatus are made available.

Generating plant for new stations and extensions of existing stations sanctioned by the Commissioners in 1928–29 had an aggregate capacity of 602 818 kW, compared with 668 357 kW in the preceding year. The three principal consents granted in respect to the establishment of new generating stations were concerned with stations for use in connection with the Regional Schemes of the Central Electricity Board. These were the Ironbridge Station for the West Midlands Joint Electricity Authority (one 50 000 kW 50-cycle set); the Clarence Dock station at Liverpool (initially one 50 000 kW and eventually two 50 000 kW sets); and the hydro-electric station at Maentwrog to contain initially 18 000 kW of 50-cycle plant.

The estimated net cost of administration of the Electricity Commission for 1928–29 was £50 450, inclusive of £3 000 for unforeseen contingencies. After allowing for a reduction of £3 450 in the previous working balance, the total amount to be apportioned amongst authorised undertakers was £47 000 against £44 000 in the preceding year. The contributions by the electricity supply industry towards the expenses of the Commissioners for the year 1928–29 involved a payment of 1·65d. per 1 000 units sold by each authorised undertaker concerned.

On the expenditure side, salaries and staff expenses accounted for £38 415, accommodation and office charges for £10 145, and the preparation of schemes for the Central Electricity Board (recoverable) for £18 068. The total actual expenditure was £68 280 as compared with an approved estimate of £81 050.

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MARINE ELECTRICITY.

Movements of Important Electric Ships—The Progress of Marine Electricity Internationally—Two Novel Electric Liners of 1923—The Economics of Electric Shipping—The Power Limits of Turbo-electric Propulsion.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types," etc.)

TWO electric ships upon which the attention of the marine world has been concentrated for some time are now homeward bound, while the third is still outward bound, but will be returning to her home port early in the New Year. The "Viceroy of India" left Port Said on December 22nd, homeward bound for London. The Ellerman liner "City of Hong Kong" passed Perim on December 23rd, homeward bound for Manchester from Karachi. The P. & O. liner "Mooltan" left Melbourne on December 24th, outward bound for Sydney, N.S.W.

These are the three ships upon which the hopes and interests of two powerful shipowning groups and two big electrical companies are now concentrated. They represent, on the one hand, something that, as far as British ships are concerned, is an entirely new system of ship propulsion, and on the other hand, the two latter ships exemplify a "booster" system of propulsion which is bound to have an important effect upon existing steam-driven tonnage in need of bringing into line, power, speed, and from an economy point of view, with the modern motorship. Alternatively this electric "booster" system may be incorporated in the machinery arrangement of an entirely new ship, and by supplying current for driving the auxiliary machinery as well as the main "booster" motor or motors may effect some further very desirable ecomonies—in space and in steam.

It is felt that shipowners in general cannot help being attracted by these new ideas that the electrical companies have put before them, and that the year which is now before us is going to be an extremely fruitful one for the marine electrical industries.

The year which has just passed has been one of unparalleled success for the motor (i.e., the oil-engined) ship, because of its root economies. It has witnessed a slow but steady decline in steam-driven tonnage. That the steamer will ever disappear entirely is unlikely. Even to-day the power-driven ship has not absolutely eliminated the sailing ship. That the steamer will undergo modification and become numerically smaller is a reasonable supposition.

The greatest obstacle in the path of motorship development, or rather expansion, to-day is the electric ship. And yet the two are in no sense of the word direct rivals, because the latter can never have a universal appeal. It can never have an international appeal. It will always find favour in those countries in which the electrical industries are powerful and enterprising. Particularly, however, will it have a special attraction in countries which, by natural inclination, are wedded to steam engines, and which only sheer economics has torn from their first love.

British Interest in Electric Ships.

Thus we shall unquestionably see Great Britain ordering numbers of electric liners over the next few years. The new P. & O. order for two new ships is perhaps the thin end of the wedge. The Orient Line looks like a company which would, and should, be interested in electric shipping. . . . The Cunard Line, too, perhaps. The Ellerman Lines have led the way with the conversion of existing tonnage to the electric "supercharge" system. A further replacement—or rather conversion—programme is on hand, and more ships are likely to follow. It is unlikely that we shall see many, or indeed any, electric cargo (only) ships built in this country. There are three American all-electric cargo ships now in service, but they would not have been electric had it not been for special reasons under the U.S. Shipping Board's conversion programme. Electric propulsion is not necessarily characteristically suited to cargo ships—except in very special cases where auxiliary loads are high and in certain tank ships where steam heat is not needed in any appreciable quantity. Even so, this is particularly a case for Diesel-electric propulsion and a very attractive arrangement of steam raising can be made by means of exhaust heat boilers, oil fired when the ship is in port.

As far as signs of development are going at present it would appear that Diesel-electric propulsion is suited to smaller craft of, say, 3 000 H.P. absolute maximum down to tugs and ferryboats of 200 and 300 H.P. at the shaft. But then, because this involves the use of the Diesel engine, it is not likely to prove popular in this country. In America, because of the attractive prices at which small Diesel engines can be offered, and because of the immense number of small craft available, Diesel-electric propulsion is likely to go ahead very much in the next few years.

Scandinavian countries are making such a success of the Diesel-engined ship that they are unlikely to take much interest in the electric ship, and particularly in the electric liner. Scandinavian countries are essentially tramp ship owners, and the electric tramp is something which is unlikely to materialise. Germany has not hitherto displayed much practical interest in electric shipping, although, as I have shown in these columns from time to time, some of the most practical "paper" arrangements of high-powered electric liners have come from one of the big German marine and land Diesel-engine building companies—the M.A.N. Company of Augsburg. France, we are sometimes apt to forget, was an early sponsor of the electric ship in two cargo and passenger ships, "Cuasuja" and "Ipanema," built in 1923 for the Société de Transports Maritimes à Vapeur Marseilles. They operate between Marseilles and the River Plate via Gibraltar, Dakar, Rio, and Santos, and carry a few first-class and a number of third-class 'tween deck passengers. They have a displacement of 7 880 tons and a deadweight of 5 050 tons on a 23 ft. 2 in. load draft.

Dual Purpose Ships.

It is interesting to remark that, in common with most of the earlier electrically-propelled ships, these vessels have their propelling motor (which is of double unit type) right aft. This motor has rather an unusual arrangement, and will be of interest to those people who like to think that one of the principal justifications for fitting electric propulsion is that the ship should be able to run different "legs" of her voyage at different speeds. Actually, then, there are two motors mounted on the one propeller shaft. The forward motor develops 1 200 H.P. at 123 r.p.m., and the after one 2 800 H.P. at 163 r.p.m. These motors take current from two Ljungström turbo generators, each of 1 000 kW capacity, operating at 3 000 r.p.m. The ships are designed with a dual purpose—either to run as cargo vessels with a loaded speed of 10 knots, or as passenger ships with a speed at sea of 13 knots, and carrying two-thirds capacity cargo. This is generally on the outward run with emigrants from the Spanish emigrant ports carried in the 'tween decks. To satisfy these two conditions one or the other of the two motors is used. One turbo-generator only is used when the vessel is running as a cargo vessel, and current from this is supplied to the forward motor, the aft motor running idle. When the ship is running as a passenger ship, both turbo-generators are in use, but the forward motor is disconnected, propulsion being effected by the aft motor.

Steam is supplied by three cylindrical boilers 15 ft. 7 in. in diameter and 12 ft. 3 in. long, fitted with superheater devices. The bulk of the auxiliary machinery is driven by three-phase a.c. motors supplied, it is interesting to note, in the light of arrangements in more modern ships, through static transformers which reduce the voltage to 190. This applies only to auxiliaries used at sea. For port auxiliaries direct current is supplied at 110 V. Current for this service and also for lighting purposes is provided by a motor generator, the "motor" part of which is driven from the 190 V three-phase current. The electrically-driven auxiliaries include a refrigerating plant.

It may also be noted that although the main propelling motors are aft, there is a passage which connects the motor room aft with the power room amidships.

These two electric ships have now been in successful operation for a number of years, and they appear to have run with complete success. Perhaps that is why so little has been heard of them. Their arrangement is in many ways novel, but would appear to have the advantage of a very great flexibility, and the wear and tear on the running parts should be small. They are, I believe, the only all-electric ships in which two distinct motors are coupled to the same shaft—one motor operating in conjunction with one turbo-generator only, and the other operating with the two. So that in effect

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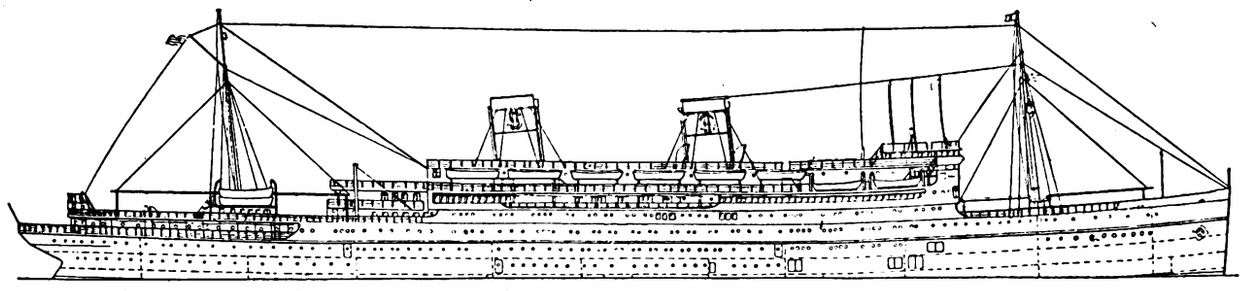
the electric propulsion arrangement is not one double armature motor, but rather two single armature motors. The "Viceroy of India" or the "California" can operate their two propelling motors with one or with two turbo-generators in operation, but both propelling motors are running, of course, because these ships are twin-screw ships. The criticism that the marine engineer would in all probability offer against the "Guaruja" and "Ipanema" arrangement is that whichever the speed of operation, one of the propelling motors is always "idling." It would seem, in fact, that in an effort to secure a superabundance of economy the designers have virtually overlapped themselves.

The major advantage of the plant consists, of course, in the fact that the machinery on the homeward run is literally only 50% in operation, and yet a perfectly satisfactory operating speed is secured. That is, of course, always supposing that we can still accept 10 knots as a reasonable service speed for a first-class cargo vessel to-day. One feels inclined to suggest that motorship competition has forced this speed up to at least 13 knots speed, which as a fact is the stipulated speed of the ships with the more powerful of the two motors in operation. Remembering that fact, and allowing also for the realisation that these two ships were constructed some eight years ago, one is inclined to wonder whether they are as economical to-day as they were when first designed and conceived, say, some ten or twelve years ago. The march of marine progress has been swift since that date, and the Diesel-driven vessel has been no small factor in this development. But it is interesting, nevertheless, in chronicling the progress of the all-electric ship to consider the root ideas at the back of these two quite important vessels.



THE MOST POWERFUL ALL-ELECTRIC MERCHANT SHIP.

OUTBOARD profile of the new Dollar electric liner now building for round the world service. Her displacement is over 32 000 tons and her electric motors will develop 26 500 h.p.

British Progress.

If, then, America is still likely—in proportion to her relatively small mercantile tonnage—to be very active in electric ship construction, and if Great Britain is likely to be second on the map, chiefly in passenger liner category, it is interesting to inquire somewhat more deeply into the economics of the all-electric ship as we know it at the present time. For it should be distinctly understood by electric companies that at the present time the electric ship still has to make its case to the majority of shipowners.

Why exactly a shipowner uses electric ships in preference to any other type of propulsion is a question which has never yet been answered on paper. That is a point which cannot lightly be discussed. Performance figures have been issued for the electric ships of the International Mercantile Marine Corporation which compare but poorly with performance figures of similar motor-driven vessels with, say, double-acting 4-cycle Diesels in two shafts. No figures have been issued as to first cost of the electrical plant, and that, first and last, is what intrigues, interests . . . and frightens the shipowner. Even the performance of the "Viceroy of India" has only been recorded in general terms, and the ships with whose performance her own has been compared have been ships whose performance could easily be bettered anyhow by any ultra-modern machinery layout.

Those of us who have any marine "sense" at all know full well the significance of the "Mooltan," the "City of Hong Kong," and of other similar ships, and of their potentialities; but even so, we do not know in actual money what their "electric supercharge" is worth to the shipowner. Nor, one ventures to suggest, does the electrical manufacturer. He knows he is developing a right line of ideas; and unquestionably he is. The potential favourable economics of electric propulsion (whether direct, as in the "Viceroy of India" and her two new sisters, or "booster," as in the "City of Hong Kong") lies, not in what is apparent on the surface, but in what is inherent in any new form of propulsion, in any new development in engineering. We do not yet know what electric propulsion can do for us, but even the most conservative among us must at least admit that it opens up an entirely new vista in marine engineering whose position will depend largely upon the efforts of the electrical companies concerned. The shipowner will never of his own accord embrace marine electricity. He can be taught to do so, however, in the widest sense. The published results of existing electric ships will be a great factor in approaching this desirable state of affairs.

Gradually, one imagines, we shall come to a realisation of the upper and lower limits of power to which turbo-electric propulsion can be fitted. At present there seems to be no indication of this kind. For while naval vessels have been constructed with electric propulsion of about 180 000 shaft H.P. on four shafts (with two propelling motors per shaft), so, too, we have excellent examples of small all-electric craft in the 3 000 H.P. U.S. Coastguard cutters, a further order for a new unit of which has recently been placed with a Californian shipyard. These little ships are really remarkable for their compact machinery spaces, and would appear directly to controvert the suggestion that Diesel electricity is the more suitable method of propulsion for smaller craft. Extended reference was made to these vessels in my article in THE ELECTRICIAN of August 2nd last, and plans of the vessels were published. Both the 180,000 H.P. and the 3 000 H.P. units are special cases, perhaps, being naval ships. And, therefore, among the most important of electric ships now constructing is the pair of vessels laid down at Newport News, Va., for the Dollar Line's round the world service, the profile of which, as and when completed, is illustrated on this page. These ships are the most powerful electric ships at present building, because they have two twin screws, each shaft being driven by a synchronous induction motor with a continuous output of about 13 250 H.P. at 133 r.p.m.

As is usual in to-day's (but not necessarily to-morrow's) marine electrical practice, there are two turbo-generator sets. Each generator is an a.c. machine with closed circuit, air cooled, and having a continuous rating of 10 100 kW, three-phase, 4 800. V. Excitation of the propelling motors and generators is obtained from the d.c. generator sets, of which there are four, of 500 kW output. They are compound wound 240 V sets, designed to deliver 125% load for two hours.

The ships are to have a service speed of about 20 knots. They are large vessels, with a displacement of 32 280 tons on a 32 ft. shaft. The deadweight is 17 000 tons, and the cargo capacity 632 000 cu. ft., of which 67 000 cu. ft. is insulated for the carriage of Californian fresh fruit and for domestic purposes. The boiler plant comprises a battery of twelve Babcock and Wilcox water tube units with a total heating surface of 52 700 cu. ft. These details are worth studying as an example of the modern all-electric ship, for here is the type of ship which is going to provide the most effective counter to the motorship, and upon which the energies of all steam propulsion interests should be concentrated.

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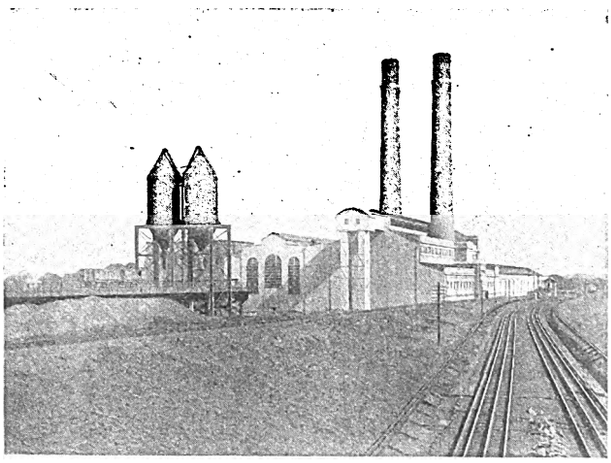
TURBO-GENERATORS AND MODERN POWER.

Probable Lines of Progress—Reduced Demand by Municipal Authorities—Railways and Lighting—Rural Supply—Good Marine and Overseas Prospects.

By W. SHARP, A.M.I.Mech.E., A.M.I.E.E.

THE object of this article is to present to engineers the probable line of progress and subsequent business prospects relative to the manufacture of high-speed alternating-current generators. The subject for consideration has a direct bearing upon the Electricity (Supply) Act, 1926, the introduction of the "grid" and the adoption of a standard frequency of 50 cycles per second.

As a result of these conditions, orders for turbine plant will be considerably reduced. This statement holds good until such time as the "grid" is in a more advanced condition,



Coal handling plant at Stonebridge Park (L.M. & S. Railway) power station, which was described in our last issue.

when we may anticipate a steady flow of orders. The effects of the new system, however, are already noticeable, so much so that, excepting in the case of emergency sets, machines for municipal authorities (in this country) with an output below 10 000 kW and even 15 000 kW are not now required. Further, in view of the fact that applications for power plant by public authorities are required to be approved by the Electricity Commissioners, it is reasonable to expect that orders for comparatively small generating units will not be considered. Consequently, with the ultimate reduction in the number of power stations, individual machines will be required to generate larger outputs (50 000 kW to 100 000 kW) and, therefore, the supply of such machines will quickly overhaul the demand. The result is obvious—the work connected with the design and manufacture of high-speed alternating-current generators for municipal authorities in the home market will become insignificant. It is, however, encouraging to know that meanwhile, neither the municipal authorities nor the Electricity Commissioners are responsible for the *whole* of the electricity supply. There are many private concerns and a number of limited liability companies which do, and will still desire to, generate their own power irrespective of the "grid."

Future of Tramways.

As regards the tram services of Great Britain, it is common knowledge that these are gradually dying out, but, while most of the smaller towns have scrapped their systems, the large industrial areas are still holding on to the service. In rural areas the omnibus is very effective, but in the city it is not so efficient; nevertheless, some routes lend themselves to bus service and we can appreciate that the tramways will be dispensed with in such places. From such considerations it is reasonable to conclude that orders for turbo-generators in respect of tramways are doubtful and for business purposes we are compelled to seek elsewhere.

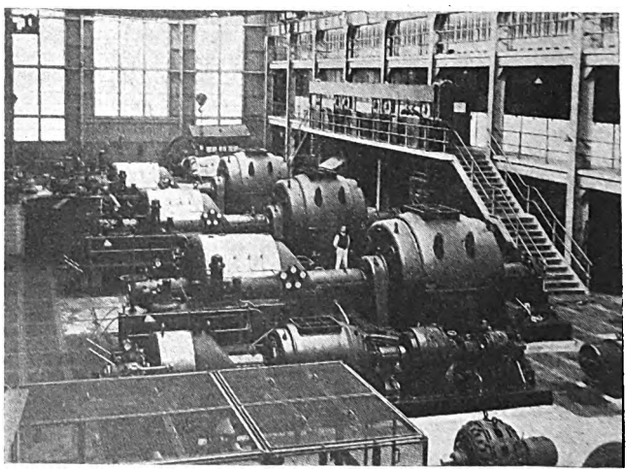
The railways, therefore, present themselves for consideration and in this case there is little fear of any real competition from the omnibus, for the simple reason that the travelling facilities on the open road cannot be compared with the comfort and safety of the railways. Another important factor is speed and, in comparison with the bus, the locomotive undoubtedly stands supreme. The steam engine, however, has now to compete with the electric locomotive, and in connection with the "grid" the electrification of the railways is already in evidence. It has been suggested that the mighty "Flying Scotsman" of the present day represents the last phase of steam locomotion, for both in London and the provinces the electric train is gradually undermining the prestige of the "iron horse." The electrification of various suburban lines in this country has shown marked economical results and consequently it is not surprising to find that the lines between Manchester and Altrincham, and also London and Brighton are being electrified. Further, in India, Japan, Canada, and still more in America, steam locomotives have given way to electrical over hundreds of miles of track. There are, however, other types of railway engines and maybe the turbo-electric locomotives, or even more probably the Diesel-electric, will be considerably developed. At the moment we are more concerned about the electrification of the railways and concurrently the manufacture of turbo-generators, and therefore we will amplify our remarks regarding the electric locomotive. It can be shown that the traction motor (for its output) lends itself to the bogie better than any other type of machine. The drive through gearing is direct on to the wheels and the speed control is much easier and more reliable than is given by any other known means. Hence, we may rest assured that with the erection of the "grid" a large number of alternating-current generators will be required to supply (indirectly) the necessary current for the various railway systems in the country.

Domestic Demands.

Coming next to domestic supply, the demand for electricity is growing rapidly and, owing to the ideal conditions attached to cooking and lighting by electricity, it is inevitable that the electrical supply for household duties will continue to increase. Such requirements, however, are receiving daily attention and are amply catered for by the various municipalities. It is evident then, that any current for domestic use will be drawn from the "grid." Town lighting—particularly railway stations (where many alterations require to be made) is another service which will be supplied by the municipal authorities.

Having given due consideration to tramways, railway electrification, domestic supply, and town lighting, we are forced to the conclusion that, in these respects at any rate, the original statement regarding the insignificance in the manufacture of turbo-generators still holds good. Let us therefore turn our attention in a direction which holds better prospects.

It has been stated that the "grid" cannot be tapped for less than 10 000 kW, the idea so far being to deliver current



Turbo-generators of 30 000 kW aggregate capacity at Stonebridge Park generating station.

only to the bus-bars of existing power stations. With the present scheme it is evident that rural areas are not yet under consideration and some time may elapse before these particular districts are supplied. Villagers and farmers, however, realise the advantages and appreciate the value of electricity, and it is reasonable to expect that they will voice their claims for electrical power. It is possible that the Central Electricity

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Board will find adequate means for dealing with the difficulty and, in due course, arrangements may be made to supply such areas. Meanwhile, here is a market for the sale of electrical plant and such apparatus as is required for the production and transmission of power. On the other hand, it is probable that rural areas will require only a few thousand kW, and considering the powers of the Electricity Commissioners, private people will not instal turbo-generators. The most which can be expected from each of such areas is electrical plant up to 100 kW, and probably these machines will be slow-speed and oil-engine driven.

We now approach the most hopeful phase of the subject, namely, the application of electricity to the propulsion of ships. Such installation calls for special consideration, particularly when the current for the propelling motors is supplied by turbo-generators. In America two of the largest passenger liners, the *California* and *Virginia*, are electrically-driven and in connection with these vessels a paper entitled "Electric Propulsion as Applied to Passenger Liners" has already been published and presented by Mr. Eskil Berg to the Institute of Marine Engineers. The equipment of these ships is practically a replica of the P. & O. liner, *Viceroy of India*—a recent development which will be closely watched by all concerned. The main propelling machinery consists of two separate turbo-generators (complete with condensing plant and auxiliaries) which supply current to two slow-speed synchronous motors coupled direct to the twin propellor shafts. Owing to the large demand for electrical supply for heating, lighting, ventilation, and cooking, four auxiliary turbo-generators and two oil engine-driven generators are installed. There is no doubt that for the propulsion of passenger liners the electric drive possesses many marked advantages over the direct Diesel drive or the geared turbine drive. Nevertheless, ideal economy and compactness are more nearly approached in the Diesel engine-driven generator. On the other hand, the maintenance costs of electrical plant, barring accidents, should be considerably less than with any other type of machinery. Further, absence of vibration, ease of control, and the advantage of having full power for going astern are features possessed in a superlative degree by the electrical system. Consequently, in connection with ship propulsion we can anticipate a steady flow of orders for turbo-generators of 5 000 kW upwards.

In our quest for orders the Dominions present to us a most favourable market for the supply of turbo-generators and other electrical machinery. A most recent report dealing with the electrical development in South Africa points to the fact that the advance of electricity during the past few years has been extraordinarily rapid. In Australia the demand for electricity is even of much greater magnitude, while a number of Canadian orders for generating plant are already in this country. From foreign countries, also, many orders may be expected, particularly since our estimates are now more nearly in line with the quotations of foreign competitors.

Finally, it may be confidently stated that any work connected with turbo-generators in this country will be confined more especially to the "Grid." Small generating units up to 10 000 kW may be utilised by the Dominion of Canada and the Union of South Africa. Plant for Australia and New Zealand should be more in the neighbourhood of 10 000 kW to 20 000 kW and foreign orders of the same capacity. The title "Turbo-Generators and Modern Power" is more applicable to ship propulsion, and it is from this source that the most considerable number of orders may be expected.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Propagandist Advertising.

[To the Editor.]

Sir,—May I be permitted to congratulate you on the exceedingly comprehensive survey of 1929 in the electrical industry which you have published in the form of the first Annual Review Number of The Electrician, and at the same time to express a difference of opinion on a not unimportant point which is referred to in the able article on technical advertising by Mr. J. S. Simmons.

In the penultimate paragraph of this article the author mentions the "propagandist campaign" type of advertising and cites, as an example, the 60 ampere house service standardisation campaign conducted by one of your advertisers. It is quite clear from the remarks made that Mr. Simmons considers this to be good advertising, but I venture to suggest that such a campaign would be conducted far more effectively in the editorial columns rather than in the advertisement pages. The editor is concerned with the progress of the industry as a whole and his remarks are read with a more open mind than any recommendations of an advertiser whose attitude is largely determined by the particular axe he has to grind. Surely the correct procedure is for advertisers to support a campaign instituted by the editor, not as Mr. Simmons seems to suggest, editorial support of a campaign instituted by the advertiser.—I am, etc.,

Beddington, Surrey. J. S. Tyson.
December 31st.

BOOK REVIEWS.

A Textbook of Illumination. By William Kemerth. (London: Chapman and Hall.) Pp. x+269. 15s. net.

This elementary work is designed to serve as a text book in illumination for undergraduate students. The fact that it is an American book is, one supposes, sufficient reason for restating the mistaken idea that Edison was the inventor of the first carbon filament lamp. The field covered is fairly extensive, and chapters are devoted to photometry, mean spherical candle power, illumination measurements, direct and indirect lighting, street lighting, recreational lighting, the lighting of public buildings, residence lighting, industrial lighting, and commercial lighting.

The numerous problems and references to other sources of information add to the value of the book.

S. W. L.

Direct Currents. By Carl E. Magnusson. (London: McGraw-Hill Publishing Co.) Pp. xi+495. 22s. 6d. net.

This book sets out to present in logical order the basic principles of the electric circuit and the characteristics of direct current machines, apparatus and distribution systems. With its companion volumes on "Alternating Currents" and "Electric Transients" it is intended to form a complete text book covering the fundamental laws of electrical phenomena as applied to practical electrical engineering problems. Circuits are dealt with separately under the headings "Electric, Magnetic and Dielectric." We then pass from generation to indicating instruments, the dynamo, armature windings and reaction, generator and motor characteristics, commutation, losses, electrolysis, transmission and distribution, and thermionic and gaseous conduction. There is a final chapter on industrial applications, and an appendix deals with approved methods of treatment for electric shock.

W. L.

Worked Examples in Electrical Technology. By F. Peasgood and H. J. Boyland. (London: Humphrey Milford.) Pp. xv+219. 15s. net.

The authors are lecturers in electrical engineering at the Northampton Polytechnic Institute, London, and the object of their book is to provide the students of electrical technology with a collection of examples to supplement his other work in this subject. Carefully graded exercises are given, and these are excellent material for those who are studying for associate membership of the Institution of Electrical Engineers and other examinations of similar standing.

The ground covered is extensive, and in the majority of cases only one problem of each type is included, while at the end of each section a number of additional questions is propounded for solution. Part I deals with the direct current circuit, Part II with the magnetic circuit, and Part III with the alternating current circuit. Paper, diagrams and printing are all excellent.

H. B.

Heaviside's Operational Calculus as Applied to Engineering and Physics. By E. J. Berg. (London: McGraw-Hill Publishing Co.) Pp. xiii+214. 15s. net.

This book, mainly a reprint of a series of articles in the "General Electric Review," deals only with a very limited field of Heaviside's work, but the treatment is so sympathetic and concise that it will surely arouse greater interest among engineers and students in his operational mathematics.

Much of Heaviside's work first appeared in the columns of The Electrician, the years 1886–87 being very fruitful in this direction. Several references are made to these articles, and the book includes a brief personal sketch of Oliver Heaviside. An appendix gives Mr. B. A. Behrend's appreciation of his work in other directions which makes very interesting reading.

W. S.

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GENERATING PLANT PROGRESS.*

A Review of Developments Since the War—Steps Towards Higher Steam Pressures—Proposed 1 800 lb. British Installation—Capacity of Present Day Sets—America's Largest Generators.

By THOMAS ROLES, M.I.E.E.

IN the days immediately prior to the outbreak of war, the usual steam conditions obtaining in power stations in this country were pressures of from 160 to 200 lb. per sq. in. and temperatures of from 450 to 550 deg. F. There were, however, power plants on the Continent working at considerably higher steam temperatures than those usually adopted in this country, one plant operating with steam at 660 deg. F. In some large power stations boilers having an evaporative capacity up to 40 000 lb. per hr. were in use, and boiler-house efficiencies of from 65 to 75 % were attained.

As typical of turbo-alternators of the largest capacity in commission in 1914, mention may be made of the 15 000 kW three-phase set, running at 1 000 r.p.m., installed in the Stuart Street Station of the Manchester Corporation. This set had an overload capacity of 19 000 kW for thirty minutes at a power factor of 0·95. The steam conditions at the turbine stop valve were 190 lb. per sq. in., 530 deg. F., and the vacuum was 27½ in. The steam consumption at a load of 15 000 kW was 13·65 lb. per kWh. At this period a good steam plant could attain a thermal efficiency of about 15%.

Position before the War.

Up to 1914 there were no turbo-alternators of 5 000 kW or over in this country running at a speed of 3 000 r.p.m., although at least one set of 5 000 kW capacity designed for this speed was at work on the Continent. In December, 1915, however, a turbo-alternator of 6 250 kW capacity built to run at this speed, was started up in the Stuart Street Station at Manchester.

Although 15 000 kW sets were considered large on this side of the Atlantic, the erection of 30 000 and 35 000 kW single-shaft machines was commenced by the Philadelphia Electric Co. in the United States of America towards the end of 1914. The steam conditions for the 35 000 kW set were 215 lb. and 540 deg. F., the steam consumption being approximately 12·0 lb. per kWh. Had there been the demand for such large units of plant over here no doubt it would have been met by British manufacturers, seeing that a 25 000 kW turbo-alternator was being built in England for the Commonwealth Edison Co. of Chicago, U.S.A., in 1912.

The first radical departure in this country from the steam conditions which had been generally adopted was the installation during the year 1915 at the power station of The British Thomson-Houston Co., Ltd., Rugby, of steam raising plant and a turbo-alternator designed for a steam pressure of 375 lb. and a temperature of 700 deg. F.

Up to about 1917 the Edwards type of air pump had held the field for air extraction from surface condensers, but about this period the steam jet air extractor came extensively into use. For large capacity condensing plants this type of extractor has almost entirely superseded the reciprocating air pump.

In 1918 a 45 000 kW turbo-alternator was put into operation at the Connors Creek power station of the Detroit Edison Co., U.S.A. A notable feature of this set was that its generating pressure of 12 200 V was stepped up to 24 000 V by a single three-phase transformer, the largest of its kind in use at that time. This power station had achieved what was up to this period the world's record for thermal efficiency, a figure of 17% being attained with an annual output of approximately 210 000 000 kWh, a maximum demand of 50 000 kW, and a load factor of 47·8%. In this country the highest thermal efficiency reached up to that time was 16%.

The year 1918 also saw twelve boilers each having an evaporative capacity of 50 000 lb. per hr. installed in the Rotherham power station, these boilers being stated to be the largest up to then constructed in this country.

During the following year boilers of 91 000/104 000 lb. capacity were installed in the Stuart Street Station, Manchester, the steam pressure being 225 lb.

In the year 1920 the North Tees power station was started up, the first installation of steam-raising plant in which comprised ten boilers each having an evaporative capacity of 42 000 lb. per hr., operating at a steam pressure of 475 lb., and a total temperature of 700 deg. F. In this station re-heating was adopted, as were also the extraction of steam from the main turbines for feed water heating and the preheating of air to the furnaces. The turbo-alternators installed were each of 20 000 kW capacity, designed for a speed of 2 400 r.p.m.

In spite of the notable increase in steam pressure at the North Tees station and the introduction of such refinements as re-heating, the general tendency in connection with power station design was still to keep to more moderate steam conditions, as is instanced by the Dalmarnock power station of the Glasgow Corporation, which was started up at about the same time as that at North Tees. For the Dalmarnock station the steam pressure adopted was 275 lb., with a total temperature of 700 deg. F.

In 1921 a 30 000 kW set—then the largest in the country—was installed in the Rotherham power station. This machine, which was constructed to operate under steam conditions of 200 lb., a total temperature of 588 deg. F., and 28½ in. vacuum, was of the single cylinder type running at 1 500 r.p.m. The steam consumption of this machine was 11·1 lb. per kWh.

By this time boiler-house efficiencies of about 80% had been recorded and steam installations for pressures of 250 lb. had become common, and a number were either at work or under erection to operate at 350 lb. Greater developments in connection with the increase of steam pressures were, however, being made by American engineers, and a number of stations were constructed in the States in which the steam plant was designed to operate at pressures of from 500 to 600 lb., and in 1925 the Edgar station of the Edison Electric Illuminating Co., of Boston, in which steam plant to operate at 1 200 lb. was installed, commenced to operate. Since then other plants have been built in America to work at still higher steam pressures, and it is reported that two boilers will shortly be put into use over there to produce steam at a pressure of 1 840 lb. gauge.

At the present time there is still no power station belonging to a public electricity supply undertaking in Great Britain which has boilers working at a higher pressure than those at the North Tees station, and until very recently no other boilers in this country were operated at so high a steam pressure. During this year, however, several very large boilers designed to work at a pressure of 800 lb. have been erected and put into commission by the Synthetic Ammonia and Nitrates, Ltd., at Billingham-on-Tees. A boiler and turbo-alternator constructed to operate at a pressure of 1 100 lb. will shortly be put to work at Bradford, and statements have been made to the effect that a large manufacturing concern in the South of England intends to instal boilers for working at a pressure of something over 1 800 lb. per sq. in.

With regard to the size of turbo-alternators, sets are now being built in this country to operate at a speed of 3 000 r.p.m., having a capacity of 30 000 kW, at 0·8 power factor and sets of 67 250 kW capacity to run at 1 500 r.p.m. are on order for the new Battersea station of the London Power Co.

In the United States of America very much larger machines are at work, one at the Hell Gate station of the New York Edison Co., being 160 000 kW capacity, and another built for the State Line Co. of Indiana being of 208 000 kW capacity.

* From the inaugural address to the North Midland Centre of the Institution of Electrical Engineers.

ELECTRICITY SUPPLY IN BERLIN.

The Vereinig. der Elektrizitätswerke E.V., Maessenstr. 9, Berlin, W.62, has issued an abstract from "Elektrizitätswirtshaft," giving particulars of the progress of the Berliner Städtische Elektrizitätswerke A.G., and the results of a census, dated October 10th, 1929, showing the degree of household electrification reached in the company's area of supply, the purposes for which the energy is used, and the probable requirements of potential consumers. Amongst much other interesting matter in the pamphlet is a table which shows the degree of household electrification in each of the 77 divisions of Berlin. The total number of householders who returned census forms was 1 188 394, and of these 54·82% used electricity for lighting only or for lighting and domestic appliances.

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INTERNAL ISOLATION SWITCHGEAR.

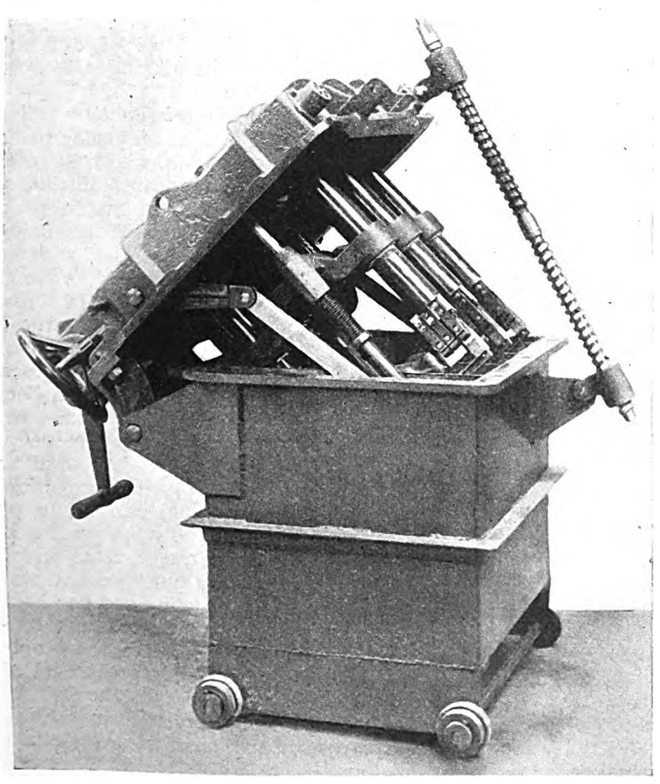
Principles of a New Design—Stationary Circuit Breaker—Elimination of Heavy Gear—Economy in Size and Weight—Self-interlocking.

THE evolution of internal isolation switchgear is the result of years of effort by switchgear designers to produce practical switchgear. They were for a long time hidebound to the conventional practice of moving the complete circuit breaker when isolating from or connecting to the line. This involved a great complication to disconnect or connect six simple plugs and sockets. Then came the inspiration of the Whitehead principle of isolation. Beginning with this embryo basic principle and advancing through designs, tests and numerous modifications the firm of Switchgear and Cowans, Ltd., produced in the short space of two years the simple internal isolation switchgear which they showed at the recent Cardiff Exhibition, in which isolation is safely and conveniently effected without moving the circuit breaker.

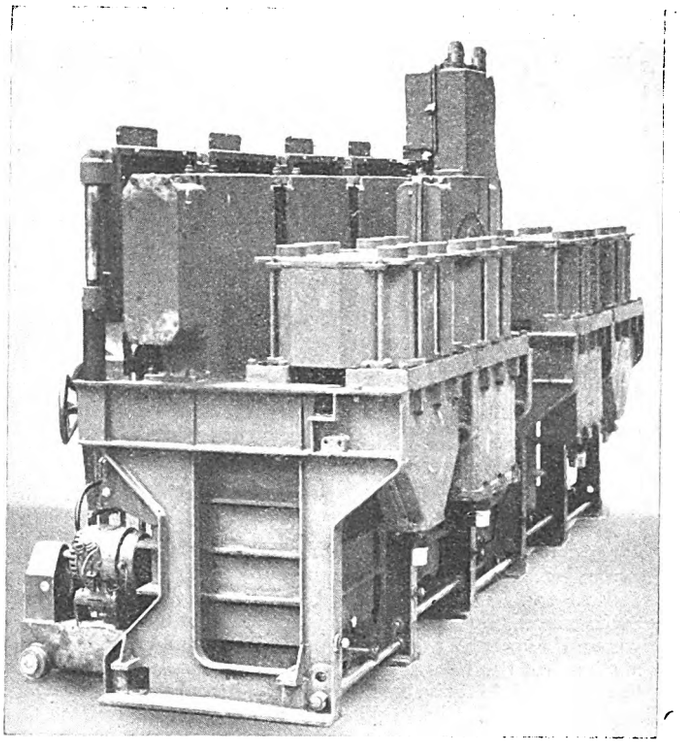
In the new switchgear the circuit breaker remains in the same position, stationary on the floor, whether connected to or isolated from the line. As the breaker is not moved horizontally nor raised or lowered vertically, all the heavy gear and framework for these purposes are eliminated. A great reduction in size and weight has been effected. All components are metal-clad, self-contained units easily removed and inspected. When it is necessary to inspect the breaker contacts the breaker is pulled out on its wheels along the floor.

The vital component of internal isolation switchgear is the moving isolating carriage, which is arranged to move up and down within the breaker tank. The six terminal stems of the breaker instead of being, as is the usual practice, fixed to the breaker top plate are mounted in insulating shrouds fixed to the isolating carriage. The terminal stems are thus employed in a dual capacity, their lower ends forming the circuit breaker fixed contacts in the usual manner, and their upper ends forming the isolating plug contacts.

These six plug contacts make and break connection with a group of six fixed terminal sockets. Three of these socket contacts are connected to the three busbars. Each of the other three socket contacts is connected through a bridge connector (or a current transformer) to the incoming cable. When isolating from the line the breaker remains stationary; the only part that is moved is the isolating carriage with its plug contacts. Raising or lowering the isolating carriage inside the breaker tank by means of a handwheel outside connects the breaker to or isolates it from the line.



Breaker contacts exposed for examination.



Back view of switchboard, showing arrangement of potential transformer and current transformers on bridge connectors and cable boxes.

When the isolating carriage is raised to connect the breaker to the line the plug contacts project through the breaker top plate and make connection with the fixed socket contacts. In this position the breaker can be operated, closed and tripped, just as if the terminal stems were permanently fixed to the top plate of the breaker.

The switchgear is self-interlocking. The sequence of operations is inherent and simple, no intricate system of complicated interlocks being necessary. When connected to the line, the breaker cannot be pulled out against the natural interlock of the plug contacts extending up into the fixed socket contacts. When the breaker contacts are closed they prevent the isolating carriage from being moved down; the breaker must first be tripped. The main current cannot be made or broken at the isolating contact, but only at the breaker contacts under oil. When withdrawn, the breaker cannot be pushed home into position with the contacts closed, as the plug contacts are then projecting above the top plate. To take any strain off the gear, these natural interlocks are supplemented by two simple interlocking bolts.

When duplicate busbars are required, busbar selection is efficiently obtained by utilising the circuit breaker as a selector switch. The only addition required is a duplicate set of three fixed socket contacts connected to the cable box terminals, while the circuit breaker is arranged to occupy two positions, each set of three busbars having, of course, its own set of three socket contacts. By this means it is possible promptly to change over from one set of busbars to the other by simply moving the circuit breaker on its wheels backwards or forwards a few inches, the plug contacts on the isolating carriage connecting one or other set of three cable socket contacts to one or other set of three busbar socket contacts.

In view of the fact that the isolating carriage is incorporated in its design the circuit breaker is of special interest, particularly so because of the ingenuity with which this has been accomplished. The top plate of the breaker is hinged and lugs are provided on the top plate and on the tank for attaching a simple screw jack. After removing the bolts in the top plate a few turns of the handwheel on the jack swings back the top plate and the breaker contacts are fully exposed for examination. The complete operation of isolating, withdrawing and opening the circuit breaker takes but a few minutes and is done in perfect safety.

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TRANSMISSION AND DISTRIBUTION.

Continental Practice in Overhead Work—Lower Standard of Safety than in Great Britain—Effect on Cost of Current to Consumers.

At a meeting of the Overhead Lines Association, held at the Institution of Electrical Engineers, London, on December 18th (Mr. Theodore Stevens, the president, in the chair), a paper was read by Major Theodore Rich, honorary secretary of the Association, on "British and Continental Methods Compared."

Major Rich said that almost from the start electricity was recognised on the Continent as a public utility and not merely something to obstruct and tax. As a consequence continental engineers were the first to tackle power transmission worthy of the name, and were also the first to handle rural electrification. British engineers, however, were pioneers in generation, and reference was made to the many works put up on the Continent by Messrs. Crompton until they were boycotted by financiers at home and pushed out by tariffs. The essence of Continental transmission had been water power, and the essence of rural electrification had been low capital costs and wayleave facilities. In England progress was held up owing to the existence of internationally owned three-phase patents arranged in such a way as to keep British engineers out of the power transmission machinery and contracting market of the world.

From comparatively early days 50 periodicity was usual on the Continent. There were local exceptions, but most countries were now on a frequency of 50. For distribution, 110 to 125 V was still usual in France, Spain, Italy and Switzerland, but Germany was changing to 220, and so were the new rural areas in France. The influence of the super-stations on the Continent, except in the lignite areas around Cologne and Leipzig, had been insignificant, and where large scale transmission had taken place it had primarily been from water power and lignite power.

As regards transmission up to 150 000 V spans had not exceeded 200 metres. A large proportion of the towers were slender, the assumption being that in case of a line breakage a simple hanger would slip so that the torsion strains to be allowed for were limited. Concrete centrifugal posts had been used especially in Germany for 50 000 and 60 000 V lines, in Italy for 130 000 V, and a new line for 240 000 V, and recently in France for 90 000 V. Elaborate differential trip gears with pilots were not often used, and this did not seem to matter much. In Scandinavia, Poland and Italy the system of two uprights and a cross bar had had some vogue for very high voltages, but for transmission line protection, lightning discharge gear was out of favour. Although earthed wires above were looked upon as a valuable help it was recognised that one could not protect a line from a direct hit.

Use of Glass Insulators.

Pin insulators were used for higher voltages than in this country, a number of recent lines at 60 000 V having them, but chain insulators were being used for lower voltages. The cap type of chain insulator seemed to be more popular than the Hewlett, the extra safety of which had proved to be somewhat elusive. Glass had made extraordinary progress in France and to a lesser extent in Italy for insulators. In France, as compared with porcelain, the output was said to be 4 or 6 to 1. Glass had not become popular for suspension work.

There was still much controversy on the Continent regarding the earthing of h.t. neutrals, and it was not so usual in Germany as in other countries. According to theory if a conductor was carrying a substantial alternating current and was surrounded by a closed circuit, eddy currents would circulate in it, but he had been told by a transmission line engineer on the Continent that this had not been found to be the case. There were quite a number of transmission lines on the Continent guarded in such a way as to be complete metallic circuits, and he was told that no extra losses had been traced.

One of the advantages for transmission lines on the Continent was the existence of many wide roads, sometimes for stretches of 20 miles alongside which transmission lines were run. People were not afraid of roadside lines on the Continent, and nowhere was it necessary to use doubled insulators for roadside running. Concrete for posts had gone ahead rapidly for h.t. voltages, especially in France, and for medium transmission voltages in Germany, Austria, Spain and Italy. Also, concrete bases were used largely to replace butts which had rotted or to enable cheap local forest wood posts to be used. In some parts very light steel lattive posts were used for cross-country lines. For h.t. distribution 10 000 to 16 000 V seemed to be favoured at the present time. There had been troubles with aerial switchgear, and the like owing to shorts at contact insulators—some fatal accidents had occurred—and in France insulated pole switch platforms had to be provided, according to the new regulations.

In regard to transformer stations—brickwork, masonry or concrete having held the field for a long time—a low tension switch was used in some places operated through a door, the key being in charge of somebody in the village, so that the low tension could be cut off on emergency. Pole type transformers had come into considerable use in rural work recently, but they had not the vogue they had had in America, one reason being that the voltages were much higher. Rural distribution was in general on the open link system, controlled by fuses and aerial switches usually operated under magnetising current only. For low tension work porcelain outdoor link fuses were very common, whilst low tension distributors in insulators in front of the houses in villages and small towns were quite usual.

Discussion.

Mr. A. H. Seabrook said that the whole tendency in this country was to make things as expensive as possible, so far as electrical work was concerned. Often expensive gadgets were put on to systems, but they were usually out of use soon after they were installed.

Mr. H. Molle said he could confirm what Major Rich had said as to simplicity of Continental construction. Notable features were the use of concrete poles and glass insulators and a very simple arrangement of distribution where the conductors were carried on iron brackets on the sides of houses. In one case the practice was adopted of digging a hole in the ground, placing the transformer in it, and putting a fairly strong cover over it. The transformers kept quite cool under these conditions and gave no trouble.

Mr. W. Fennell said that one thing that had appealed to him from his limited experience of Continental work was the absence of stays on poles. There was also an entire absence of any earthing of the ironwork of poles, and that also was quite the usual thing in America. All this, of course, was very different from our methods. He had also seen some very interesting examples of bracket work in France, the brackets attached to the buildings carrying various power lines of different voltages and also telephone lines. He had some poles in the Mid-Cheshire area carrying lines of different voltages, but had not yet succeeded in getting the Post Office to put their lines on the same poles.

Mr. Napier Prentice, commenting on the reference by Major Rich that very often pole lines could be laid alongside roads on the Continent for 20 miles in a straight run, said that these long straight runs often introduced temperature difficulties. If there were a few angles things were better in that respect. Further, these long straight lines often caused humming troubles. As to lightning arresters, there was a large installation in Italy where these had been put in for 25 000 V, but he understood that the arresters were practically out of use.

Mr. L. Stanton suggested the possibility of the Overhead Lines Association formulating a sort of code as to the best methods of overhead line construction for various purposes. He maintained that it was possible to improve on both Continental and American practice, and yet do the work cheaper. As to the use of the guard round the conductors on the poles, eddy currents were insufficient to cause any effect, and he believed the idea of these guards was for lightning protection.

Major Rich, replying, said that the whole object of the paper was to draw attention to the fact that there was a great deal of overhead line construction on the Continent, from which many people received supplies of electricity which never would have received them if the pole line construction had not been exceedingly cheap. Even if in some cases the pole line construction in parts of the Continent was execrable, the people got the supply, and there did not seem to be a great deal of trouble. We were killing people by hundreds in the streets, and yet there were these very stringent regulations regarding electricity supply where the risks in any event were very much smaller. This was ridiculous.

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NEWS IN BRIEF.

Hams Hall and the Public—New Showrooms for Ilford Electricity Department—Exploitation of the Narva Falls—Dundee and Foreign Cables—Steam-Electric Generation in America.

MANCHESTER Corporation requires a power station engineer.

At a meeting of the Junior Institution of Engineers on January 10th, Mr. H. J. N. Riddle will read a paper entitled "The Track Circuit in Railway Signalling."

Hammersmith (London) Electricity Committee proposes to borrow a further £6 000 for the scheme for the provision of electrical installations on hire and hire purchase.

It is understood that the British Post Office will shortly start a public service of telegraphic transmission of photographs, drawings, manuscripts, etc., to a Continental capital.

Tenders have been invited for the erection of telephone exchanges at Southall, Southampton and Folkestone.

Ilford Corporation is to establish new showrooms and offices for the electricity department at a cost of £52 000.

Chester City Council has referred back for further consideration a proposal to extend the municipal electricity showrooms.

A new edition of the London Telephone Directory is in preparation. New subscribers should give their orders before January 9th if they wish their names included in the new issue.

The Electrical Engineers' Dance will take place on January 31st at the Grand Hotel, Harrogate. Tickets £1 1s. each, inclusive of dinner, from Mr. H. Cecil Fraser, hon. sec., 36, Park Place, Leeds.

The first ordinary general meeting of the 1929–30 session of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers will take place on January 7th at the University, Brownlow Street, Sheffield. Mr. S. S. A. Watkins will lecture on "Talking Films."

Applications are invited for the position of borough electrical engineer of West Hartlepool.

The headquarters of the Electrical Trades Union will be transferred from Manchester to London in the near future.

At an informal function at the factory of the North British Aluminium Co., on Monday, electricity obtained from the Lochaber hydro-electric works was used for the first time in casting aluminium.

The National Institute for the Blind had at the time of going to press received £8,000 for the British "Wireless for the Blind" Fund, in response to the appeal broadcast by Mr. Winston Churchill on Christmas night.

The Oil Heating Institute (U.S.A.) has issued a warning to users of household appliances operated by electricity that it is advisable to learn the location of the fuses and how to change fuses. It is also suggested that electrical circuits should be checked when an automatic heater, electric refrigerator or other device is installed.

The Exchange Telegraph reports that a provisional contract for the exploitation of the Narva Falls has been granted by the Esthonian Ministry of Trade to the International Hydro-Electric Development Syndicate, Ltd., which has been formed in England. The Syndicate proposes to establish a 50 000 kW power station, at an estimated cost of 30 000 000 kroner.

Fulham (London) Electricity Committee recommends the Borough Council to engage a lady demonstrator and attendant at the electricity showrooms. The lady appointed is also to visit the homes of consumers to give instruction in the economical use of apparatus, and deal with minor difficulties. The Committee recommends that the appointment be temporary, and that the salary be from £4 to £5 per week.

Owing to the number of requests received for permission to visit the new Hams Hall station, the Birmingham Electric Supply Committee has decided to fix certain days in the spring and autumn during which ratepayers may visit the station.

Sir Andrew Duncan, chairman of the Central Electricity Board, opened the works of the Northern Chromium Co. at Newcastle-on-Tyne on December 18th. He said the company's process, which was new in that area, would consume a fair amount of electricity.

Dundee Corporation has accepted a tender amounting to £2 890 9s. for the supply of Belgian and Dutch cables. The lowest British tender was £3 422.

Mr. Norman Young delivered a lecture to the Paisley Association of Electrical Engineers on December 18th on "A New Electrical Method of Determining the Pressure in Engine Cylinders."

Chorley Education Committee has accepted the offers of the Lancashire Electric Power Co. to instal and maintain an electric cooker free of charge, on condition that instruction in its use is given to the students attending the cookery classes.

Mr. Wm. Keay, addressing the Sheffield Branch of the Association of Engineering and Shipbuilding Draughtsmen recently, said lights on lightships and lighthouses would be discernible through fog by television at no far distant time.

At the Borough Polytechnic Institute, London, S.E.1, a short simplified engineering course for women, arranged in conjunction with the Women's Engineering Society, will begin on January 7th. Fee for the course £1. Application forms from the Principal.

Mr. Wm. M'Farlane, of the Central Electricity Board, addressed the West of Scotland Iron and Steel Institute recently on the subject of "The Grid and Standardisation of Frequency."

Mr. R. Wilson, opening a discussion, at a meeting of the Midland Branch of the Association of Mining Electrical Engineers at Mansfield on December 22nd, said trailing cables were the most frequent cause of electrical accidents in mines. He thought that eventually a super "cab tyre" cable would be the most efficient means of preventing such accidents.

The Postmaster General announces special facilities until January 15th for New Year telegrams of greeting to the Continent of Europe at half the normal rates. Special facilities for the transmission of Christmas and New Year greeting telegrams through Rugby, Portishead, and other Post Office wireless stations to ships at sea are also announced.

A report by the National Electric Light Association of America states that the principal electrical developments of the year in the U.S.A. have been mainly in the improvement of steam-electric generation. Only 10% of the year's power house construction has been in hydro-electric plants, while, on the other hand, the concentration of production in large, high-pressure steam units has made remarkable progress.

The proposed extension to the Heriot-Watt College, Edinburgh, has been further discussed at a recent meeting of the governors. The extension will provide for the accommodation of the mechanical and electrical engineering, physics and other departments, and an examination hall capable of seating 750 people. The governors agreed to instruct the architect to proceed with the preparation of working drawings, and a committee was appointed to raise funds.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN, *dated January 3rd, 1880, reported the opening (on December 29th, 1879) of the cable to Cape Town via Zanzibar.*

Passengers by the Inman liner "City of Berlin" on her trip to New York "with the electric light on board" addressed a note of congratulation to the company.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of January 6th, 1905, reported the placing of an order by the Underground Electric Railways Co. of London for a large number of Maxim direct current traction circuit arc lamps.*

The Lyceum Theatre had just been opened after rebuilding, and a description of its electrical installation of about 2 000 lights was given.

Electrical methods for the fixation of nitrogen from the air were being tested.

* * *

FIFTEEN years ago, according to THE ELECTRICIAN *of January 1st, 1915, a Bill was promoted for the amalgamation of ten London electricity supply companies with a capital of £6 000 000.*

* * *

TEN years ago, THE ELECTRICIAN *of January 2nd, 1920, recorded an arrangement made by the Wolverhampton Corporation in connection with its housing scheme for the provision of electric lighting on the basis of a uniform charge of 1s. per week or thereabouts, to be collected with the rent and so obviate the use of meters.*

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PERSONAL.

MR. Bernard C. Holding, who has edited THE ELECTRICIAN during the past three years, resigned at the end of last month to take up an appointment with the International Standard Electric Corporation, and has been succeeded in the editorship of this journal by Mr. G. H. Lepper.

Mr. Archibald Page, who has been awarded a knighthood.

The New Year Honours list contains few names of persons associated with the electrical industry. Amongst those upon whom the honour of knighthood has been conferred is Mr. Archibald Page, chief engineer and manager of the Central Electricity Board and a past-president of the Institution of Electrical Engineers; Mr. James Scott-Pitkeathly, is created a Companion of the Order of St. Michael and St. George, in recognition of his services as director of electrical undertakings in Ceylon; and Mr. Ernest Edward Rogers, examiner of technical accounts in the electrical engineering department of the Admiralty, is made a Member of the Order of the British Empire.

Sir A. V. Roe has joined the board of Runbaken Motor and Electrical Accessories, Ltd.

The appointment of Mr. J. H. Parker, as electrical engineer of the L.C.C. Tramways Dept., has been confirmed.

Capt. J. W. Barber, of the Brownie Wireless Co., Ltd., has been elected chairman of the R.M.A. in succession to Mr. J. T. Mould. The new vice-chairman is Mr. R. M. Ellis, of Climax Radio, Ltd.

Estate of the gross value of £128 418 with net personalty £119 146 was left by the late Mr. William Bannister, chairman of the Chloride Electrical Storage Co., Ltd., who died on October 1st, aged 81 years.

Mr. F. H. Bevan has been appointed manager of the joint branch of the London Electric Wire Co. and Smiths, Ltd., and the Liverpool Electric Cable Co., Ltd., at Leeds. Mr. Bevan was, until this appointment, outside representative of these companies at Manchester.

A battery-operated braking device for motor vehicles has been patented by Mr. H. M. Dudgeon and Mr. T. C. E. Rowland, engineers in the employ of Birmingham Corporation tramways department. The apparatus is said to be very effective and economical as regards the use of current.

With reference to the paragraph on page 834 of the December 27th issue of THE ELECTRICIAN, regarding the election of Mr. W. M. Selvey to full membership of the Institution of Electrical Engineers, this should have read Institution of Civil Engineers, Mr. Selvey having been a member of the I.E.E. since 1912.

Mr. T. W. Colson, owing to ill-health, has asked to be relieved of his duties, and he will, therefore, cease to be chief engineer and manager of the Surbiton electricity supply undertaking as from January 1st, but will be retained as advisory engineer. Mr. Edgar Stopford Saunders has been appointed his successor as from that date.

Mr. Robert Illingworth, who is leaving Cardiff to take up the position of deputy electrical engineer at Plymouth, was the recipient of personal gifts at three functions held in his honour during the week. The first was made by the workmen and officials of the power supply undertaking of Cory Brothers and Co., Cardiff, Ltd., in the form of a walnut full Westminster chime clock, suitably inscribed; the second gift was an all-mains radio-gramophone set, presented by the whole of the officials of the company; and the third was a silver cigarette cabinet, inscribed with the signatures of the donors, from his many friends at Cardiff.

Obituary.

LT.-COL. MONTAGU CRADOCK, aged 70 years. He had been a director of the Metropolitan-Vickers Electrical Co., Ltd., since 1902.

MR. WILLIAM HUBBARD, on December 16th, aged 49 years, for 15 years with Messrs. Burch and Vertue, electrical engineers and contractors, of 26, Union Street, Aldershot.

BUSINESS ITEMS.

MR. G. D. Witham, electrical engineer and contractor, has opened temporary business premises at 70, Elaine Street, Warrington.

The telephone numbers of INSULATORS, LTD., Derby Road Works, Montague Road, Edmonton, N.18, have been changed to Tottenham 4256/7.

The address of C. WILKINSON (LEEDS), LTD., Marshall's Mill, Holbeck, Leeds, has been changed to Marshall's Mill, Town End, Morley, near Leeds.

The D.P. BATTERY CO., LTD., has moved the Service Depot from Orchard Street, London, S.W.1, to 107A, Pimlico Road, S.W.1, where the charging of electric vehicles can now be undertaken.

MOFFATS, LTD., of Weston, Ontario, Canada, have recently shipped to the order of the Electricity Supply Board, Dublin, a consignment consisting of 133 electric ranges, 31 of which are of the cabinet type.

A fire which occurred on December 20th at a warehouse in Elder Yard, Saltergate, Chesterfield, destroyed a quantity of electrical equipment belonging to Mr. EDGAR R. MORRIS, electrical contractor, of Knifesmithgate.

The HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, London, E.15, announces that "Hart" batteries are used in the world's fastest lifeboat, various references to which have recently appeared in the daily Press.

We are asked by the GENERAL ELECTRIC CO., LTD., to state that the fire which broke out in the Moulded Insulation Works, Witton, Birmingham, on the morning of December 30th was of quite a minor character, and will only involve a relatively small number of employees being out of work for a few days.

WE are informed that BROWETT, LINDLEY AND CO., LTD., Sandon Works, Patricroft, Manchester, who have been in the Receiver's hands on behalf of the debenture bond holders, are to be reconstructed early this year. The scheme of reconstruction is already well in hand and details will be made public shortly.

Mr. H. J. Brett, British Commercial Secretary at Shanghai will be available at the offices of the Overseas Trade Department, from January 16th to 24th. Firms desiring interviews or information regarding trade with China, should apply to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, London S.W.1. (Reference 2203/1/29.)

Mr. H. O. Chalkley, Commercial Counsellor to the British Embassy at Buenos Aires, will be available at the offices of the Department of Overseas Trade, from January 13th to 17th, and from February 3rd to 7th. Firms desiring interviews, or information regarding trade with the Argentine, should apply to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference 5534/1/29.)

METRO-VICK SUPPLIES, of Charing Cross Road, London, W.C., point out that perhaps the most notable example of the growing popularity of the "Harcourt" fittings is the recent installation at Chiltern Court, a large block of residential flats recently built over Baker Street (London) station, the whole of the fittings in all the public rooms, entrance hall, corridors, restaurant, etc., forming part of this contract. Other examples are fittings for the Plymouth Hippodrome; Bonington Theatre, Nottingham; Stock Exchange Restaurant, Manchester; the Sligo Cathedral, Ireland; and the whole of the decorative fittings for the Bristol Art Gallery.

One of the features of Radio Week, which this year will be held from January 12th to 18th, is a window display contest arranged by the MARCONIPHONE CO., LTD., of 210-212, Tottenham Court Road, London, W.1. The first, second and third prizes offered are £50, £20 and £10 respectively, while four prizes of £5 each are also offered. Special window display material, including pelmets, screens and showcards, has been prepared for free distribution among intending competitors, and the conditions of entry are (1) displays of "Marconiphone" lines illustrated in the current general catalogue—including receivers and loud speakers, valves, mains units, accumulators, batteries—only are eligible; (2) the display must be shown throughout the whole of Radio Week, January 12th to 18th; (3) a photograph of the display of a size not less than 5 in. by 4 in. and bearing the name and address of the competitor, must be sent to the organisers so as to reach them not later than January 21st. The photograph should also bear brief particulars of the display and approximate cost. Intending competitors may obtain entry forms from the company at the address given above.

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INDUSTRIAL THERMAL STORAGE.

New Installation for Chromium Plating—Heating during "Off-peak" Hours—Time and Thermostat Switching—Labour Economy.

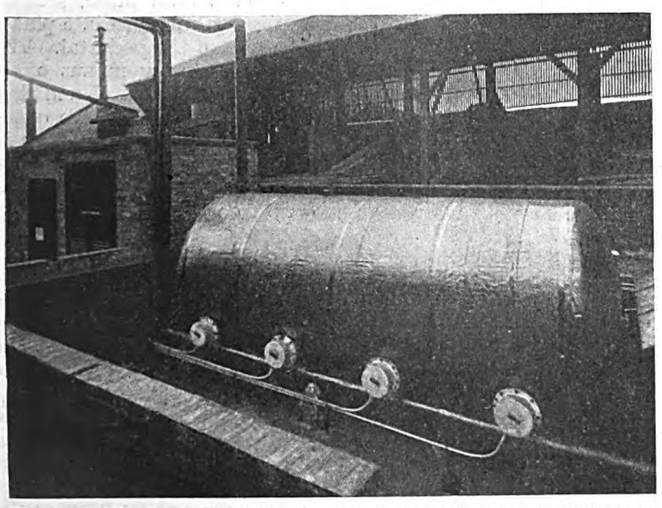
THE many advantages both to consumer and to supply authority of utilising electrical energy during off-peak-load periods are gradually being recognised throughout the country, and the demand for the cheap power obtainable during these periods is happily increasing. At the present time the field of application is somewhat restricted, and probably the largest demand is made by thermal storage systems. One of the first of these to be applied in Great Britain to industrial heating, if not actually the very first, is used in connection with the extensive plant recently installed by the Northern Chromium Co., Ltd., for chromium plating by a new process, for which they have the sole rights in Great Britain.

In all, there is a total of 24 large tanks, which have to be maintained at temperatures varying between 70 deg. F. and 140 deg. F. These tanks include chromium-plating tanks, hot-sawdust tanks, hot-water tanks, degreasing tanks and various acid baths used for copper, nickel and aluminium plating. Each tank is fitted with a heating coil made of steel or lead, depending on the nature of the electrolyte, and this coil is connected through valves on the inlet and outlet side to hot-water mains run round the building. One of these valves is a check valve, and is usually fully open, regulation being carried out on the other valve.

The whole system is efficiently lagged and the supply of hot water is taken from the large thermal storage cylinder installed in a pit outside the main building. This cylinder, which is 18 ft. long by 8 ft. diameter, holds 5 650 gallons of water, and is heated by immersion heaters of a total capacity of 120 kW, supplied by Messrs. A. Reyrolle and Co., Ltd., and arranged in four 30-kW banks. Each bank consists of nine 3·3-kW heating units mounted on a common flange-plate with their connections brought out to terminals on a set of four circular busbars. The supply is 3-phase at 440 V, 40 cycles, and three of the busbars are connected to the outers, while the fourth forms a star point. The heating units are so arranged that the load is equally divided between the three phases.

Energy for heating the cylinder is supplied at special rates, during the night hours only, from the mains of the Newcastle-upon-Tyne Electric Supply Co., Ltd. Current is automatically switched on by a time-switch at 7.30 p.m. and continues to flow until the water in the main cylinder reaches a temperature of 220 deg. F., when it is switched off by a thermostat.

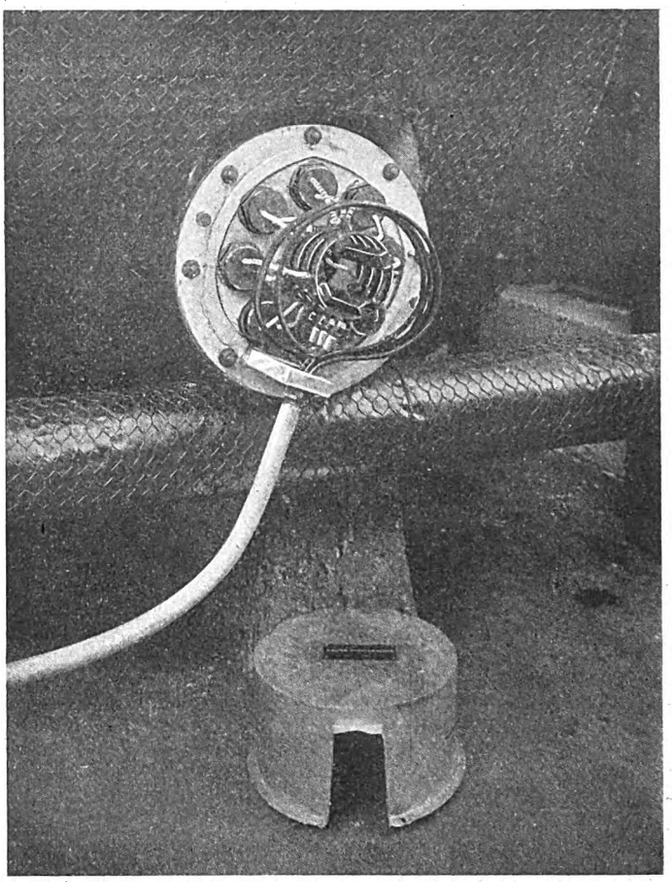
In the morning the main stop-valve is opened and a small circulating pump is started up, to pump hot water at a temperature of 220 deg. F. round the heating system, thus making



View of a 5 600 gallon storage tank showing projecting ends of four 30 kW banks of immersion heaters.

heat energy immediately available for heating up the various tanks required for the day's work. At the end of the day the water is at a temperature of 140 deg. F., which implies a total heat storage equivalent to 1 320 kW hours. It has been found that the majority of the tanks can be brought up to the required temperature within three-quarters of an hour after starting up the circulating pump.

The alternative to the above method of heating would have been the installation of a steam boiler, and each of the 24 tanks would have had to be fitted with a steam trap and, further, a connection to the steam trap would have had to be taken



One of the 30 kW banks with end cover removed to show the arrangement of busbars and method of connecting the single heater units.

through the bottom of the tank. This joint would always have been a possible source of leakage, allowing valuable electrolyte to escape to the floor of the plating room. Further, the replacement of a heating coil could only have been carried out by emptying the tank, whereas with the scheme of hot-water heating actually in use this can be done by merely breaking the joints and lifting the heating coil out of the tank.

It should also be remembered that the demand for heating is very heavy early in the morning, when the tanks are being brought up to temperature. It would, therefore, have been necessary to start firing the boiler a few hours before the beginning of the day's work, so as to reduce the danger of boiler-priming, and for the remainder of the day the boiler would have been working inefficiently on a very light load, to maintain the vats at their appropriate temperatures.

It will thus be seen that thermal storage heating has simplified the installation of the heating coils in the tanks and has also made the system much cleaner and easier to maintain. Labour has been reduced, because the operation of the thermal storage cylinder is entirely automatic, and the only labour involved is that of opening and closing the stop-valve and starting up or shutting down the circulating pump.

The equipment was installed by Messrs. R. W. Cairns, Newcastle-upon-Tyne, and the lagging of the pipe system and the thermal storage boiler was carried out by Newalls Insulation Co., Ltd.

Chromium plating is now extensively employed in the electrical industry, amongst its applications being switch-covers, plugs and sockets, lampholders, table lamps, irons, cooker apparatus, switchboard fittings, instrument cases, switch handles, relay cases, power station handrails and wireless parts. Its use is also extending in other branches of engineering.

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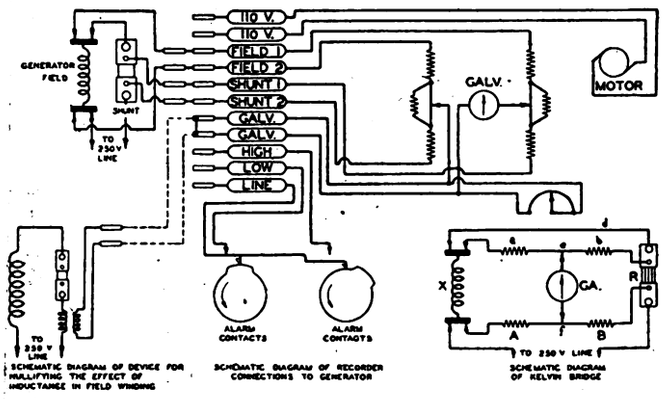
POWER EQUIPMENT.

A Vernier Regulator Switchgear Device — Maximum Demand Indicators — Direction Finding Apparatus—Dust Separator Fans.

ENGINEERS and others connected with the installation of switchgear may be interested in the "Duplex Vernier Type Regulator" recently introduced by the WALSALL ELECTRICAL CO., LTD., of 61, Bridge Street, Walsall. This regulator, whether mounted in front or at the back of the board, occupies no more space than the more ordinary type. In the standard model it is fitted with 30 contacts for coarse adjustments and 10 contacts on the vernier portion; the



The theoretical arrangement of the "L. and N." generator field temperature recorder.

radial switch arm is controlled by concentric hand wheels. The switch is of the laminated brush type, with liberal contact area. Together with the contact studs it is mounted on a "Sindanyo" ebony panel. The resistance units are stated to be of a special non-ferrous alloy, which is rustproof, has a negligible temperature coefficient and will not get brittle or perish under the influence of heat, exposure or age. The units are mounted on an insulating and heat-resisting compound, and are rated on a conservative basis. The standard design is suitable for currents up to 50 A. The manufacturers emphasise the convenience of the concentric hand wheels for manipulation when "paralleling," or controlling the alternator field.

The maximum demand indicator, type KM, of the A.E.G. ELECTRIC CO., LTD. (131, Victoria Street, London, S.W.1), is stated to constitute a new departure in this kind of indicator. It has a self-contained time switch and is claimed to compete strongly with the more usual type of meter equipped with a separate time switch, hand or electrically wound. We understand that although it comprises an electrically operated time switch combined with a maximum demand indicator, it costs less than an ordinary hand-wound time switch alone. The resetting, every 15, 30 or 60 minutes, is effected by a small shaded-pole motor, and the influence of voltage and frequency fluctuations on the time interval are said to be negligible. The indicator is advanced by a ratchet device working in conjunction with a relay which is actuated by two contacts fitted in the meter itself. These contacts make a break with the rotation of a toothed wheel of insulating material mounted on the register spindle.

The A.E.G. has also introduced a two-part tariff prepayment meter. It is not a creeping meter, and is stated to be the only instrument of its type which does not measure the "fixed charge" on the meter dial. Two elements are employed, the meter element proper for the energy consumption, and a Ferraris motor to take account of the fixed charge. The motor is constantly in circuit across the mains, and runs at a speed determined by the fixed charge, and shown on a graph which is supplied for the purpose. The drive of both elements is transmitted through a differential gear to the coin gear, which is thus returned to zero after an interval depending on consumption and fixed charge. The Ferraris motor, however, continues to operate, taking account of the sum necessary to cover the charge accruing between the opening of the switch and the next coin insertion. For example, if the consumer is absent for a fortnight, the correct amount for this period on the "fixed charge" basis is indicated in red on the coin dial, and must be paid—together with the coin, such as a shilling, which is due in advance—before the switch can revert to the closed position.

The coin mechanism is arranged with two sets of dials, the lower showing total coins inserted, up to 999, the upper indicating the amount paid in advance—in white figures on a black ground; the same dials show in red figures any amount up to 18 coins owing on the fixed charge basis, as explained above. The fixed charge apparatus is adjustable between the limits of 6d. and 4s. per week; the adjustment is effected by means of a stop watch and screw-driver, which alters the position of the screw above the Ferraris disc. The speeds corresponding to the above-mentioned values are 13 and 104 r.p.m., respectively; a wider range can be obtained by changing gears. The speed variation of the Ferraris motor with voltage and frequency changes is stated as approximately 1% for 10% in voltage and 1·2% for 1% in frequency.

An important feature of the new design of the direction finder equipment (type RA76) manufactured by the RADIO COMMUNICATION CO., LTD. (34-35, Norfolk Street, Strand, London, W.C.2) is the incorporation of complete automatic correction of quadrantal and pointer errors. The manufacturers explain that h.f. currents often induce in the metal structure of a ship, currents which give rise to a h.f. magnetic field. This induced magnetic field is superimposed on the magnetic field of the wave itself, consequently altering the apparent direction of the distant wireless station. The effect is analogous to the change in the apparent direction of the North Pole, as indicated by a simple magnetic compass when placed in a ship whose steel hull is magnetised by induction from the earth's field.

The errors introduced are quadrantal—reaching a maximum value at intervals of 90 deg. The amount of the error in the reading of a simple direction finder thus depends on how nearly the ship's electrical properties approach symmetry and on the position of the d.f. coils in relation to the ship's structure. In, therefore, a ship having perfect electrical symmetry the induced currents in the structure produce a magnetic field in the thwartship line, and the quadrantal error is zero in directions 0 deg., 90 deg., 180 deg., and 270 deg. from the bow; but in many instances the ship's field is to some extent misaligned, so that the quadrantal error is zero at four other angles from the bow. In order to correct the new direction finder for quadrantal error the following adjustments are therefore provided:—(*a*) Adjustment for magnitude of ship's field; (*b*) adjustment for alignment of ship's field; (*c*) adjustment for alignment of the pointer. This last is provided to correct the small error all round the scale which may be caused by a slight misalignment of the pointer with respect to the frame aerial. The device for the automatic correction consists of a gear wheel mounted on a base plate, secured to the rotating column and geared by an intermediate pinion to a toothed rim on the lower extension of the pedestal. The rotating gear wheel drives the scale plate by means of an eccentric pin working in a radial slot in this plate, and thus slightly advancing or retarding the scale in successive quadrants. The amount by which the driving pin is eccentric in relation to the axis of the gear wheel is indicated by a scale, and can be adjusted (at the time of installation and calibration) to correct quadrantal error up to a maximum of 20 deg.

Measuring Temperature Changes.

Power station engineers may be interested to learn some particulars of the system of measuring temperature changes in the field windings of alternators which is offered by the LEEDS AND NORTHRUP CO., of Philadelphia, for whom the INTEGRA CO., LTD. (183, Broad Street, Birmingham) act as agents. The L. and N. "Generator Field Temperature Recorder" is designed to give a continuous record of the temperature fluctuations. If, moreover, the generator is carrying a heavy load and the rotor overheats, the recorder will operate alarm signals when the temperature reaches the danger point. The recorder can also be used to ascertain the rate of cooling when the operator wishes to avoid risk of the insulation becoming strained through the windings being allowed to cool too rapidly. The apparatus operates on the principle of the resistance of a conductor varying with the temperature, the actual quantity measured being the resistance of the field winding. As this resistance amounts to only a few tenths of an ohm it can be measured more accurately with the Kelvin than with the Wheatstone bridge. Further-

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more the fluctuating resistances of the brush contacts on the collector rings are made relatively unimportant in the Kelvin bridge circuit. The details of the circuit are shown in the accompanying diagram, in which the fundamental elements of the Kelvin bridge circuit are shown in the lower right-hand corner. X represents the resistance of the field winding, and R is a low-resistance shunt connected in series with it in the exciter circuit. Auxiliary brush contacts on the collector rings serve as potential points at the terminals of the field windings. These are connected to potential posts on the standard resistance through the fixed resistances A, B and a, b, with a slide-wire resistance between A and B and another between a and b. The terminals of the galvanometer leads are attached to movable contacts on these slide wires. A change in position of these contacts changes the ratio of A to B and of a to b, but at any setting $A=a$ and $B=b$. When the resistances are related as follows—

$$\frac{X}{R}=\frac{A}{B}=\frac{a}{b}$$

—the galvanometer pointer will not deflect from zero. The resistance R being constant, the ratio $X:R$ varies as X varies with the temperature; thus $A:B$ and $a:b$ must be varied accordingly, to reduce the deflection to zero. This is effected by changing the position of the slide wire contacts, the adjustment being made automatically by the recorder mechanism. Simultaneously with this action the recording mechanism draws a pen across a chart which is moved forward by the motor that actuates the instrument. The curve drawn by the pen shows the amount of adjustment of the ratio slide wires which is necessary to establish the required ratio, and it can thus be calibrated in temperature.

The connection denoted by d (in the small diagram on the right) represents the part of a Kelvin bridge circuit known as the yoke. Accuracy of measurement depends on the resistance of the yoke being kept low, and for this reason the standard resistance R is mounted as close to the generator as possible.

With self-induction in the field winding a change in field current may result in a momentary difference in potential at the galvanometer terminals, and this may cause a movement of the pen which does not correspond to temperature change. This effect can be avoided by connecting the galvanometer in series with the secondary of a current transformer, of which the primary is in series with the standard resistance and the field winding—as indicated at the lower left of the diagram. In this way a compensating e.m.f. is applied to the galvanometer in opposition to the e.m.f. induced in the field winding, so that load fluctuations do not affect the temperature record. This refinement is, however, only necessary when the recorder is connected to a generator supplying a fluctuating power load.

A New Engine.

The ENGLISH ELECTRIC CO., LTD., of Queen's House, Kingsway, London, W.C.2, have sent us particulars of their latest output of "Fullagar" oil engines. One of the special features of this type of engine consists in its having only one crank and connecting rod per cylinder, in place of the three cranks usual in other opposed-piston engines. The "Fullagar" is, indeed, a double-acting, two-stroke-cycle engine without cylinder covers, this design leading automatically to cylinders of small size for a given power, in spite of the low mean effective pressure and piston speed which have been adopted. The method by which the need for three cranks per cylinder is overcome is briefly as follows:—

In this explanation a single pair of cylinders is considered, A, B and C, D being respectively the upper and lower pistons in the first and second cylinders. The lower piston in the first cylinder, i.e., B, is connected to the upper piston in the second cylinder, i.e., C, and similarly A is connected to D by pairs of oblique rods external to the cylinders themselves. Combustion takes place between A and B and causes B to move downwards and A upwards. Piston A acts on the right-hand crank through the oblique rods, and also draws up D in the adjacent cylinder. Piston B acts directly on the left-hand crank, and also draws C downwards. The power required for compressing the air is thus obtained directly from the pistons in the adjoining cylinder, instead of being transmitted through the crankshaft. As the obliquity of the rods between the pistons is small, the lateral forces on the crosshead faces are claimed by manufacturers to be insignificant.

The top cross-heads are so designed and enclosed that they act as the displacers of the scavenge air pumps. The exhaust ports are uncovered slightly before the scavenge inlet ports, and when the latter open the scavenge air sweeps through the cylinder from end to end. Among the advantages claimed for the "Fullagar" construction are good balance, due to the centres of gravity of the adjacent reciprocating masses nearly coinciding; uniformity of torque, since each connecting rod is double acting and the effort of each crank is uniformly in one direction; and small load on main bearings.

Dust Separation.

The running parts of the Keith-Blackman patent dust separator fan are almost identical with those of the standard "Keith" induced draught fan. The manufacturers, however —JAMES KEITH AND BLACKMAN CO., LTD., of 27, Farringdon Avenue, London, E.C.4—ingeniously utilise a simple principle to make the fan incorporate the dust separating feature. A two-stage fan housing is adopted; the first stage has a conical vortex chamber in which the dust is thrown out centrifugally and diverted into the dust collector, while the cleaned gases pass to the second stage of the housing, in which a spiral diffuser converts into useful pressure the kinetic energy of the rotating stream of gases, providing also a suitable outlet into the chimney.

The actual cycle of changes which ensures separation of the dust is explained in more detail by the following:—The dust-laden flue gases are drawn through the circular inlet dust to the eye of the fan runner, at which point the flow is diverted by the runner from an axial to a radial direction. This change of direction is the first stage in the separation of the dust, as the particles tend to pass towards the back plate of the runner, along which they slide under the compulsion of the vanes. On reaching the periphery of the runner the dust is projected by centrifugal action on to the smooth slope of the deflecting cone, along which it is conducted until, assisted by a slight air current, it passes through a narrow annular space into the dust chamber.

IN PARLIAMENT.

Points from Replies to Recent Questions in the House of Commons.

IT is proposed to open the following automatic exchanges within the London telephone area during the next 12 months: Primrose Hill, Amherst (Hackney), Fairfield (Croydon), Addiscombe, Shepherd's Bush, Frobisher (Earl's Court), Gladstone (Cricklewood), Macaulay (Battersea Park), Livingstone (Norwood).

With regard to the proposal to construct a deep-level tube railway for fast traffic between Hammersmith or Earl's Court and the City, the Minister of Transport understands that, in the opinion of the railway companies concerned—with which he is disposed to agree—there are other improvements of tube railways likely to be needed before any such scheme as that to which reference had been made.

Attention having been called to agreements made or about to be entered into between the North Metropolitan Electric Supply Co. and certain local authorities whereby, in consideration of certain annual payments made by the company to the local authority, the local authority agrees not to exercise its right to purchase the electricity undertaking in its area, the Minister of Transport says such agreements do not have to be submitted for approval. He is not aware whether any further agreements of this kind are contemplated.

An automatic telephone exchange to serve the Bredbury district will be opened towards the end of 1931.

The Minister of Labour has no authority to interfere with the decision of Hull City Council to dismiss 130 tramwaymen who volunteered for service during the general strike.

The financial position does not at present permit of a reduction in Post Office telephone rental charges.

The technical officers of the Post Office are keeping the experimental transmissions of television under regular observation and are furnishing interim reports from time to time. The last such report was received at the beginning of December, 1929.

Approval of Electricity Orders.

The House of Commons has approved Electricity Supply Special Orders in respect of: (1) Knaresborough urban district and parts of Pateley Bridge and Great Ouseburn rural districts; (2) parts of Carmarthen rural district; and (3) Hayfield rural district and part of Glossop Dale rural district.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BIRMINGHAM GUARDIANS, January 4th–31st.—Electric lighting services, etc., in the extension of the nurses' home at Dudley Road Hospital. Specifications will be supplied on deposit of £3 3s. with The Treasurer, Union Offices, Edmund Street, Birmingham, on or before January 4th.

MANCHESTER CORPORATION, January 4th.—Supply of lead batteries for transport vehicles. Specifications from Mr. C.H. Lamb, Electricity Department, Town Hall, Manchester.

CENTRAL ELECTRICITY BOARD, January 6th.—Supply and erection of 132 kV overhead transmission lines (special crossings and high spans), in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.—P.L. 2) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2 ; deposit £2 2s.

WEST RIDING EDUCATION COMMITTEE, January 6th.—Electric lighting installation at Selby School of Art. Specifications, etc., from the Education Officer, County Hall, Wakefield.

WHARFEDALE RURAL DISTRICT COUNCIL, January 6th.—Electrician's work in connection with erection of 10 non-parlour houses, in three blocks, on housing site at Mill Lane, Pool. Bills of quantities, etc., from the Surveyor, Council Offices, Menston ; deposit £1 1s.

AYR COUNTY COUNCIL, January 8th.—Electrical work in connection with proposed new County Council Buildings, Ayr. Schedules, etc., from Mr. Alexander Mair, architect, 20, Wellington Square, Ayr ; deposit £2 2s.

LEEDS GUARDIANS, January 8th.—Electric lighting and bell installation at the vagrant wards, Holbeck Institution. Specification, etc., from Mr. J. H. Ford, Poor Law Offices, South Parade, Leeds. Stamped addressed envelope to be sent.

READING GUARDIANS, January 8th.—Electric lighting installation at new casual wards to be erected at Woodley, Berks. Energy will be taken from Thames Valley Electric Supply Co. Further particulars from Mr. J. Wayne-Morgan, 6, Church Road, Whitchurch, Cardiff ; deposit £2.

ISLINGTON (LONDON) GUARDIANS, January 9th.—Supply and erection of five full-automatic push-button electric lifts at the Infirmary, Highgate Hill, N.19. Specification, etc., from Mr. Albert King, Guardians' Offices, St. John's Road, Upper Holloway, N.19 ; deposit £2.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 13th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (tender form H), and supply of electric lamps (form S). Forms of tender from the Borough Engineer.

DEWSBURY CORPORATION, January 13th.—Supply and erection of rotary convertor plant (1 500 kW and 500 kW). Specification, etc., from Mr. R. W. Grubb, borough electrical engineer, Bradford Road, Dewsbury.

STOKE AND WOLSTANTON GUARDIANS, January 13th.—Electric light and power wiring and fittings, in connection with new nurses' home, London Road Institution, Stoke-on-Trent. Specification, etc., from Mr. T. Wood, clerk to the Guardians, Union Offices, Stoke-on-Trent ; deposit £3.

DUNDEE CORPORATION, January 15th.—Supply of two 300 kVA outdoor type transformers and one 200 kVA outdoor type transformer. Specifications from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

BARMING HEATH MENTAL HOSPITAL, MAIDSTONE, January 16th.—Electrical installation, for lighting, heating, etc. Electrical energy will be supplied from the mains of Maidstone Corporation. Specification, etc., from Mr. E. E. Hoadley, Corporation Electricity Works, Maidstone ; deposit £2 2s.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 17th.—One year's supply of cables, electricity meters, cable terminal and other boxes, switches, wires, lamps and sundries. Specification, etc., from the Town Clerk, Municipal Buildings, Upper Street, London, N.1.

CENTRAL ELECTRICITY BOARD, January 20th.—Supply and erection of 3·3 kV, 6·6 kV, and 11 kV switchgear, for connecting the Board's supply to undertakers' busbars. Specification (N.W.E.—G.S.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2 ; deposit £2 2s.

METROPOLITAN WATER BOARD, January 21st.—Supply and erection of four steam turbines, with pumps, and two electric generators, for Surbiton pumping station. Specification, etc., from the Chief Engineer (Room 173), 173, Rosebery Avenue, London, E.C.1 ; deposit £3 3s.

BATH CORPORATION, January 22nd.—Supply of 60 000 lb. boiler, 7 000 kW turbo-alternator, and e.h.t., h.t. and l.t. cables required during 12 months. Specifications, etc., from Mr. J. W. Spark, city electrical engineer, 7, Dorchester Street, Bath ; deposit £2 2s.

GRIMSBY CORPORATION, January 23rd.—Manufacture, supply and erection of 10 000 kW three-phase turbo-alternator, with condensing plant. Specification, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby ; deposit £2 2s.

LIVERPOOL CORPORATION, January 23rd.—Twelve months' supply of materials to the electric supply department, including cables ,compounds and tapes (Form E.S.1), insulated cables (E.S.2), meters (E.S.3), incandescent lamps (E.S.5), a.c. motors and starting gear (E.S.7), electric cookers and kettles (E.S.11), etc. Tender forms from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

CENTRAL ELECTRICITY BOARD, February 1st.—Supply and erection of 33 000 V overhead transmission lines in South-East England. Specification (No. S.E.E.—S.L. 3) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2 ; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

LOURENCO MARQUES TENDERING DEPARTMENT OF THE TREASURY, January 3rd.—Supply of oil-engine driven d.c. generator and battery. (Reference B.X. 5 961.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

JOHANNESBURG MUNICIPALITY, January 4th.—Supply of automatic traffic signals. (Reference B.X. 5 924.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 6th.—Supply and erection of plant for supply of filtered and unfiltered water, including pumps, electric motors, etc. (Reference A.X. 8 746.)

CAPE TOWN MUNICIPALITY, January 7th.—Supply of 3-core 11 000 V cable (specification No. 482/1929.) (Reference B.X. 5 925.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Telephone cable terminal boxes (schedule C. 540). (Reference B.X. 5 938.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C. 504). (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526). (Reference B.X. 5 823.)

BELGIAN POSTS AND TELEGRAPHS, January 8th.—Supply of 250 tons of bronze wire and five tons of annealed soft copper wire. Cahier des Charges Special, No. 3 455 (frs. 2½), from the Posts and Telegraphs Department, Salle Madeleine, Brussels.

PORT ELIZABETH MUNICIPALITY, January 9th.—Supply of electric cables, transformers and sundry electric materials (specification No. 35). (Reference B.X. 5 980.)

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BLOEMFONTEIN MUNICIPALITY, January 10th.—Supply of automatic electric traffic signals (contract No. 5). (Reference B.X. 5 887.)

POSTMASTER-GENERAL'S DEPARTMENT, January 14th.—Supply of copper, bronze, tinned copper and cadmium copper jointing sleeves (schedule No. C.547). (Reference B.X. 5 997).

CAPE TOWN MUNICIPALITY, January 15th.—Supply of direct-coupled, electric motor driven, centrifugal pump for sewage works (specification No. 475/1 829.) (Reference A.X. 8 836.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943.) (Reference B.X. 5 879.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 21st.—Spare parts for automatic telephones. (Reference B.X. 5 917.)

SOUTH INDIAN RAILWAY CO., January 24th.—Supply of cables and accessories, in connection with Madras improvements. Specifications and forms of tender (£1, not returnable) from the Company's offices, 91, Petty France, Westminster, S.W.1.

NEW ZEALAND POSTS AND TELEGRAPHS, January 27th.—Supply of breastplate transmitters. (Reference B.X. 5 956.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates (schedule No. C. 533). (Reference B.X. 5 899.)

DUNEDIN DRAINAGE AND SEWERAGE BOARD, February 1st.—Supply of two centrifugal or propeller pumps, with electric motors and accessories (contract No. 737). (Reference A.X. 8 961.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct-coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

Telephone Materials for New Zealand.

NEW ZEALAND POSTS AND TELEGRAPHS, February 3rd.—Supply of protector blocks (carbon and porcelain). (Reference B.X. 5 948.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 5th.—Supply and delivery of indication alarm fuses. (Reference B.X. 5 947.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3.) (Reference B.X. 5 844.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T., 151/2 025). (Reference B.X. 5 955.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (schedule C. 541). (Reference B.X. 5 940.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Reference B.X. 5 941.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of switchboard plugs (schedule C. 548). (Reference B.X. 5 998.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of magneto and common battery telephones and automatic dials (schedule C. 544). (Reference B.X. 5 999.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457.) (Reference B.X. 5 793.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o the International Construction Co., Ltd., 56, Kingsway, London, W.C.2.

Tenders Accepted.

WREXHAM CORPORATION.—S. Thornton, electric light wiring of 160 houses, £1 100.

GREAT NORTHERN RAILWAY CO. (IRELAND).—British Thomson-Houston Co., Ltd., 12 months' supply of Mazda gasfilled electric lamps.

PUNJAB GOVERNMENT.—Callender's Cable and Construction Co., Ltd., h.t. overhead transmission lines for Uhl River hydro-electric undertaking, £659 585.

LIVERPOOL CORPORATION.—English Electric Co., Ltd., supply of twelve 750 kVA, three phase, 6 600/400 V, oil cooled, step down transformers for sub-stations, £279. (Recommended.)

GENERAL POST OFFICE.—Telephone exchange equipment, Altrincham, Standard Telephones and Cables, Ltd.; Guildford and Worthing, Ericsson Telephones, Ltd.; telephone repeater equipment, Birmingham, General Electric Co., Ltd.

LONDON COUNTY COUNCIL.—Electrical Installations, Ltd., electric light wiring and fittings and provision of power for lift at Stamford Hill Stores. Also tendered: Malcolm and Allen (London), Ltd., £470; Alex. Hawkins and Sons, £489; Pinching and Walton, £491; A. Dean and Co., Ltd., £509.

GLASGOW CORPORATION.—British Insulated Cables, Ltd., insulated bolts; Richard Johnson, Clapham and Morris, Ltd., wire; Titan Trackwork Co., Ltd., and Edgar Allen and Co., Ltd., points and crossings, tongues and switches; Hadfields, Ltd., tongues and switches; Dyer and Young, Ltd., armature coils.

LEEDS CORPORATION.—Supply of cables: Enfield Cable Works, Ltd., £11 130; Macintosh Cable Co., Ltd., £12 600; W. T. Henley's Telegraph Works Co., Ltd., £3 021; Hackbridge Cable Co., Ltd., £3 330; Croydon Cable Works, Ltd., £4 132; Derby Cables, Ltd., £1 147 9s. 2d.; and Edison Swan Cables, Ltd., £2 227 5s. 10d.

SOUTHEND CORPORATION.—English Electric Co., Ltd., two 59-seater, low-loading, trackless trolley vehicles, £4 760; J. Le Boutillier and Co., two cylinder heads for Diesel engines, £193 4s.; Chloride Electrical Storage Co., plates for renewal of 60 cells, Chalkwell Battery, £2 661 10s.; G. D. Peters and Co., Ltd., four sets transverse seats for tramcars, £669 4s. 6d.; Tilling-Stevens and Co., Ltd., tower wagon, £440.

DORKING ELECTRICITY SUPPLY.

Public Show Preference for Supply from the Central Board.

AT recent meetings of landowners and householders in the district around Dorking strong opposition has been shown to the Greater London and Counties Trust's Dorking Electricity Order, which has been made by the Electricity Commissioners and is awaiting confirmation by the Minister of Transport. At the inquiry which preceded the making of the Order (which covers about 50 square miles of country in Surrey), the London and Home Counties Electricity Authority opposed the granting of the Order to the Trust, on the ground that the district could be supplied more efficiently and at a cheaper price under a scheme in regard to which the Joint Authority would co-operate with the Central Electricity Board. It will be remembered that the Dorking undertaking was leased from 1909 to 1928 to the Dorking Electricity Supply Co., a subsidiary of Edmundson's Electricity Corporation, that the Council agreed that the company should promote an Order to carry on the undertaking for another 40 years, and that the Greater London and Counties Trust purchased practically the whole of the issued ordinary shares of Edmundson's Corporation on the understanding that the management and development of the Dorking undertaking should be entrusted to Edmundson's. The Joint Authority stated at the inquiry that it was prepared to take over the undertaking from the Council on terms at least as favourable as those agreed with the company. It is stated that a belief is held to a considerable extent in the district that electricity supplied under the companies' scheme is likely to cost more than if it is supplied under the national scheme, and the decision of the Ministry is awaited with some anxiety.

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WORK IN PROSPECT.

ALTRINCHAM.—New Theatre for the Altrincham Garrick Society, to cost from £5 000 to £6 000. Particulars, Mr. T. Harold Hill, 19 Kingsway.

ANDOVER.—New premises for F. W. Woolworth and Co. Particulars, Mr. W. Priddle, Victory House, Kingsway, London, W.C.2.

BAMBRIDGE.—Conversion of workhouse into hospital, to cost £35 000. Particulars, Mr. Thos. Houston, architect, Belfast.

BARNET.—2 Operating theatres for the Guardians, to cost £3 500. Particulars, Clerk to the Guardians.

BARNSTEAD.—22 houses in Wilmott Way. Particulars, E. Best and Co.

BARROW-IN-FURNESS.—New wing and cottage at Barrow War Memorial Convalescent Home. Particulars, Mr. H. T. Fowler, architect, 6, Cornwallis Street.

BELFAST.—New Presbyterian Church, etc., at Stormont. Particulars, Mr. T. Houston, Wellington Place, Belfast.

BLACKBURN.—New cinema. Particulars, Messrs. Gray and Evans, architects, 51, North John Street, Liverpool.

BLACKLEY.—Café and cinema. Particulars, Mr. John Knight, 5, Cross Street, Manchester.

BROADSTAIRS.—New church. Particulars, Sir Giles Gilbert Scott, 7, Gray's Inn, Square, London, W.C.1.

BROMLEY.—New school at Bromley Common. Particulars, Mr. W. A. Forsyth, Stratford Place, London, W.1.

BROTHERTON.—Rebuilding of "Fox Inn" for Tower Brewery Co. Particulars, Messrs. Garside and Pennington, Ropergate, Pontefract.

CARLTON, NOTTS.—100 houses. Particulars, Mr. J. A. West, surveyor, Carlton.

CREWE.—45 houses. Particulars, Borough Architect.

DEVIZES.—New wing to Isolation Hospital. Particulars, Mr. T. Walker, architect, Trowbridge.

DONCASTER.—New premises for Co-operative Society. Particulars, T. H. Johnson and Son, architects, 20 Priory Place.

DORKING.—Three halls to seat 1 000, 400, and 150 respectively, with block of shops and offices. Particulars, Mr. P. W. Meredith, architect, 34, Old Queen Street, London, S.W.1.

DUMMERY.—New school, to cost £6 000. Particulars, Messrs. Ferguson and M'Ilveen, Belfast.

DUNDEE.—Nursery School, to cost £3 000 on the Blue Mountain site. Particulars, Mr. Charles Soutar, architect.

EAST HAM.—Factory. Particulars, Mr. T. Anders.

FRIERN BARNET.—33 houses. Particulars, Mr. G. Elphick.

KNUTSFORD.—Alterations and improvements at Mainwaring Arms Hotel, Higher Plaver. Particulars, A. Price and Son, Middlewich Road, Sandbach, Cheshire.

LEICESTER.—Extensions, etc., to Isolation Hospital, to cost about £4 455. Particulars, Messrs. Symington and Price, Market Street.

LONDON.—New buildings for Royal Institute of Public Health. Particulars, Mr. Josiah Gunton, of Messrs. Gunton, and Gunton, architects.

LUTON.—New bakery premises for Co-operative Society. Particulars, Architects' Department, 99, Leman Street, London, E.

MANCHESTER.—New factory at Trafford Park. Particulars Messrs. Halliday and Agate, architects, John Dalton Street, Manchester.

MARCH.—20 houses. Particulars, Messrs. J. Eggitt and Sons.

OLDHAM.—Alterations to main block at Poor Law Institution. Particulars, Messrs. C. T. Taylor Roberts and Bowman, 10, Clegg Street.

ROMFORD.—20 houses. Particulars, Messrs. Watts and Pierce.

ROTHERHAM.—New premises, for Messrs. Montagu Burton. Particulars, Mr. Harry Wilson, architect, 81, North Lane, Roundhay, Leeds.

RUNCORN.—50 houses in Grappenhall. Particulars, Mr. J. L. Beckett, surveyor.

SIDMOUTH.—New church at Woolbrook. Particulars, Mr. W. D. Caroe, 3, Great College Street, London, S.W.1.

SHEFFIELD.—Printing offices and works for Northcliffe Newspapers, Ltd. Particulars, Messrs. Herbert C. Ellis and Clarke, 3, Old Queen Street, S.W.1.

STRATFORD-ON-AVON.—Extension to grammar school. Particulars, Mr. A. C. Bunch, architect, 27, Binswood Avenue, Leamington Spa.

TRADE PUBLICATIONS.

AN illustrated catalogue dealing with switch and fuse gear has been compiled by the MIDLAND MANUFACTURING CO., LTD., Barford Street, Birmingham. The reference number of the new publication is 180, and the company has included information and tables of use to engineers.

The latest publication of CRYSELCO, LTD., Kempton Works, Bedford, is an attractively coloured showcard featuring the company's decorative lighting sets. The card is illustrated with a box of suitable lamps in various colours with a decorated background. The title of the card is "Use Cryselco Decorative Lamps and Eliminate Fire Risks."

A well-produced catalogue containing 108 large pages and dealing with the problem of correct artificial lighting, has been published by the BENJAMIN ELECTRIC, LTD., Brantford Works, Tariff Road, London, N.17. The number of the catalogue is 1100. Both commercial and industrial installations are covered, and numerous illustrations of both types of lighting are included.

BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2, have now entered the field of electrical suppliers. We have just received their latest catalogue, an illustrated list of nearly 200 pages. As with the other branches of their business, Brown Brothers, Ltd., have been very thorough in the ground they have covered, for the range of appliances, fittings and accessories listed is very comprehensive. Everything is arranged in alphabetical order; thus it is quite simple to refer to whatever is required without recourse to the index, although such is provided.

The latest publication of WATSON AND SONS (ELECTRO-MEDICAL), LTD., Sunic House, 43/47, Parker Street, Kingsway, London, W.C.2, is a catalogue dealing with high tension transformers for X-ray work. This booklet deals with the principles on which high-tension transformers operate, and describes fully such matters as methods of rectification, testing and rating. Further, it sets out the forms of rating prescribed in the British Standard Specification, and shows that "Watson" transformers are rated in accordance with these forms. The booklet also includes a detailed description, together with illustrations and prices, of the whole range of transformers manufactured by the firm.

CALENDARS FOR 1930.

THE number of calendars which we always receive at this time of the year indicates that manufacturers are not unmindful of the valuable publicity which these useful publications afford. So far we have received calendars from: The D.P. Battery Co., Ltd., Bakewell, Derbyshire; Thomas Ballin and Sons, Ltd., Widnes, Lancs; Robert Hornby and Co., Ltd., 77, Dean Street, London, W.1; B. S. and W. Whiteley, Ltd., Pool-in-Wharfdale; Mr. Christopher Wade, of Richard Wade Sons and Co., Ltd., 32, Linden Road, Bedford; the Sun Electrical Co., Ltd., 118-120 Charing Cross Road, London, W.C.2; C. A. Parsons and Co., Ltd., Newcastle-upon-Tyne; the North Metropolitan Power Co., Ltd.; Mr. W. H. Squire, 31, Sweyne Avenue, Southend; the Enfield Cable Works, Ltd., 296, High Holborn, London, W.C.1; George Nobbs, Ltd., 89, Cleveland Street, London, N.W.1; Brown, Boveri and Co., Ltd., Waterloo Place, London, S.W.1; Metro-Vick Supplies, Charing Cross Road, London, W.C.2; the Mullard Wireless Service Co., Ltd., Charing Cross Road, London, W.C.2; Vereeniging van Directeuren van Electriciteitsbedrijven in Nederland, 1, Nachtegaalspad, Arnhem; Crossley Brothers, Ltd., Openshaw, Manchester; the Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, London, W.3; the Britain Electric Motors Co., Earldown Works, Dermody Road, London, S.E.13; and the Revo Electric Co., Ltd., Great Queen Street, Kingsway, London, W.C.2.

1930 DIARIES, ETC.

We have received during the last few weeks pocket and other diaries from the following:—Mr. Charles Selz, 47–49, New Cavendish Street, London, W.1; the Enfield Cable Works, Ltd., Brimsdown, Middlesex; the Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester; the Westinghouse Electric International Co., New York; Francis Polden and Co., Ltd., 56, Cannon Street, London, E.C.; the Electrical Power Engineers' Association, 102, St. George's Square, London, S.W.1 (also novelty pencil). A diary has also been received from the A.C.E.C., 56, Victoria Street, London, S.W.1, and a novelty desk lighter from British Insulated Cables Ltd., Prescot, Lancs.

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E.H.T. CONFERENCE.

Proceedings of Last Conference to be Published in Book Form.

SOME particulars have been received from M. Tribot-Laspière, the secretary of the Paris High-Tension Conference, 25 Boulevard Malesherbes, Paris, regarding the meeting that took place in June last, and the one which will take place in 1931.

It is a matter of congratulation that regarding the number of papers read at the last conference Great Britain took the second place with 17, coming after France with 27; being followed by the U.S.A. with 12, Switzerland 10, Italy 8 and Holland 8.

Political utterances three years ago made many people abroad think that our country was hopelessly out of date regarding electrical power matters; active participation in international conferences tend to advertise the country in question and neutralise such impressions.

The proceedings in three volumes in French, covering 2 400 pages, will be published shortly at 350 frs., paper covers, and 380 frs. bound. An English edition will be published at 58s. 6d. paper, and 63s. 6d. bound.

The proceedings form a well-printed mine of information, with a great deal of material regarding transmission lines, a subject of much interest at home at the present juncture.

A number of international committees are at work between conferences, including those dealing with insulating materials, transformer oils, oil switches, neutral earthing and line surges. The conference works in co-operation with the International Electrotechnical Commission.

Papers to be read at the next conference in June, 1931, should be forwarded as far as possible by the end of this year, and, therefore, within the next month or so, a number of engineers will start getting together notes to make the 1931 meeting as successful as was the last.

TYNESIDE ELECTRICITY.

Inquiry into Alleged Excessive Charges by Electricity Supply Companies.

AN inquiry was opened by Sir Harry Haward and Mr. W. W. Lackie, Electricity Commissioners, in Newcastle, on December 17th, in regard to demands by local authorities in surrounding districts for a reduction in the charges for electricity by the Newcastle-upon-Tyne Electric Supply Co., County of Durham Electrical Power Distribution Co., Northern Counties Electricity Supply Co., and Cleveland and Durham County Electric Power Co.

Mr. T. Rowland Harker, K.C., for the local authorities concerned, said the methods of charge adopted by the Newcastle company were methods not approved by the Ministry of Transport. In Newcastle the primary charge per unit was 5¾d. and in Hebburn 6d.

Sir George Lunn, giving evidence in support of the local authorities claims, said the worker in Jarrow paid 6d., while on the other side of the street, in South Shields, he paid 3½d.

Mr. Arthur Collins, adviser to the local authorities, said in 1921 it was the practice of all utility companies to put up their prices to meet the higher costs, but between January, 1921, and January, 1929, except for some minor alterations, the electricity charges of 1921 were maintained. The ratio of the companies' gross profits to capital outlay had risen from 4·9 in 1913 to 7·14 in 1928. Assuming that the present power prices stood, and after making provision for dividends, 3·269d. per kWh would, in his opinion, be a fair standard price for domestic lighting. A fair maximum price would be 4½d.

Mr. Robert Sloan, chairman and managing director of the Newcastle-upon-Tyne Electric Supply Co., maintained that the company's average price per unit was the lowest in the kingdom. Replying to Sir Harry Hawaid, Mr. Sloan said he thought the agricultural labourer was as well able to pay for electricity as a large number of consumers in the towns.

Mr. Harker argued that the real point to consider was that in practically every one of the typical cases which had been considered, the price was over 5d., and he considered it would be an unfortunate thing if the companies were to be left in a position to enable them to maintain such charges. The inquiry lasted four days.

As from Monday next the B.B.C. will transmit a daily Stock Exchange Report Service, via 5XX, at 9.15 p.m.

BRITISH INDUSTRIES FAIR.

Arrangements for Official Visits to the Electrical Section.

AS in previous years, arrangements have been made for a number of official visits to the electrical section of the British Industries Fair, which opens at Castle Bromwich, Birmingham, in February.

On February 20th, a luncheon will be attended by members of the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, the British Electrical Development Association, the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Association, the Municipal Tramways and Transport Association, and the Tramways and Light Railways Association.

A luncheon to the Electrical Power Engineers' Association will be held on February 22nd, with a conference in the afternoon.

On February 27th, a luncheon will be attended by members of the South Midland Centre of the Institution of Electrical Engineers, the Association of Consulting Engineers, the Association of Supervising Electrical Engineers, the Electrical Contractors' Association, the Electrical Contractors' Association of Scotland, the Electrical Wholesalers' Federation, Ltd., the Electrical Merchants and Manufacturers' Association, the Association of Mining Electrical Engineers, and the Illuminating Engineering Society. A conference of members of the Electrical Contractors' Association and Electrical Wholesalers' Federation will be held in the morning.

Electrical Exhibitors.

We give below a preliminary list of electrical exhibitors at Birmingham :—

Alpha Electrical Apparatus Co.; H. E. Ashdown,(Birmingham),; Ltd.; Allday and Co., Ltd.; W. and T. Avery, Ltd.; A1 Electric Welding Appliances Co.; Allen-Liversidge, Ltd.; Belling and Co. Berkeley and Young, Ltd.; Berry's Electric (1928), Ltd.; S. O. Bowker; Bull Motors, Ltd.; British Electrical Repairs; Bulpitt and Sons, Ltd.; British Thomson-Houston Co., Ltd.; Bakelite, Ltd.; Birmingham Electric Furnaces, Ltd.; British Sangamo, Ltd.; British Aero-Technical Co., Ltd.; P. M. Braidwood; Birmingham Electric Supply Department; Birkbys, Ltd.; British Brass Fittings, Ltd.; British Electrical Development Association; British Electric Transformer Co., Ltd.; S. G. Brown, Ltd.; G. Bray and Co.; British Hanovia Quartz Lamp Co.; Brown's Dryers, Ltd.; British Resistor Co., Ltd.; British Furnaces, Ltd.; Cambridge Instrument Co.; Clear Hooters, Ltd.; Jones, Chesterton and Co., Ltd.; R. M. Catterson Smith; Credenda Conduits, Ltd.; Cellon (Richmond), Ltd.; W. Canning and Co.; Chloride Electrical Storage Co., Ltd.; L. G. Coade and Co.; Commutator Grinding Block Co., Ltd.; Curtis Manufacturing Co., Ltd.; Callender's Cable and Construction Co., Ltd.; Donovan and Co., Ltd.; De La Rue and Co., Ltd.; G. Dunhill; Drayton Regulators and Instrument Co., Ltd.; Electrical Power Engineers' Association; Electrical Power Engineering Co. (Birmingham), Ltd.; G. Ellison, Ltd.; Edison Swan Electric Co., Ltd.; Electric Furnaces, Ltd.; G. Elliott; Ellmar Moulding Co., Ltd.; Ever-Ready Co. (Great Britain), Ltd.; Eastern Telegraph Co., Ltd.; Film Cooling Towers (1925), Ltd.; Fielding and Platt, Ltd.; Falk Stadelmann and Co., Ltd., and Stoves, Ltd.; General Electric Co., Ltd.; Gent and Co., Ltd.; Harland Engineering Co.; John Harper, Ltd.; Hackbridge Electric Construction Co., Ltd.; H. Hope and Sons; Hewittic Electric Co., Ltd.; Highfield Electric Co., Ltd.; Horstmann Gear Co., Ltd.; Hailwood and Ackroyd, Ltd.; Holden and Hunt; W. C. Holmes and Co., Ltd.; Ingram and Kemp; India Rubber, Gutta Percha and Telegraph Works Co., Ltd.; Chas. Joyner and Co., Ltd.; Jackson Electric Stove Co., Ltd.; Langbridge, Ltd.; A. P. Lundberg and Sons, Ltd.; R. A. Lister and Co., Ltd.; Moffatts, Ltd.; H. Marsh and Co.; P. A. Mudd and Co.; Metropolitan-Vickers Electrical Co., Ltd.; McGeoch and Co., Ltd.; Micanite and Insulators, Ltd.; Midland Fan Co., Ltd.; Oldham and Son, Ltd.; F. Parks, Ltd.; C. H. Parsons, Ltd.; Pritchett and Gold and E.P.S. Co., Ltd.; Parker, Winder and Achurch, Ltd.; Parkinson Stove Co., Ltd.; W. and B. Parkinson and Cowan, Ltd.; Petters, Ltd.; Premier Electric Welding Co., Ltd.; Restlight, Ltd.; Rainsford and Lynes; Ray Engineering Co., Ltd.; Revo Electric Co., Ltd.; A. Reyrolle and Co., Ltd.; Rapid Magnetting Machine Co., Ltd.; Ringsdorf Carbons, Ltd.; Record Electric Co., Ltd.; Ransomes, Sims and Jefferies, Ltd.; Sperryn and Co., Ltd.; Stuart Turner, Ltd.; Shropshire, Worcestershire and Staffordshire Electric Power Co., Ltd.; Sturge and Baker, Ltd.; Streetly Manufacturing Co., Ltd.; G. and J. Swingler, Ltd.; Star Vacuum Cleaner Co., Ltd.; Maiden Ostick, Ltd.; Sturtevant Engineering Co., Ltd.; Sutherland Meter Co., Ltd.; Smalls, Ltd.; Turners Asbestos Cement, Ltd.; Telegraph Construction and Maintenance Co., Ltd.; Thermo Path Co., Ltd.; J. H. Tucker and Co., Ltd.; Taylor and Challen; Bertram Thomas; Vac-Tric, Ltd.; Vitalite, Ltd.; H. Wiggin and Co., Ltd.; Wardle Engineering Co., Ltd.; Wild, Barfield and Co., Ltd.; Wm. Whitehouse and Co., Ltd.; Young, Osmond and Young, Ltd.

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ELECTRICITY SUPPLY.

Loans for Mains, Plant, etc.—Wokingham Objects to Overhead Lines—Bulk Supplies to Hampstead—New Power Station for Douglas—Expansion of Demand at Birmingham —No Contractors under Swansea Assisted Wiring Scheme.

WREXHAM T.C. has applied for a loan of £8 000 for mains and services.

Dover Electricity Committee seeks sanction to borrow a further £2 000 for mains.

The Electricity Commissioners have granted the East Grinstead Electricity (Extension) Special Order.

Walsall Electricity Committee is to extend mains in Camden Street and Dartmouth Avenue, at a cost of £600.

Hebden Bridge U.D.C. has applied for a loan of £3 000 for mains, services, and meters for a period of three years.

The Electricity Commissioners have sanctioned the borrowing of £78 000 by Battersea (London) B.C. for mains and services.

Bangor (Co. Down) B.C. received 90 applications up to December 3rd for supplies of electricity, and further applications were expected.

The Twickenham and Teddington Electric Supply Co. is to extend cables in Queen's Road and Burton's Road, Hampton Hill.

Warrington T.C. has applied for a loan of £1 716 for h.t. mains from Winwick to Croft, and the provision of a sub-station at the latter place.

Poplar (London) Electricity Committee seeks sanction to borrow £21 466 for services, £6 654 for meters, and £6 680 for wiring installations.

Preston Electricity Committee has decided that new consumers under the home tariff system must pay for a minimum consumption of 1 kWh per day, calculated over 12 months.

Hornsey Corporation has received sanction from the Electricity Commissioners to borrow £30 000 for mains and services.—The electricity department is to extend mains at a cost of £722.

The Irish Free State Ministry of Commerce has received a further application from the Antrim Electricity Supply Co. for consent to the placing of a h.t. line above ground to supply electricity at Randalstown.

The Brixham Gas Company is promoting a bill to authorise the company to extend the area in which it has the right to supply electricity, so as to include part of the urban district of Paignton at Broadsands.

Stoke Newington (London) Electricity Committee has received sanction to borrow £7 045 for mains and £8 235 for plant. The Committee is seeking sanction to borrow £5 000 for free wiring installations.

Burnley's gas and electrical engineers are submitting estimates for the improved lighting of the main road from Yorkshire Street to Belvedere Road and thence to Towneley tram terminus for an inclusive annual charge.

Shipley Electricity Committee has authorised the Engineer to arrange for the purchase of a 40 H.P. a.c. motor for hire to a consumer, and to lay 250 yards of cable, at an approximate cost of £230, in order to supply energy for driving the motor.

Uckfield R.D.C. is to ask the Ministry of Transport to rescind the powers of the Uckfield Gas and Electricity Co., with regard to the parishes of Buxted and Hadlow Down, in the event of the company not supplying electricity to the two villages within two months.

Bury St. Edmunds T.C. has decided, in order to provide labour for the unemployed, to carry out work in connection with the change over of a section of the area from d.c. to a.c., at a cost of £4 340, including switchboard, 100 kW rotary convertor, and 800 yds. of service cable.

Wokingham R.D.C. is recommended by the Town Planning Committee not to withdraw its opposition to the overhead lines proposed to be put up at Woodley, Berks, by the Thames Valley Electric Supply Co., Ltd., in spite of the Electricity Commissioners' request for such withdrawal.

The Irish Free State Electricity Supply Board has refused to lay underground cables in the streets of Carlow at present served by such cables, as requested by the U.D.C., on the ground that it is not an economic proposition. It has been decided to call a public meeting of protest.

Marylebone Electric Supply Committee recommends that subject to the sanction of the Electricity Commissioners, expenditure of the estimated sum of £34 915, in respect of cables and switchgear, be approved in connection with future bulk supplies to the Hampstead Borough Council.

Derby Electricity Committee recommends application to the Electricity Commissioners for sanction to borrow £77 398 to cover capital expenditure in 1928 and 1929. The committee also proposes to apply to the Unemployment Grants Committee for grants towards £24 100 to be spent upon electricity extensions.

Peterborough T.C. has applied for loans amounting to £26 000 for electricity purposes, made up of £4 000 for supply and distributing mains to give a supply to Stanground; £10 000 for replacements of old mains; £5 000 for changing over from d.c. to a.c.; and £7 000 for additions to coal-handling plant.

Barking U.D.C. has agreed with London County Council to give a supply of electricity to 1 414 houses proposed to be erected on the Barking section of the Becontree estate on terms previously agreed for another section of the estate. The Electricity Committee recommends that 2d. per kWh be charged for prepayment meter supplies.

The new power station at Pulrose, established by the Douglas (Isle of Man) T.C., was opened on December 20th by Alderman R. Corlett, J.P., chairman of the Electricity Committee. Alderman Corlett announced that the cost of the station, sub-stations, and new plant for the old station was approximately £75 000.

During November an additional 1 200 premises were connected to Birmingham Corporation's mains, involving an extra 12 000 lamps in the lighting section, and 1 500 H.P. in the power section. The total capacity of the motors now installed on consumers' premises and supplied from the Corporation's mains exceeds 330 000 H.P.

Morecambe Electricity Committee has instructed the electrical engineer to prepare a scheme for extending the electricity mains to an area situate off Lancaster Road, embracing Croft Street, Dudley Street, Buxton Street, Maylands Square and Hope Street. The scheme is to be submitted to the Unemployment Grants Committee for approval for grant in aid of the works.

Hammersmith (London) electricity department is to give an additional supply to the Duramin Engineering Co., Ltd., at Hythe Road, amounting to 25 H.P., for which a h.t. main is to be laid from the Hythe Road sub-station to a new sub-station on the company's premises. The department is to carry out mains extensions in Bradmore Grove and Chancellor's and Wellington Roads, at an estimated expenditure of £486.

Ilford Electricity Committee has authorised the Borough Electrical Engineer to report in reference to the provision of electric mains in connection with the Loxford Estate development. The Committee has received sanction to borrow £50 000 for mains and services, and is seeking sanction to borrow £9 700 in respect of sub-station plant.

Swansea Electricity Committee has arranged terms for a supply of electricity to the Mannesmann Tube Co., Ltd., which is to instal further electrical plant.—The Borough Electrical Engineer has reported to the Electricity Committee that installation contractors in the borough have requested permission to carry out the installations under the assisted wiring scheme, but the Committee has decided that for the time being the work be carried out by the electricity department.

Bexhill Electricity Committee is to construct a sub-station near Mount Idol Farm at a cost of £2 757; extend cables from Broadoak Lane at a cost of £1 635; provide a l.t. feeder from the proposed sub-station to a feeder pillar, £1 471, and provide distributor cable from the proposed sub-station to the junction of Watermill Lane, £353.—On the half year's working of the electricity department ended September 30th last there was a loss of £4 426, compared with a loss of £2 345 for the corresponding period last year.

Worcestershire County Highways Committee has received notices from the Central Electricity Board asking consent to the placing of overhead 132 000 V cables in several parts of the county, for the purpose of the Central England electricity scheme, and enquiring whether the Council desires to be heard by the Minister of Transport in connection with these applications. The committee has informed the board that it is unable to advise the Council to consent to the erection of the overhead cables referred to in the county.

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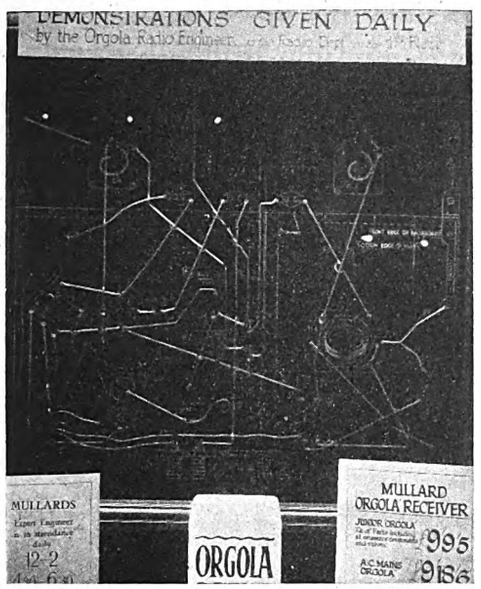
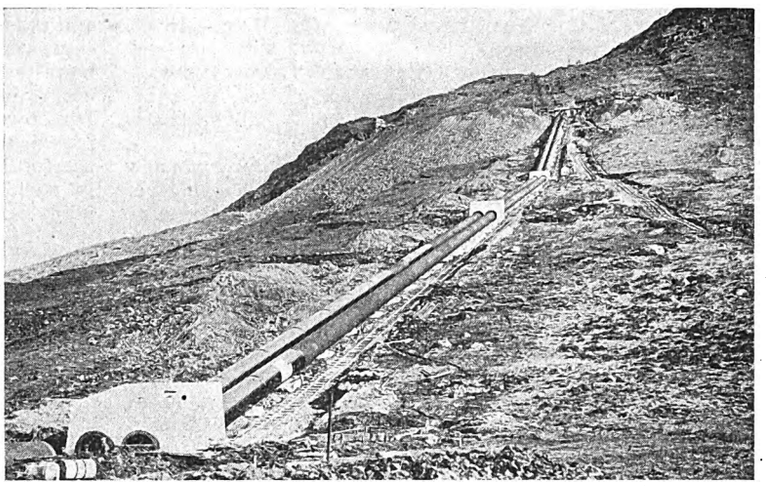
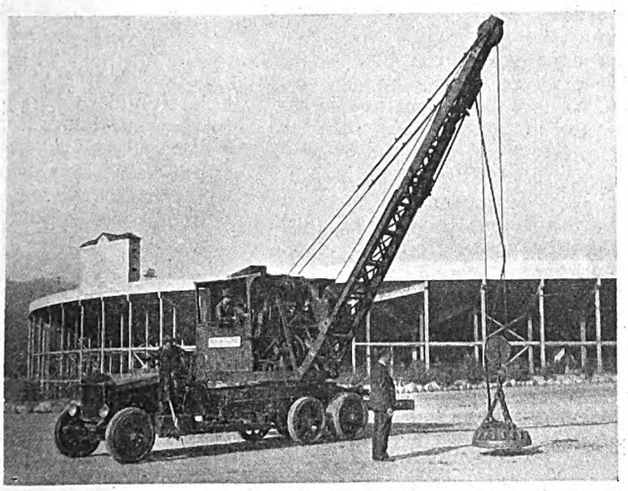
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



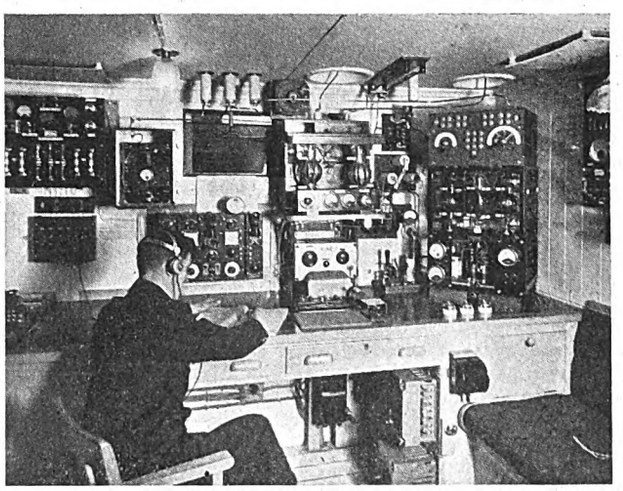
A novel window display seen at a London store. The wiring diagram represents the back-of-panel arrangement of the Mullard "Orgola" receiver, and the connections are made with glass tubes, filled with different coloured liquids to indicate the various circuits.



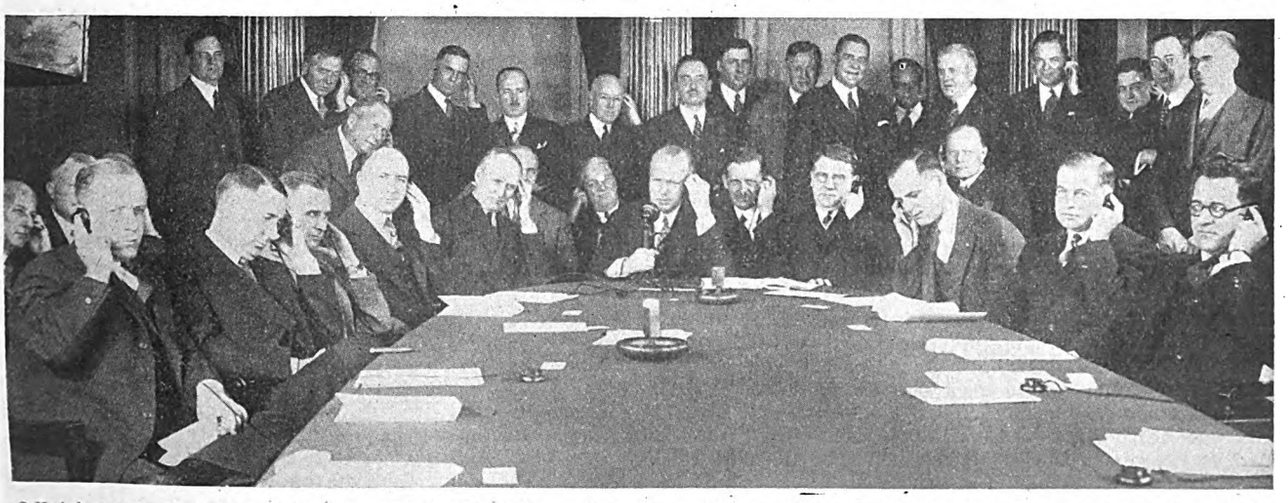
The 16-mile tunnel bored through Ben Nevis in connection with the Grampian electricity scheme is nearing completion, and orders will soon be given to blast the last few tons of rock, which will release the waters of Loch Treig through the tunnel to Inverlochy, near Fort William. This picture of the Fort Wlliiam end of the works shows the junction of the tunnel and the pipe lines leading to the power station.



In order to eliminate traffic difficulties due to burst tyres when the Rose Bowl at Pasadena, Cal., is emptied of its thousands of motor-cars following the annual East *v.* West football match on New Year's Day, the city authorities clear the ground of nails, etc., by means of a large portable electro-magnet.



Marconi equipment on the "Discovery II," the Royal research ship now proceeding to the Antarctic for three years. The apparatus will enable the vessel to keep in direct communication with this country throughout the whole period of the expedition, both medium and short wave transmitters being provided.



Officials of the American Telephone and Telegraph Co. and the United States Shipping Line in the offices of the A. T. and T. at New York on the occasion of the inauguration of the ship-shore public telephone service in America. This picture, which is among the first to reach this country, shows Mr. Walter S. Gifford, President of the A. T. and T. in the centre at the head of the table, holding conversation with the Commander of the s.s. "Leviathan" in mid-Atlantic.

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COMPANY NEWS.

Perak Hydro-Electric Project—American Power Merger—Adjournment of Baird Television Meeting—Allen West and Co's Increased Continental Trade.

ELECTRIC AND GENERAL INVESTMENT CO., LTD.—Intm. div. of 5% is announced.

YORKSHIRE (WEST RIDING) ELECTRIC TRAMWAYS CO., LTD.—Fin. div. in respect of half-year ended Dec. 31, 1929, on 6% cum. pref. shs. of 3% (at rate of 6% p.a.) has been declared.

SYDSVENSKA KRAFTAKTIEBOLAGET.—At this company's new Karseforsen hydro-electric power station on the Lagen river a 16 500 kW set has been started, and another unit of the same capacity will soon be completed.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Divs. of 3% on pref., plus further 3% participatn. (same as last year), and 3% on ord. (same), will be payable on Jan. 15. Earngs. for qrtr. ended Sept. 30, before provisn. for taxatn., £318 468, agst. £298 169.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Div. on 7% cum. participatg. pref. shs. for year ended Dec. 31, 1929, at rate of 7%, being 1s. 4·8d. p. sh., less tax (coupon 38), is payable at the head office of the company, Marconi House, Strand, London, W.C.2. Coupons to be left four clear days.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—A mtg. will be held on Jan. 10 to consider a resolution to alter the articles of association so as to comply with the new Companies Act, and to secure that the control of the company shall remain in the hands of British subjects, by restricting the holdings of foreign shareholders to 20% of the whole sh. cap.

WEST INDIA AND PANAMA TELEGRAPH CO., LTD.—Mtg. to consider revisn. of articles of association will be held on Jan. 20. Proposed amendmts. are intended to secure that only British subjects can be appointed directors of the company, except any director who is on the Board of Cables and Wireless, and that not more than 25% (nom. value) of the issued amt. of any class of shs. shall at any one time be under foreign control.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD.—Rpt. to July 31, 1929, states that steam statn. has been in operatn. since Dec. 12, 1928, and has given satisfactory and increasg. supply of power. Erection of 6,000 kW extensn. of steam statn. (makg. 18 000 kW installed) has bn. completed, and plant in now in operatn. In constructn. of hydro-electric statn. good progress has been made, and final sectn. of dam is now under constructn.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—Receipts for year ended March 31, £53 495, includg. £33 902 from subsidiaries. Eleven companies made pfts. aggregatg. £235 596, while two made losses amtg. to £19 838. Tradg. of the group shows pft. £215 758, agst. £148 379. Deductg. maintenance, depreciatn., taxatn., int., etc., leaves £33 968, agst. £53 945. Combined accts. of parent company and subsidiaries show surplus of assets over liabilities, £2 477 492.

AMERICAN POWER MERGER.—It is reported from New York that it is proposed to transfer the present assets of the Standard Power and Light Corporation (which include over 94% of the common stk. of the Philadelphia Co.) to the Standard Gas and Electric Co. The Standard Power and Light Co. will acquire a majority of the common stk. of the Standard Gas and Electric Co., which will be the sole votg. stk. of that company. The Standard Gas and Electric Co. is one of the largest public utility undertakings in the United States, serving a total of 1 554 communities.

COMPAÑIA HISPANO-AMERICANA DE ELECTRICIDAD S.A.—Coupon B 10 of the income bonds issued by the company is to be paid in advance. As from Jan. 2, 1930, these coupons are payable as follows: Coupon of bonds which have been converted into Argentine paper pesos will be paid at rate of 6·75 paper pesos p. coupon or equivalent at sight rate on Buenos Aires ruling on day on which paymt. is effected, and coupon of bonds which have not been converted into Argentine paper pesos will be paid at rate of Ptas. 15 p. coupon, or, in foreign countries, equivalent, at sight rate on Madrid ruling on day on which paymt. is effected.

BRITISH RADIOSTAT CORPORATION, LTD.—A statement, issued to comply with the requirements of the Stock Exchange, contains the following information: Company was incorporated in Canada on Oct. 24, 1929, to acquire plant, patents, etc., of "Stenode Radiostat" Inventions, and to carry on business of wireless, electrical, cable, communication and allied concerns; authorised cap., 1 000 000 shs., and issued and paid up, 953 000 shs. of no par value. The directors are empowered to borrow money and obtain advances from any bank or banks, etc., at such times and in such sums as they may think necessary, with the consent of six of the directors. Directors' remuneratn. is to be $2 400 p.a., divided so that the president receives two shs. and each other director one sh. of the total, plus 5% of the net pfts., divided amongst directors in such manner as they may determine. Particulars are given of contracts which have been entered into.

Company Meetings.

BAIRD TELEVISION DEVELOPMENT CO., LTD.—At the recent general meeting it was decided to adjourn the meeting until a date in February, to avoid any possibility of prejudicing pending negotiations for the amalgamation of Baird International Television and the Baird Television Development Co. Notice will be sent in due course to shareholders announcing the date of the adjourned meeting.

CEARA TRAMWAY, LIGHT AND POWER CO., LTD.—Mr. E. H. R. Trenow, presiding at the meeting on December 23rd, said the net operating receipts for the year ended June last were 33 012 milreis in excess of those of the previous year, in spite of motor omnibus competition. To meet this competition the company had acquired and put into operation 14 motor omnibuses, which were running as a counter to those opposing the tramways. Though the tramway receipts had suffered from the cause mentioned, the falling off had been more than offset by economies in operation and by the increase in earnings of the power supply section of the company. It had been decided to instal a complete new turbo-generating unit, and they were hoping to be able to add this to their assets without making an addition to their capital. During the last five years they had spent over £86 000 on capital account without any increase in capital liabilities. During that period they not only did not increase their capital, but cancelled £50 000 of debenture debt. The report was adopted, and a dividend of 5% on the ordinary shares was approved.

ALLEN WEST AND CO., LTD.—Mr. A. E. L. Slazenger, presiding at the recent annual meeting, said since the date of their last balance sheet they had become a public company and increased their capital to £500 000 by the issue of 200 000 7% participating preference shares and by the distribution of £130 333 out of the capital reserve of £157 982 to the ordinary shareholders by the allotment of 130 333 ordinary shares of £1 each. £27 443 ordinary shares were issued for the purpose of acquiring the whole of the ordinary and deferred shares in Electric Control, Ltd., and 500 ordinary £1 shares issued for cash at £2 per share. The net profits amounted to £29 291, as compared with £24 224 in the previous year. The amount invested in subsidiary companies had been increased from £30 493 to £61 157, due to the continued growth of the business secured by these companies, and, in view of their successful operation, it was the intention of the directors to carry out a similar policy in other overseas markets. Orders in hand were two-and-a-half times as large as at the date of the last balance sheet, notwithstanding the largely increased output which had been obtained. This increase was mainly in export business, where, contrary to the experience of the large electrical companies, better prices had been obtainable than in the home market. During the year the whole output of the company's new products had been sold on the Continent, as, owing to the rapid increase of the Continental demand, it had been impossible to allot any output to the home market. In view of this, the directors had bought the Government factory at Woolston and 83 acres of freehold land. With the removal of the heavier products to Woolston, the output of lighter repetition work could be accelerated in the present factories to cope with the increasing demand. They looked forward to the future with the greatest confidence, in view of the increasing recognition of the quality of the company's products by important users both at home and overseas. The report was adopted and the following dividends were approved: 8% on ordinary shares for 12 months ended July 31st, 1929, and a further dividend at the rate of ⅛% per annum for six days on the preference shares, to be paid at the same time as the first half year's preference dividend.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BARRY, J., 370, Kingsland Road, electrical engineer. £15 14s. 2d. October 28th.

HOLLAND, Mr. E. A., Station Street, Kirkby-in-Ashfield, wireless dealer. £13 14s. 4d. October 30th.

JEM RADIO CO., 55, Fishergate, York, radio engineers. £10 16s. 4d. October 30.

MODERN ELECTRICAL DEVELOPMENT SUPPLY CO., LTD., electrical contractors, 185, Hammersmith Road, W. £18 16s. 5d. November 15th.

POLLOCK BROS., Royston Works, Upper Richmond Road, Putney, electrical engineers. £41 6s. 6d. October 29th.

SOUTH ESSEX ELECTRIC CO., 30, London Road, Romford, dealers. £29 15s. 4d. October 3rd.

THOMAS, H. C., Wireless Depot, Bellevue, Tenby, wireless dealer. £15 8s. 9d. October 30.

TRESMAN AND TRESMAN, 51, Leyspring Road, E., wireless dealers. £10 4s. 4d. October 30th.

Bills of Sale.

THURSTON, William Thomas, Stanley, 6, Creswold Street, West Bromwich, electrical engineer. Dated December 19th, filed December 23rd. £50.

WASSELL, Frederick William, Belgrave House, Belgrave Drive, Whitby, electrical engineer. Dated December 18th, filed December 17th. £35.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BOWYER-LOWE CO., LTD., London, W.C., electricians.—Registered December 17, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *Nil. August 14th, 1929.

BRITISH HORO-ELECTRIC, LTD., London, E.C. Registered December 12th, agreement as to further advance securing £1 000, to A. Bingguely, 77, Rue du Nord, La Chaux-de-Fonds, banker; general charge. *£2 000. December 31st, 1928.

CLARK AND MOIR, London, S.E., wireless factors. Registered December 4th, series of £5 000 debentures, present issue £500; general charge. *Nil. July 6th, 1929.

"M. P. A." WIRELESS, LTD., London, W.—Registered December 19th, £3 600 debentures, part of £35 000 and bonus of 12½%; general charge.

WILKINSON (THOMAS) (ARNSIDE), LTD., electrical engineers.—Registered December 17th, £2 500 equitable mortgage, to Martins Bank, Ltd.; charged on property at Arnside. *£9 721. October 21st, 1929.

Satisfactions.

GENERAL ELECTRIC CO., LTD., London, W.C. Satisfaction registered December 12th, £232 580, part of amount registered. July 26th, 1921.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD., London, E.C.—Satisfaction registered December 13th, £3 595, part of amounts registered July 11th, 1905, and June 20th, 1907.

PETERSFIELD ELECTRIC LIGHT AND POWER CO., LTD.—Satisfactions registered December 17th, £5 000 (not ex.) registered August 14th, 1924, and all moneys, etc., registered August 15th, 1925.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

SMITH (B.) and EVANS (B. I.), trading as RADIDYS, wireless retailers, 841, Fulham Road, London, S.W.6. A meeting of the creditors of the above was held on December 23rd at the offices of Percy Phillips and Co., certified accountants, 132, Great Portland Street, W.1, when a statement of affairs was presented which showed liabilities of £427. Of that amount £412 was due to the trade and £15 to creditors for expenses. The assets (including book debts £7, and stock at cost £207, valued at £100) totalled £133, less £16 preferential claims, or a deficiency of £310. It appeared that the debtors commenced business in July last, the debtor Evans putting in £350 cash and £50 worth of goods. The debtor Smith brought a motor-car into the business, on which he had paid £100 under a hire purchase agreement, and stock amounting to £216. Against that he had trade creditors and a bank overdraft amounting to £266, which the partnership concern took over. His net capital was therefore £50, and the total partnership capital was £450. The deficiency was accounted for by depreciation of stock £107, of fixture and fittings £105, of motor-car £152, loss on trading £236, and salaries of the debtors £8 a week. The debtors stated that the present position was due to the fact that the shop was not situated in the right quarter and the trade had been very bad indeed. The takings had never been more than £20 a week. One of the debtors said that they had tried to keep up the prices of their stock, but they were handicapped owing to the fact that there were several wireless shops in the vicinity where the prices were cut, and in some cases goods were sold by the competing firms at less than the debtors could purchase.

An offer was made of 4s. in the £, in cash, but the creditors considered that the offer should be increased to one of 5s. in the £, in cash, payable within seven days. Mr. Durs, representing Brahams, Ltd., who were creditors for over £200, said that he had no instructions to bind his clients in any composition arrangement, but he would report the result of the meeting to them and let the accountant know the course they wished to take in the matter. The following are creditors: Brahams, Ltd., £205; Sacks, Alfred, £103; Oldhams, Ltd., £36; Callenders Cable Co., £28; Formo, Ltd., £16.

London Gazette, etc.

Company Winding-up.

IDEAL WIRELESS CO., LTD., Dorland House, 14, Regent Street, S.W.1. Meetings of creditors, January 9th, 11.30 a.m., and contributories, 12 noon, 33, Carey Street, Lincoln's Inn, London, W.C.2.

Company Winding-up Voluntarily.

BUILTH WELLS ELECTRIC SUPPLY CO., LTD. By special resolution December 20th. H. Ashton, Victoria Hall, Llandrindod Wells, corporate accountant, appointed as liquidator.

Notice of Intended Dividend.

TATTERSALL, John Harold Barlow, 456, Burnley Road, Scout Bottom, Waterfoot, Lancashire, trading as H. TATTERSALL. plumber and electrician. Last day for receiving proofs, January 8th. Trustee, J. D. Turner, Byrom Street, Manchester, Official Receiver,

Order Made on Application for Discharge.

HURLES, Edward James Gordon, 8, Blackfriars Road, London, S.E.1, wireless dealer. Discharge suspended for two years until November 29th 1931.

Partnership Dissolved.

STUBBINGS AND ROE (John William STUBBINGS and Arthur Eric ROE), motor, electrical and general engineers, 160, London Road, Nottingham, as from September 30th, 1929. Debts received and paid by A. E. Roe, who will continue the business under the style of The London Road Garage, Nottingham.

METAL AND CHEMICAL PRICES.

		TUESDAY, December 31st. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£74 10 0	—	15s.
Electro Wirebars	,,	£83 10 0	—	—
H.C. Wires, basis	per lb.	11⅝d.	¹⁄₁₆d.	—
Sheet	,,	11¹³⁄₁₆d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛d.	¹⁄₁₆d.	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 5 0	—	—
Foreign or Colonial	,,	£21 12 6	—	2s. 6d.
Tin—				
Ingot	per ton	£175 5 0	—	£4 15s.
Wire, basis	per lb.	2s. 4½d.	—	¼d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 15 0	—	7s. 6d.
Mercury	per bottle	£23 0 0	—	—

Sulphur—Flowers, Ton £12 0 0; Roll, ,, £10 10 0. *Copper Sulphate* .. Ton £25 to £25 10 0. *Boric Acid* (Crystals) ,, £23 0 0. *Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0. *Sodium Chlorate*—Per lb., 2¼d. *Sodium Bichromate*—Per lb., 3¼d.

Rubber—Para fine, 8¼d.; plantation, 1st latex, 7⅛d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

319 713 Standard Telephones and Cables, Ltd., J. H. E. Baker, E. P. G. Wright and A. H. Cameron. Automatic or semi-automatic telephone systems. (27/6/28.)
319 716 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale and R. Taylor. Telephone systems. (27/6/28.)
319 819 T. A. W. Robinson. Variable-capacity electric condensers. (28/6/28.)
319 823 A. S. Cachemaille (Westinghouse Lamp Co.) Vacuum electric tube devices. (28/6/28.)
319 825 C. E. Fry. Trip or cam mechanism, particularly applicable to prepayment devices for use with electric meters. (29/6/28.)
319 826 C. E. Fry. Prepayment devices for use with electric meters or the like. (29/6/28.)
319 827 C. E. Fry. Release mechanism, particularly for use with electric meters, remote release switches, or the like. (29/6/28.)
296 979 Electrical Research Products, Inc. Manufacture of loaded conductors. (10/9/27.)
293 308 Electrical Research Products, Inc. Electro-optical transmission systems. (2/7/27.)
319 833 W. H. Armistead. Automatic salmon-lift. (3/7/28.)
319 834 General Electric Co., Ltd. and W. Wilson. Electric power-supply apparatus. (3/7/28.)
319 835 English Electric Co., Ltd. and G. Schroeder. Performance on short circuit of rotary convertors and direct-current dynamos. (3/7/28.)
319 837 Siemens Bros. and Co., Ltd. and W. E. Goodwin. Electrical connectors. (3/7/28.)
293 423 Soc. Anon. des Etablissements L. Hatot. Electric time-pieces. (6/7/27.)
319 849 J. A. Reavell. Electrically-heated apparatus for evaporating, distilling, and the like. (6/7/28.)
307 819 Telefonaktiebolaget L. M. Ericsson. Electric excess-supply meters. (14/3/28.)
319 851 Santon, Ltd. and H. C. Sanders. Electric plug-and-socket devices. (10/7/28.)
319 854 J. Y. Johnson (I. G. Farbenindustrie Akt.-Ges.). Manufacture and production of magnetic cores of high permeability. (14/7/28.)
319 858 C. P. Seckham. Junction-boxes for electric cables. (18/7/28.)
319 861 Burovox, Ltd., S. C. Winfield-Smith and W. P. Fraser. Electrical switches. (19/7/28.)
294 481 International General Electric Co., Inc. Circuits of ignition and lighting generators. (21/7/27.)
310 867 R. Frister Akt.-Ges. Electrically-heated vessels provided with covers (2/5/28.)
319 877 L. H. A. Carr and Associated Electrical Industries, Ltd. Electric potential regulators. (2/8/28.)
319 884 Siemens-Schuckertwerke Akt.-Ges. and E. Willie. Armoured cables. (17/8/28.)
296 314 Siemens and Halske Akt.-Ges. Electric discharge devices. (27/8/27.)
296 784 E. S. Ali-Cohen. Construction of high-tension electric cables. (8/9/27.)
319 915 M-L Magneto Syndicate, Ltd. and E. A. Watson. Permanent magnets. (14/9/28.)
319 922 F. C. Fahy, W. H. Wilkinson and J. W. Parkinson. Electric switches. (21/9/28.)
319 929 T. L. Rimmer. Electrical heaters. (24/9/28.)
299 767 Siemens and Halske Akt.-Ges. Multiple-signal transmission systems with echo eliminators. (31/10/27.)
319 938 Burnley Components, Ltd. and D. K. Ward. Thermal cut-outs for electrically-heated receptacles. (5/10/28.)
298 896 S. Von Bogdandy and L. Wamoscher. Mercury-vapour lamp. (15/10/27.)
319 942 J. I. Bernard. Loud-speaker telephone instruments. (10/10/28.)
319 943 H. H. Thompson and A. E. Davies. Magnetic separating-machines. (11/10/28.)
300 510 International General Electric Co., Inc. Methods of protection of electric conductors. (11/11/27.)
319 984 A. Warwick, J. A. A. Taylor and H. C. Holmes. Systems of distributing electrical signals. (16/11/28.)
319 985 A. J. Curnow. Fire-alarms. (17/11/28.)
300 971 Longsign Corporation. Electric signs. (21/11/27.)
301 918 Ateliers Vaucanson and P. Marchal. Electric starting-apparatus for motor-vehicle or other engines. (8/12/27.)
320 001 S. Moss. Electric variable condensers. (10/1/29.)
320 003 H. A. Gill (Deutsche Telephonwerke und Kabelindustrie Akt.-Ges.). Switch-points for pneumatic tube conveying systems. (17/1/29.)
304 600 Koch and Sterzel Akt.-Ges. Alternating-current rectifiers. (21/1/28.)
305 029 International General Electric Co., Inc. Machine drives by means of electric motor and back-pressure turbine. (28/1/28.)
320 005 H. A. Gill (Deutsche Telephonwerke und Kabelindustrie Akt.-Ges.). Closures for pneumatic tube conveying systems. (29/1/29.)

Applications for Patents.

September 20th.

28 553 R. Ambronm. Calibration and control of a.c. compensation apparatus. (5/12/28, Germany.)
28 574 Associated Electrical Industries, Ltd., and J. Etchells. Electric switches for train lighting, etc.
28 563 R. S. C. Ball and H. Heather. Electric driving mechanism for signs, etc.
28 605 Electrical Research Products, Inc. Electromagnetic devices. (19/12/28, U.S.)
28 598 H. G. Furlong and W. H. Murad. Electromagnetic pick-ups, microphones, etc.
28 571 General Electric Co., Ltd., and N. F. T. Saunders. Electric motors.
28 495 J. H. Hewitt and Wilkins and Wright, Ltd. Electric switches.
28 615 G. D. L. Horsburgh, H. S. Levick, and S. Levick and Sons, Ltd. Electric radiators, etc.
28 608 L. H. M. Huydts. Measuring arrangement for electric potentials, etc. (21/9/28, Holland.)
28 620 Marconi's Wireless Telegraph Co., Ltd. Oscillation generating and modulating systems. (23/3/28, U.S.)
28 618 H. J. Norballi. Automatic speed regulation of d.c. motors.
28 625 R. T. Norton and J. E. Stewart. Fittings for making multiple connections to aerial lines.
28 609 Siemens-Schuckertwerke Akt.-Ges. Protection of a.c. machine. (22/9/28, Germany.)
28 528 W. J. F. Smith. Incandescent lamp socket. (29/10/28, Australia.)
28 505 A. M. Taylor. Electric power transmission.
28 548 Telehor Akt.-Ges. Television apparatus, etc. (5/1/29, Germany.)
28 549 Telehor Akt.-Ges. Television apparatus, etc. (16/1/29, Germany.)

September 21st.

28 690 Associated Electrical Industries, Ltd., and E. Y. Robinson. Grid electrodes of vacuum electric tube devices.
28 664 C. R. G. Cosens. Alternating current galvanometer device.
28 644, 28 645, 28 646 Ericsson Telephones, Ltd. Totalisators.
28 697 C. Lorenz Akt.-Ges. Electric circuits. (22/9/28, Germany.)
28 642, 28 648 Mather and Platt, Ltd., F. Whipp and Whipp and Bourne, Ltd. Electric switches.
8 654, 28 655, 28 657 J. H. Reyner. Electric amplifiers.
28 656 J. H. Reyner. Audio frequency inductances.
28 678 A. Ristow. Method of calling wireless stations. (17/9/29, Germany.)
28 687 L. Spangler. Braking apparatus for electric motor vehicles. (27/9/28, Austria.)
28 633 P. D. Tyers. Electric pick-ups.

September 23rd.

28 824 Akt.-Ges Brown, Boveri et Cie. Selective relays.
28 780 A. Massey, Allen, and North and Sons, Ltd. Ignition switch devices.
28 814 Associated Electrical Industries, Ltd. Printometers.
28 774 P. Carlberg. Electrical resistance furnaces.
28 842 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Smoothing d.c. ripple.
28 813 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Ceiling rosettes.
28 701 J. D. and W. E. Doyle. Dynamo-electric machines.
28 751 Ferranti, Ltd., and G. L. Porter. Resistances for alternating current.
28 715 A. Graham and Co., Ltd., and W. Stott. Microphones.
28 815 Heraeus Vacuumschmelze Akt.-Ges., and H. Hiemenz. Electric furnaces.
28 801 M. S. Hoban and Kolster-Brandes, Ltd. Permanent magnets.
28 787 G. D. L. Horsburgh, H. S. Levick and Levick and Sons, Ltd. Permanent magnets.
28 813 L. Mellersh-Jackson (Siemens-Schuckert Akt-Ges.). Apparatus for setting submarine mines.
28 802 Kolster-Brandes, Ltd. Remote control of broadcast receiving apparatus. (3/10/28, U.S.)
28 771 M. Lewis. Electric light fitting for hand bags, etc.
28 719 Lodge-Cottrell, Ltd. (Metallges Akt.-Ges.) Electrical cleaning of furnace gases.
28 837 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.) Submarine signalling cables.
28 863 Western Electric Co., Ltd. (B. M. A. Trebes.) Manufacture of submarine cables.
28 864 Western Electric Co., Ltd. (J. F. Wentz.) Manufacture of submarine cables.
28 804 F. Wilkens. Cable laying.

September 24th.

28 946 Allgemeine Elektricitats Ges. Electricity meters. (29/9/28, Germany.)
28 934 Allmanna Svenska Elektriska Aktiebolaget. Operating mechanism for circuit breakers. (26/9/28, Sweden.)
28 887 R. Bosch Akt.-Ges. Heating elements. (6/10/28, Germany.)
28 935 British Thomson-Houston Co., Ltd. Suppressing corona. (24/9/28, U.S.)
28 936 British Thomson-Houston Co., Ltd. Volume control apparatus. (26/9/28, U.S.)
28 948 C. R. Brown. Electric megaphones.
28 985 A. Carpmael (I.G. Farbenindustrie A.G.) Electric blasting fuses.
28 990 Electrical Research Products, Inc. Frequency changer systems. (1/10/28, U.S.)
28 991 Electrical Research Products, Inc. Glow discharge devices. (25/3/29, U.S.)
28 897 Forest City Electric Co., Ltd. Street traffic signals.
28 915 F. G. Harris, J. Lucas, Ltd., and W. C. Turner. Magneto-electric machines.

COMING EVENTS.

Friday, January 3rd.

Institution of Mechanical Engineers.—Storey's Gate, Westminster, London, S.W. Thomas Lowe Gray lecture by Eng. Vice-Admiral Skelton on "Progress in Marine Engineering." 6 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London. Paper by Messrs. J. G. Wellings and C. G. Mayo on "Instrument Transformers." 7 *p.m.*

Monday, January 6th.

Institution of Electrical Engineers (Mersey and North Wales-Liverpool-Centre.)—University, Brownlow Street, Liverpool. Lecture by Mr. S. S. A. Watkins on "Talking Films." 7 *p.m.*

Tuesday, January 7th.

Electrical Association for Women (Bristol and District Branch).—Electricity Showrooms, Colston Avenue. Cookery Demonstration by Miss G. Edbrooke. 3 *p.m.*

Electrical Power Engineers' Association.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Miss C. Haslett on "The Place of Women in the Electrical Industry." 7.15 *p.m.*

Electrical Society of Glasgow.—30, Gordon Street. Paper by Mr. T. Ingram Craig on "The Electric House." 7.30 *p.m.*

Television Society.—Engineers' Club, Coventry Street, Piccadilly Circus, London. Lecture by Mr. W. S. Newton on "Photographic Problems of Picture Telegraphy." 8 *p.m.*

Tuesday, January 7th—Thursday, January 9th.

Physical and Optical Societies.—Imperial College of Science and Technology, South Kensington. Twentieth annual exhibition of electrical. optical and other physical apparatus.

Wednesday, January 8th.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting 5.30 *p.m.*

Electrical Contractors' Association (Eastbourne Sub-Branch).—South Street. Ordinary meeting.

Institution of Railway Signal Engineers.—Institution of Electrical Engineers, Victoria Embankment, London. Paper by Mr. H. H. Dyer on "Some Further Electrical Details of the Bow Road—Barking Signalling." 6 *p.m.*

Institute of Fuel.—Chemical Society, Burlington House, Piccadilly, London. Paper by Mr. O. Kubalek on "Fuel Economisers, with Special Reference to Their Construction, Materials and Recent Developments." 6 *p.m.*

Thursday, January 9th.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Paper by Messrs. T. W. Ross and H. G. Bell on "Recent Developments in the protection of Three-Phase Transmission Lines and Feeders." 6 *p.m.*

Institution of Electrical Engineers (Dundee Sub-Centre).—University College. Paper by A. F. Stevenson on "Cable Design." 7.30 *p.m.*

Friday, January 10th.

Institution of Electrical Engineers (North-Western Centre).—Free Trade Hall, Manchester. Faraday Lecture by Captain P. P. Eckersley on "Broadcasting by Electric Waves." 7.30 *p.m.*

Junior Institution of Engineers.—30, Victoria Street, Westminster, London, S.W. Paper by Mr. H. J. N. Riddle on "The Track Circuit in Railway Signalling." 7.30 *p.m.*

Saturday, January 11th.

Association of Mining Electrical Engineers (South Wales Branch).—Paper by Mr. S. T. Richards on "Electricity in Mines—First Aid."

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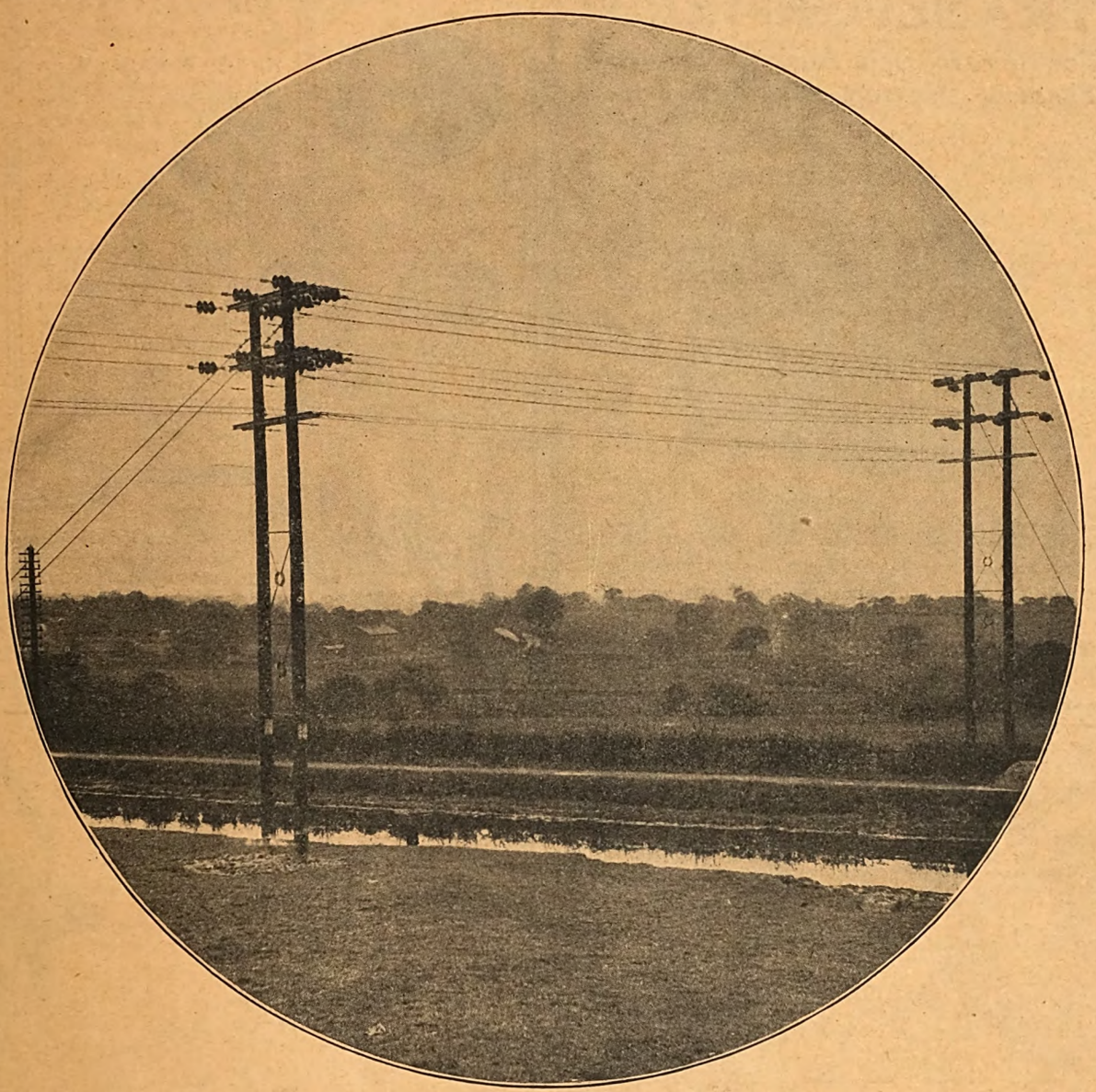
THE ELECTRICIAN

Vol. CIV.—No. 2693. Friday, January 10, 1930. [Registered at the General Post Office.] Sixpence



In the Trent valley

A view at the crossing of the canal and the G.P.O. telegraph lines at Hawk Green, near Marple, Cheshire, of the 33 K.V. Overhead Line erected in the Trent valley.

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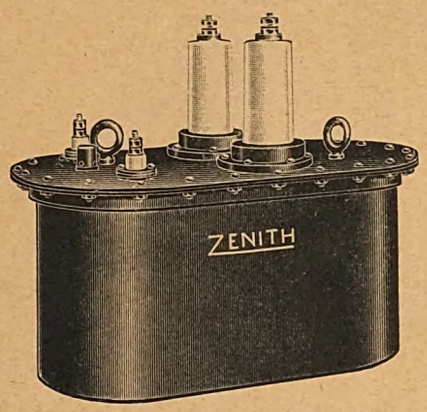

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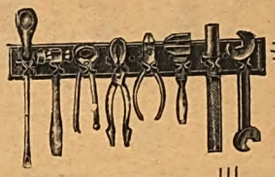

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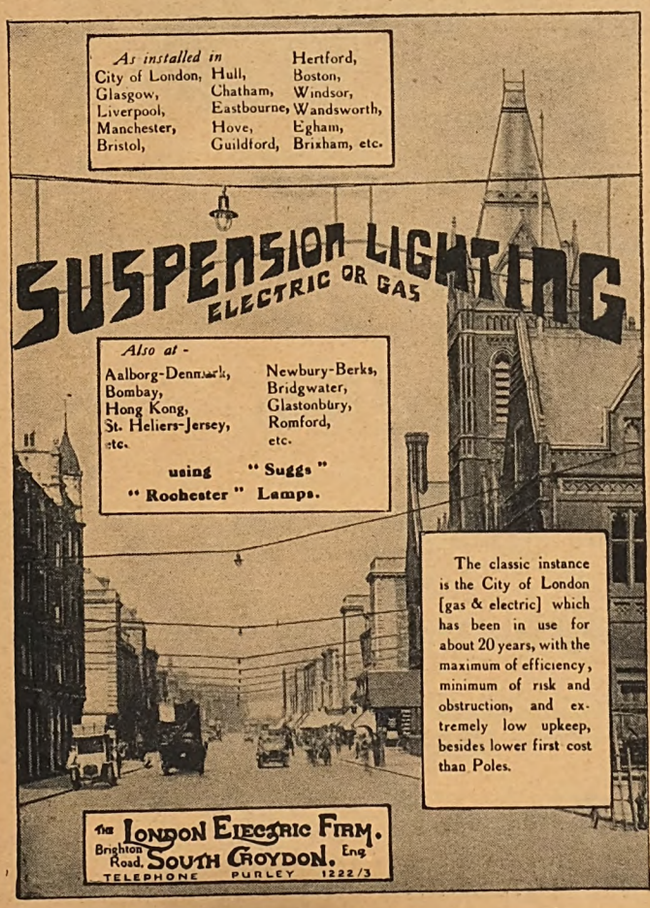

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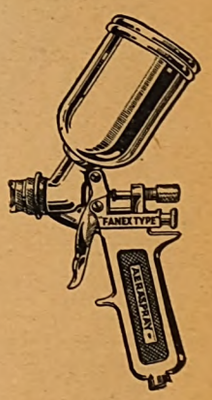

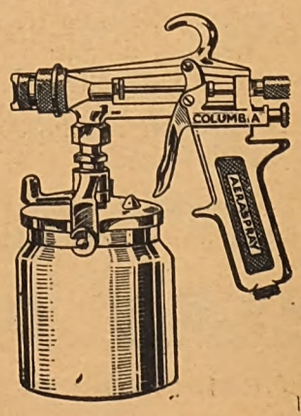

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[The offices of THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.]*

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The Index to Vol. CIII of "The Electrician" is included in this issue, and wil be found facing page 48.

Current Topics.

Sir Archibald Page.

SIR ARCHIBALD PAGE, the chief engineer and manager of the Central Electricity Board, has received a host of congratulations on the knighthood which has been conferred upon him, as recorded in our last issue. This well earned recognition of the energy and tact with which Sir ARCHIBALD PAGE is carrying out a task the magnitude and complexity of which can only be fully realised by those who have an intimate acquaintance with the work, has given great satisfaction to his many friends in the electrical world. During the war the phrase "work of national importance" was used to cover such a multitide of occupations, in some cases of a somewhat dubious value, that we hesitate to apply it to the work of the Central Electricity Board, though in its undefiled sense it correctly characterises the Board's activities, which are playing a vital part in the industrial reconstruction of Great Britain.

Physical and Optical Exhibition.

THE twentieth annual exhibition of the Physical and Optical Societies, which was held for three days in London this week, was even larger than that of last year. Though this exhibition is confined mainly to apparatus of a laboratory nature, its size and importance appear to grow with the years, indicating to some extent the tendency for greater recognition of research work. This year's exhibition showed in a very convincing manner the accuracy of our standards and the amount of time and research which must be expended and pursued before such accuracy can be attained. High frequency measuring apparatus, etc., has been greatly improved since the last exhibition, and those who have knowledge of the difficulties encountered when making measurements at frequencies over 30 000 kc will realise that any improvement, no matter how small, is an outstanding achievement. Generation of high frequency currents has also made some advance, and it is interesting to note that oscillation at frequencies which were regarded as high last year have now become almost commonplace in the manner of radiation and control. The exhibition may be regarded as representative of a very creditable year's work among manufacturers and physicists alike, tending towards further economy and more efficiency in the electrical industry as a whole.

Industry and Research.

AMONG the interesting subjects discussed at the educational conferences held in London and elsewhere last week, was that of the relations between science and practical life. The electrical industry as a whole will agree with Prof. WINIFRED CULLIS in the view that a piece of pure scientific investigation may bring to light knowledge which may be invaluable in industry. As an example, Prof. CULLIS is reported to have quoted the artificial silk industry, which, by the way, is not only a greatly electrified industry, but is furthermore based on the discoveries of Sir JOSEPH SWAN, the inventor of the incandescent electric lamp. Even this latter invention was not altogether independent of other researches, for it was partially due to Sir Joseph's knowledge of chemistry that he was able finally to develop a satisfactory filament for his lamp. In an industry such as ours applied science has played, and is still playing, a part unrivalled in importance in any other industry, and the sooner the rest of the industrial world realises the benefits which may accrue from a closer co-operation with science, the sooner will many of our trade problems be solved.

British Industries Fair.

THE next big exhibition which is engaging the attention of the electrical manufacturing world is the British Industries Fair, and though there is still a month before the opening, only a few stands, all of comparatively small dimensions, are now available, either in London or Castle Bromwich. The electrical exhibits promise to reveal much that is new, and including the many firms which showed last year, a number of "first timers" will occupy well over 25% of the total exhibition space. No details are yet to

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hand with respect to the exhibits themselves, but from information gathered in conversation with manufacturers the 1930 Fair is likely to establish a record in the matter of new apparatus and machinery; one firm, for instance, claims to have perfected an industrial fan which gives greater efficiency at half the horse-power usually required, saving up to £2 000 per annum on running costs of a large equipment. In spite of the controversy which has prevailed in the past concerning the month in which the Fair should be held, we notice that with each year all such discussion ceases with the approach of February, while those taking part in the debate divert their labours towards making the Fair—even in February—a greater success than was the previous show. Such is the spirit in the electrical industry that, given a common cause, all differences are laid aside until the main issue is decided, and electrical trade, home and export, becomes even more established in the world markets. Team work plays no inconsiderable part in our big electrical undertakings, and it may even be said that it assumes equal importance in the industry as a whole. If the same spirit prevailed in our other basic industries, we venture to think that their future would be less precarious.

British Patent Record.

WHILE no revolutionary patents were applied for during 1929, the number of applications received by the Patents Office was approximately 40 000. Chief among these were those relating to electrical devices, such as cleaners, heaters, and other domestic appliances, indicating the rapid strides which domestic electrification is making in this country. Radio was, as usual, also responsible for the patenting of a number of new ideas chiefly concerned with devices for operating receiving equipment from the supply mains and rectifying a.c. to d.c; inventions of fundamental importance were, however, few and far between, and then the outcome of experiments in such subjects as television. Though the manufacturing world has adopted a cautious attitude towards new inventions, owing to their multiplicity, the number of improvements which have been made to existing apparatus is colossal, and since such eliminations or additions are invariably the subject of a patent application, the task of the Patent Office in avoiding duplication is no easy one. Inventive genius usually follows in the wake of demand, and since such a condition is invariably followed by sales we may take the 1929 patent record as an indication that all is well in the domestic electrical appliance trade and that demand, sales and new ideas are ever on the increase—a very good omen for the new year.

Public Picture Telegraph Service.

ON Tuesday afternoon a regular public service of picture telegraphy between London and Berlin, of which we give a description on another page, was opened for traffic. A service was previously at work on the Continent between Berlin, Copenhagen, Frankfurt, Stockholm and Vienna, and Munich will be added in a month or two. If the new service between Great Britain and Germany proves a commercial success it is likely to be extended between London and the cities named. The chief obstacle to such expansions is lack of circuits. In the case of Paris it is not regarded as probable that a public service will be established, at any rate in the immediate future. Various private transmissions have been operating between London and Paris and internally in Great Britain for some time past, but the systems employed differ from that used by the Post Office. The Siemens-Carolus system which has been adopted for the public service between London and Berlin, and is at work between the Central European cities previously mentioned, has, it is claimed, certain advantages in dealing with photographs. In this field a very high degree of success has been achieved. There is still a tendency to exaggerate the intensity of blacks and whites, and occasional interference from induction is experienced, but the results achieved by experienced operators are really remarkable. The extent to which the new service will be used is unpredictable, but this will depend to a considerable extent on the manner in which its existence and capabilities are made known to the public.

Telephone Progress.

WHEREAS this year Great Britain proposes to spend about £10 500 000 on telephone development in this country, the American Telegraph and Telephone Co. has made plans calling for the expenditure of over £140 000 000 during the same period on extensions and developments in the United States. This unfavourable comparison is made all the more unpleasant by the announcement last week that at the end of September last 44% of the rural post offices and railway stations in this country were without public telephones, while in Northern Ireland the proportion was 69%. The American telephone system is already in a better state of development than our own, and when we learn that over ten times the amount to be expended in development in this country is to be devoted to further improvement in the United States, the smaller amount appears to be hopelessly inadequate. Even making all allowances for America's larger population and area, the ratio of £10 500 000 to £140 000 000 is obviously absurd.

Overhead Lines.

AT next Wednesday's meeting of the Overhead Lines Association the subject for discussion will be: "How far is recent criticism of overhead transmission lines deserved?" A large number of invitations have been sent to persons interested in the subject and it was hoped originally that it could be made a joint meeting with the Council for the Preservation of Rural England. The latter body has preferred to circularise the invitation to its members and we understand that it will have a number of representatives at the meeting. We hope that this will prove to be the first step towards a much needed substitution of collaboration for controversy. If, as the result of consultation between the interests concerned, friction can be avoided or, at least, reduced, one of the aims which all good engineers should have constantly before them will be greatly furthered and the task of extending electricity supplies in rural districts will be made easier.

Our Annual Review.

OUR first Annual Review number, published on December 27th, has met with a very gratifying reception, and we have received a number of appreciative letters from all parts of the country. A few copies can still be supplied, but, in view of past experience with special issues of this journal, anyone wishing to obtain them would be well advised to make early application.

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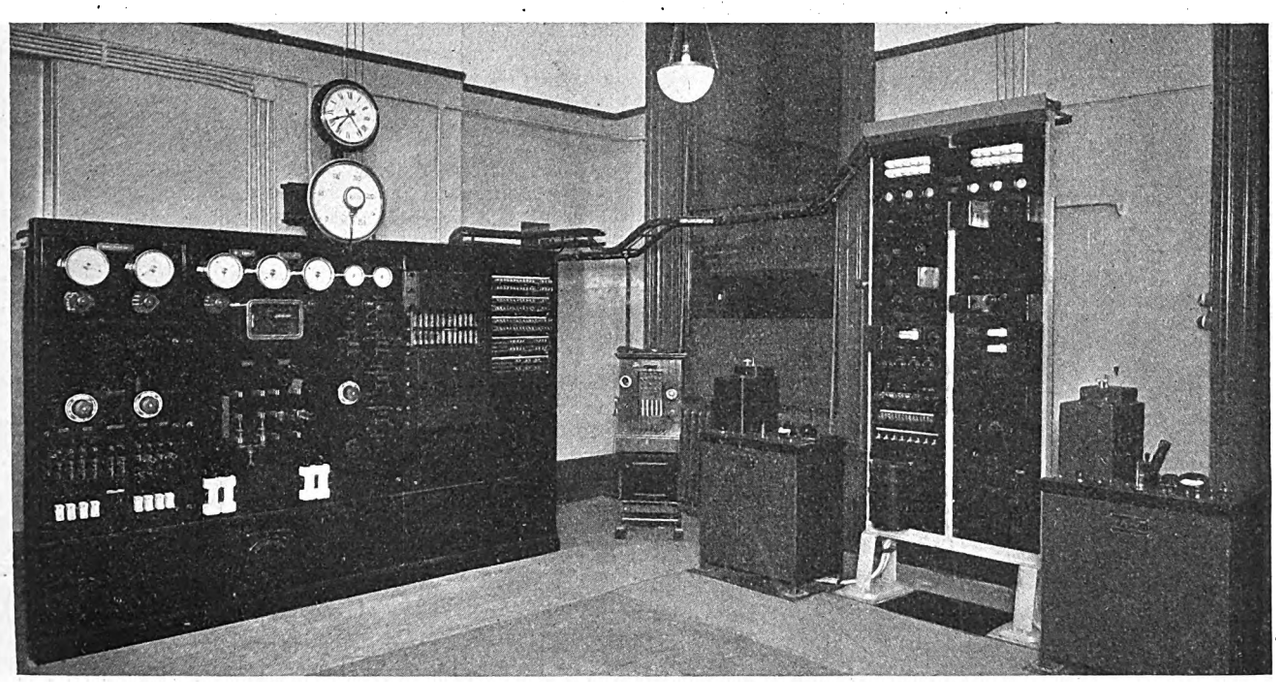
PICTURE TELEGRAPHY TO BERLIN.

Public Service Opened this Week—Description of the System Employed—Remarkable Accuracy Achieved—The Kerr Cell Condenser—Synchronisation and Phasing—Conditions Governing Good Reproduction.

WE are able to give below an illustrated description of the apparatus employed in the new public picture telegraphy service between Great Britain and Germany which was inaugurated on Tuesday afternoon. Almost any kind of picture—such as drawings, sketches and photographs—as well as printed type or writing can be transmitted. Extra copies can be delivered and negative films can be supplied at the receiving end in place of positive copies, if desired. The maximum size that can be dealt with is 25 by 18 cm. (approximately 10 by 7 in.), but larger pictures can be subdivided and sent in sections. The charge is at the rate of 2½d. per sq. cm. (about 1s. 4d. per sq. in.), with a minimum of £1 covering 96 sq. cm. (about 15 sq. in.). Normal hours of working are between 7 a.m. and 11 p.m.*

The system of picture-telegraphy employed on the London-Berlin service is the Siemens-Carolus. The transmitter and receiver are shown in the schematic diagram (Fig. 2) and a view of the apparatus in the London head telegraph office appears in this page. The cases of the cylindrical drums in which the picture is placed for transmission and, at the receiving end, in which the film or positive is made by the incoming impulses, are to be seen at the top of the sending and receiving apparatus on either side of the twin panels on the right of the photograph. On the left is the power switchboard for charging the necessary batteries, next comes the sending machine, then the control rack for the picture apparatus, including the necessary measuring instruments, and on the right is the receiving machine. On the control rack are mounted the amplifiers and alarm devices, the latter indicating any failure of battery voltage, as well as a telephone for speaking over the picture circuit.



The picture telegraphy apparatus and control panels at the London end. The transmitter is to the left and the receiver to the right of the two narrow panels.

For transmission, the original picture is clipped round a cylindrical drum with two spring clips. The long dimension of a full-size picture is measured round the circumference whilst the short dimension is parallel to the axis. The clips are parallel to the axis, and each covers about ·5 sq. cm., or ¼ sq. in., so that space for these should be left on the picture. When the apparatus is started the drum is rotated about its axis with uniform speed, and at the same time a photo-cell and an objective lens are carried past the picture by means of a rotating threaded spindle parallel to the axis of the drum. Suitable lenses and prisms are employed to throw a narrow pencil of light from a light source upon the picture, and to focus it there as a fine point. The dispersed light reflected from this small point on the picture will vary in brightness; the lighter the picture at the point, the brighter the reflected light.

This reflected light is caught in a photo-cell (Fig. 1), which consists of a hollow glass vessel coated on one side with a thin film of potassium. All the air has been extracted from the vessel and the potassium surface has been treated so that it emits electrons when light falls on it. The number of electrons emitted is within limits proportional to the amount of light falling on the cell. The free electrons are attracted to a positively charged open wire grid in the cell, whence they are conducted to the input of a valve amplifier.

When the transmitting drum rotates, the light spot and the photo cell "scan" the picture in the form of a spiral. Before reaching the picture the light is "interrupted" by means of a thin metal disc, revolving at a high speed in the path of the beam, and having on its circumference a number of teeth. It will therefore be seen that the tone values of the picture are reproduced (by the photo cell) in terms of an interrupted or pulsating direct current.

This pulsating direct current is converted into alternating current by the amplifier, and is sent from the transmitting station over a telephone trunk line to the receiving station, where it is amplified further and applied to the "Kerr cell" (Fig. 1). This consists of a small condenser immersed in nitrobenzole, and performs a function the reverse of that of the photo cell, namely, the re-conversion (without inertia) of the incoming electric current alternations to proportional light values.

A narrow beam of light is directed first through a Nicol prism, then between the plates of the Kerr cell condenser (through the nitrobenzole), and finally through a second Nicol prism. The output of the receiving amplifier is applied across the condenser plates. Under the influence of the incoming voltage, which corresponds to the photo-cell current at the sending station, and therefore with the tone values of the original picture, the light passed varies in intensity in accordance with the voltage fluctuations. By means of suitable

* Leaflets giving particulars of the service are obtainable at head post offices throughout the country and at London branch post offices.

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apertures and lenses the beam is then focused to a fine point on the surface of the receiving drum, which carries a light sensitive photographic film and rotates in a light tight cylindrical housing. The light point traverses the film in a close spiral, in the same manner and at the same speed as the light spot on the picture at the sending end, and (so to speak) photographs each individual point of the distant picture. There is thus obtained at the receiving station a negative

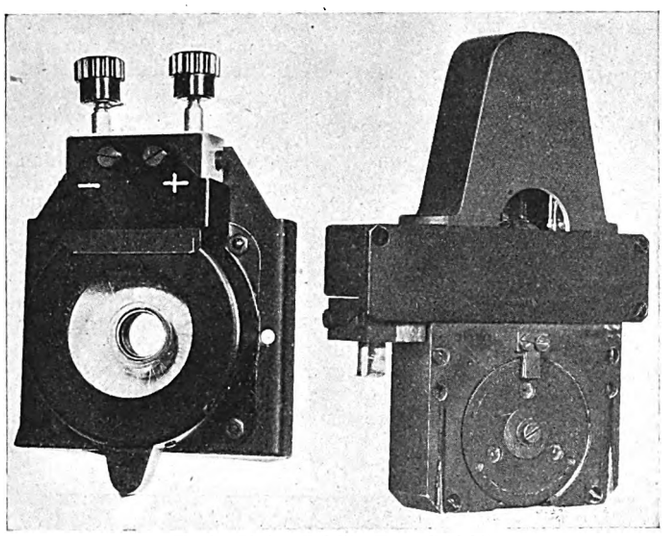

Fig. 1.—Photo cell (left); Kerr cell (right).

which, when developed, fixed, hardened and dried, reproduces the original picture in form and tone. Any number of prints may be made from this negative in the ordinary way.

It is necessary that the drum of the sending machine rotate at exactly the same speed as the drum of the receiving machine; if it does not do so, the received picture, instead of being a rectangle, will be distorted into the form of a parallelogram.

To illustrate the exactness with which the machines work, it is not unusual to find that a full-size picture is 1 mm., or about ·04 in., out of being a true rectangle. This means that the light spot in one machine has travelled 1 mm. more than the spot in the other machine after traversing 248 000 mm., or is four-hundredths of an inch out in about 813 ft. That this result is wonderful will better be realised when it is mentioned that the time of transmission of a picture is about twenty minutes. What other two instruments separated by a distance can compare with this result other than an accurate clock or watch?

Synchronisation is effected without transmitting a synchronisation frequency over the line (except as a check before the transmission of the first picture), but is accomplished by means of tuning fork oscillators, one at the sending end and one at the receiving end (or ends) when the picture is being received at more than one station. The forks themselves are adjusted to be of identical frequency and are maintained at a constant temperature by means of thermostats. As a result there is available at each station an alternating current of exactly the same frequency, which, after amplification by means of valve amplifiers, is used to control an alternating current synchronous motor or phonic wheel. Coupled to this motor, on the same shaft, is a direct current motor, the speed fluctuations of which are checked by the phonic wheel.

Phase Synchrony.

Besides the setting up of identical speeds it is further necessary that the drums at all stations should rotate in phase, so that the picture margins in the transmitter may correspond in position with those in the receiver. Phasing is done by a temporary acceleration of the receiving motor, accomplished by rotating the stator of the receiver phonic wheel. The adjustments of phase and synchronisation are made by the operator at the receiving end, and are checked by special signals sent over the line.

The carrier current frequency for picture transmission should be as high as possible, having due regard to the characteristics of the line. For the London-Berlin service the frequency used is 1 125 cycles. As one of the principal requirements of a picture is sharpness, that is, the transit from white to black in the shortest possible interval of time, one line requirement is that the carrier current be established or extinguished quickly. This can only be the case when all the frequencies transmitted for the picture arrive at the receiving end at the same time. A lump or coil-loaded line tends to have a longer time for transmission of the higher frequencies, until at the cut-off or critical frequency nothing is transmitted.

Other necessary conditions for good pictures are

(1) The line must be free from momentary or other interruptions.

(2) The attenuation of the line must not vary appreciably throughout its transmission range.

(3) The attenuation must be constant and not vary from moment to moment.

(4) The line must be free from echoes and other irregularities.

(5) The line must be reasonably free from cross-talk, ringing induction, telegraph induction and noise.

(6) The telephone repeaters must not introduce spurious frequencies by modulating the carrier wave.

(7) The cut-off frequency should be as high as possible.

The carrier frequency should not exceed half the cut-off frequency, and high pass filters are required at the sending

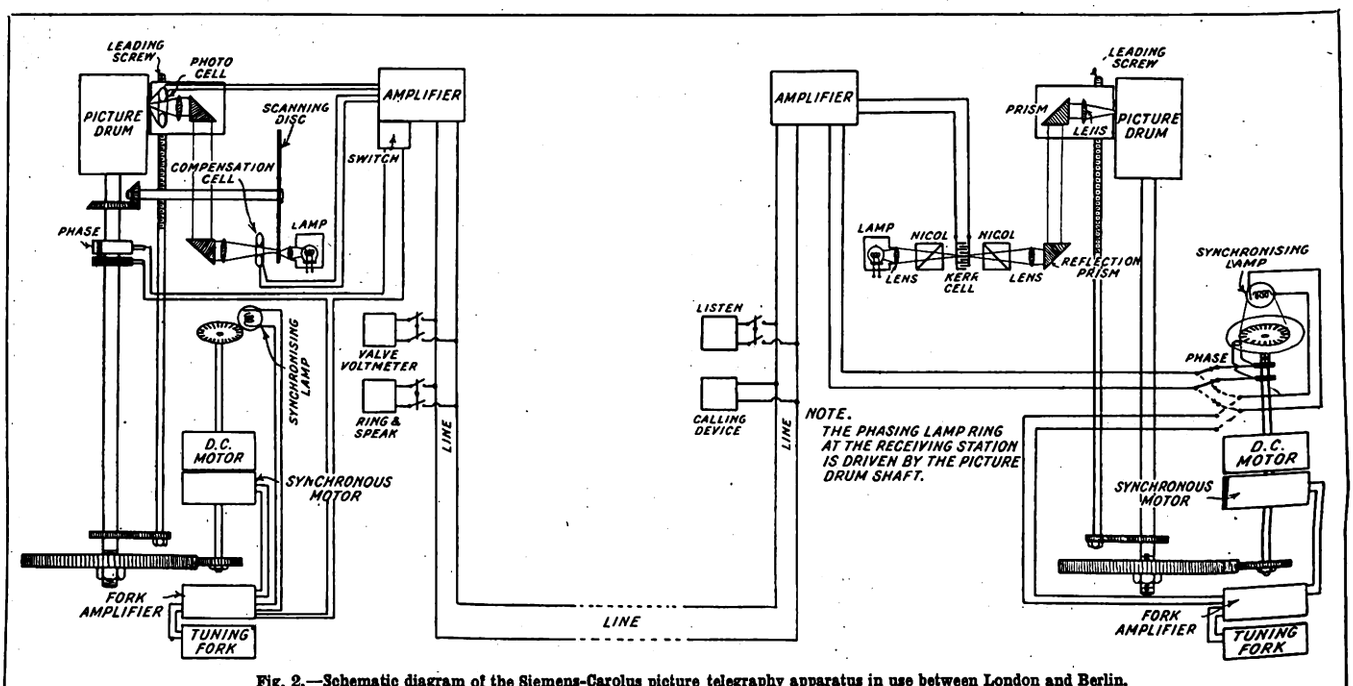

Fig. 2.—Schematic diagram of the Siemens-Carolus picture telegraphy apparatus in use between London and Berlin.

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and receiving ends to cut off all below about half the carrier frequency.

Some of the operating troubles experienced during the experimental period on the London-Berlin circuit, which is about 1 000 miles long and consists of cable throughout, included the difficulty of holding synchronism with the driving motor supposed to be running off the 120 V telegraph battery during the daytime, though in the evening it ran satisfactorily. The motor was changed over to the lighting system and ran well. It was found afterwards that during the day the supply came from motor-generators and there were considerable fluctuations in voltage.

Ringing induction from harmonics in 17-cycle ringing current caused interference on the pictures occasionally. This induction came from side circuits and the trouble was removed by changing to other pairs.

A fifty cycle per second modulation of the picture carrier wave was experienced frequently, particularly during the daytime. This was traced to the anode current supply from a rotary convertor.

Public picture offices exist on the Continent at Berlin, Frankfurt-on-Main, Vienna, Copenhagen and Stockholm; and it is understood that arrangements are in hand for extending the public service from this country to those Continental centres if traffic inducements warrant the provision of further facilities.

NEW YEAR GREETINGS BY PICTURE TELEGRAPHY.

CARD, as received in London by telegraph from Berlin. It will be noted that the names of the other stations which are already at work appear on the card. This is interesting as an example of transmission of a photograph and lettering at the same time.

REFERENCES TO CURRENT LITERATURE.

Articles in Recent Publications of Interest to Electrical Engineers.

APPARATUS, MACHINERY AND MATERIALS.—Diesel Engines for Peak Loads. P. H. Schweitzer. ("Electrical World," December 21, 1929, pp. 1213–1216.)

Abnormal Voltage Rises in E.H.T. Potential Transformers. S. A. Stigant and H. M. Lacey. ("Electrical Times," January 2, pp. 15–18.)

Applications of Adjustable Speed Motors. C. E. L. Dapprich. "Electrical Manufacturing," December, 1929, pp. 46–48.)

Characteristics of Insulating Materials for Power Cables. E. W. Davis. ("Electrical Manufacturing," December, 1929, pp. 49–51.)

Accumulators for Electric Vehicles. ("La Vie Technique et Industrielle," December, 1929, pp. 959–960.)

The Mercury Rectifier in Railway Service. ("Electrical News and Engineering," December 15, pp. 45–47.)

Ready Reckoners for Short-Circuit Faults. ("Electrical News and Engineering," December 15, pp. 51–53.)

New Magnetic Flow Meter. G. Stein. ("Elektrotechnik und Maschinenbau," December 15, pp. 1097–1102.)

The Stoppage of Rotating Field Motors by Single-Phase Running. H. Franken. ("Elektrotechnik und Maschinenbau," December 22nd, pp. 1127–1130.)

ILLUMINATION.—Good Lighting. H. Lingard. ("Nursery World." January 1, pp. 172 and 183.)

TELEGRAPHY AND TELEPHONY.—Carrying Capacity of Cables. T. F. Peterson. ("Electrical World," December 7, 1929, pp. 1132–1135.)

London Automatic Exchange System: Satellite working. H. Mortimer. ("Post Office Electrical Engineers' Journal," January, pp. 271–278.)

Fulham Exchange, London. ("Post Office Engineers' Journal," January, 278–282.)

Mechanical Aids to Works of Underground Cabling. C. F. Street. ("Post Office Electrical Engineers' Journal," January, pp. 294–300.)

RADIO.—German Wireless Sets Abroad. ("Oversea-Post," December, p. 6.)

Radio Apparatus and Accessories. ("British Trade Journal," January, p. 77.)

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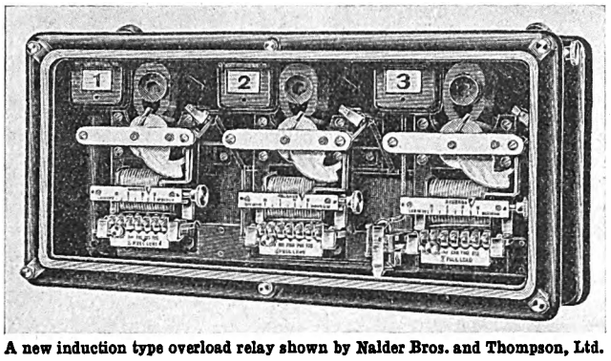
THE PHYSICAL AND OPTICAL EXHIBITION.

Brief Details of Some of the New Electrical Exhibits at the Imperial College, London —Instruments of Precision Form Chief Interests.

THE twentieth annual exhibition of the Physical Society and the Optical Society was held at the Imperial College of Science, South Kensington, London, on Tuesday, Wednesday and Thursday, many of the exhibits being staged by firms engaged in the electrical industry. In some cases apparatus exhibited this year was also shown in 1929, and in reviewing the more interesting items of this year we have confined ourselves to equipment of recent design. It will be appreciated



A new induction type overload relay shown by Nalder Bros. and Thompson, Ltd.

that even in these circumstances it is not possible to deal adequately with each exhibit, nor will space requirements permit of every such piece of apparatus being mentioned. Should readers desire further information regarding the items dealt with, we suggest that application be made to the exhibitors whose names and addresses are given for this purpose.

A new type of bridge, developed by Albert Campbell, and shown by the CAMBRIDGE INSTRUMENT CO., LTD., of 45, Grosvenor Place, London, S.W.1, may be regarded as an extension of the three-arm Carey Foster bridge by the addition of a fourth arm which is variable and of low resistance. The capacitance of the condenser under test is read directly on a conductance box which forms one of the other arms, and is obtained in terms of a fixed mutual inductance, a most permanent type of standard. The power factor at a given frequency is proportional to the fourth arm, and can be read directly on a slide-wire, one division corresponding (at standard frequency) to 0·0001. For the smaller capacitances it is desirable to use a one-stage amplifier. The instrument covers a range from 1 μμF up to 10 μF. From 100 μμF upwards the capacitance sensitivity at 800 cycles per second is of the order of 1 in 10 000.

Several examples of an instrument having a new movement using Mumetal irons were exhibited by CROMPTON PARKINSON, LTD., Instrument Works, Chelmsford. These instruments give readings on either d.c. or a.c. of any commercial frequency within the limits of first grade accuracy as laid down in B.E.S.A. Specification No. 89 of 1926. The movements are of very light weight, the torque/weight ratio is high, and the pointer comes to rest at any part of the scale within 2 seconds in the 6 in., and 3 seconds in the 8 in. size. Instruments with exposed movements for demonstration purposes were exhibited.

A new pattern of "Luxometer" portable photometer was shown by EVERETT EDGECUMBE AND CO., LTD., 117, Victoria Street, London, S.W.1. It embodies all the improvements which years of experience have indicated. The whole equipment is contained in a compact leather carrying case and includes a 4 V accumulator, a voltmeter with regulating resistance, and a separate test-plate with adjustable levelling and orienting devices. The instrument has four or five ranges (0·2 up to 0-2 000 foot-candles), and colour filters for daylight measurements are available.

EVERSHED AND VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4, demonstrated a working exhibit designed to show the operation of the "Megger" earth tester. A model was constructed showing the testing of the earthing of a sub-station, and not only reproducing faithfully the actual type of earth resistance, but showing clearly the fact that the "Megger" earth tester is not affected by back voltage and stray currents. Although the model was a scale one, the full-size instrument was used, and conditions were very similar to those encountered in field work. A development was shown in the new "Dionic" water purity meter, which was exhibited both in the indicating and recording types.

Among the apparatus shown by GAMBRELL BROS., LTD., Merton Road, Southfields, London, S.W.18, was a $\frac{G}{C}$ bridge. This bridge has been designed by Dr. L. G. Brazier, of Callenders Cable and Construction Co., Ltd., for the precise measurement of the power factor of telephone cables at frequencies up to the audio limit. The measurement has to be made with the potentials of the two wires symmetrically disposed with respect to earth, so that stray capacity difficulties cannot be solved by placing an earth connection on the bridge. It is necessary for the effective capacities of two points of the bridge to be reduced to zero, and for this purpose elaborate screening arrangements are necessary.

A range of control gear recently designed for operating on a.c. supply mains to meet the generally increased demand for changing over from local supply to the "grid" system was exhibited, by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C. The "AAA" type startor was shown, and this is for directly connecting across the mains motors up to 7½ H.P. The startor is fitted with a duplex thermal time limit overload device, giving ample protection to the motor both during starting and running. This overload allows a time interval to take care of starting inrush and momentary overloads without tripping. However, when an overload becomes dangerous the motor is disconnected from the line. For motors larger than 7½ H.P. star delta startors were shown up to 15 H.P., and above this horse-power, where slip-ring motors are used, resistance type controllers were exhibited. All these controllers are arranged for remote control either by means of push-buttons, pressure devices, float switches, or vacuum devices.

Chief among the exhibits of Mr. O. E. MALINVERNO, 37, Walbrook, London, E.C.4 (representing Messrs. Istrumenti di Misura "C.G.S." of Monza, Italy), was the Frequencygraph described in our December 27th issue. The instrument shown, however, was of the type intended for the British market whereas that illustrated in the December 27th issue is as supplied to the Italian market. There is little difference between the two instruments so far as appearance is concerned and none at all with respect to technical construction.

This year's display by the M.O. VALVE CO., LTD., Hammersmith, London, W.C.6, again consisted of working demonstrations illustrating various interesting processes in the manufacture of valves, including automatic grid making, and technical dmonstrations designed to show the comparative power outputs of valves. So far as other exhibits are concerned, these were somewhat numerous in character, but were entirely indicative of recent developments in valve production. Special cooled anode valves of the types supplied to the G.P.O. and the B.B.C. etc., figured among them, together with e.h.t. rectifiers, dull emitter transmitting and modulating valves, large valves (incorporating molybdenum electrodes), screen-grid valves, pentodes, power valves (receiving), a.c. mains, valves (both directly and indirectly heated), full-wave rectifiers and repeater valves.

Domestic Convertors.

The introduction of a.c. mains-operated receivers and amplifiers, and the comparative absence of apparatus to work direct from d.c. mains, has made it desirable that a machine should be available which can be connected to d.c. mains and which will supply alternating current for the operation of these receivers. The d.c. to a.c. rotary transformer, exhibited for the first time by the M-L Magneto Syndicate, Ltd., Coventry, has been specially designed for this purpose. It can be wound to run from d.c. mains of any voltage, a country house private d.c. supply, or small accumulator. Particular applications of this type of machine would be found on ships where d.c. is always available, and on demonstration vans where a 12 V startor battery forms the only power supply. The models shown had outputs of 40 VA and 85 VA, at 200-250 V, 50 cycles.

The MULLARD WIRELESS SERVICE CO., LTD., Charing Cross Road, London, W.C.2, showed a complete range of P.M.

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products, including examples of the most recent developments in indirectly heated cathode valves for a.c. mains and power output valves suitable for operating batteries of loud-speakers. Rectifying valves with outputs from 30 mA at 250 V to 2 A at 12 000 V were also shown.

Among the exhibits of NALDER BROTHERS AND THOMPSON, LTD., 97A, Dalston Lane, London, E.8, was a new induction type overload relay. This instrument is described as inverse, with adjustable definite minimum time delay characteristic specially designed for the protection of the "grid," supplied in single, double and triple pole units. An illustration of the instrument is given on the previous page.

The increased importance of X-ray crystallography makes an apparatus for the examination of single crystals and crystal aggregates desirable for any well-equipped physical or chemical laboratory, and its use is becoming more and more necessary in technical research laboratories, particularly for metals and textiles. W. G. PYE AND Co., Newmarket Road, Cambridge, showed such apparatus, and by use of interchangeable parts all the standard methods of photographic investigation can be used, and in order to facilitate investigation, particularly in laboratories which are not primarily crystallographic, optical measurement of crystals can also be carried out, thus dispensing with a separate goniometer. The instrument is also so constructed that practically any special type of research, such as, for instance, high or low temperature work, optical or X-ray spectrometry, can be carried out by means of special attachments of the carriages.

The RECORD ELECTRICAL CO., LTD., Broadheath, Manchester, showed a complete range of moving iron and moving coil switchboard and portable instruments, including a combined voltmeter and ammeter consisting of two separate moving iron movements arranged in one case. The voltmeter is provided with five ranges from 1-750 V. On the current side, a change of range is produced by altering the series coils, such coils being slipped over the moving iron element, which is protected by a sleeve, and held in position by guide rods, and clamped by winged nuts. Six coils are provided in the standard model, giving ranges from 0-1 to 0-600 A. Each range has a separate scale marked on a drum, which rotates by depressing two knobs at the end of the drum, thus overcoming the disadvantages of having many scales on the one dial. The test set is complete in itself, all the coils being housed in a receptacle in the case.

Continuous chart temperature recorders, distance thermometers, thermo-electric pyrometer stems and switchboards, optical pyrometers, and similar apparatus were shown by SIEMENS BROTHERS AND CO., LTD., of Woolwich, London, S.E., whose exhibit at this exhibition can always be relied upon to reveal something of outstanding interest.

Unbalance Measurements.

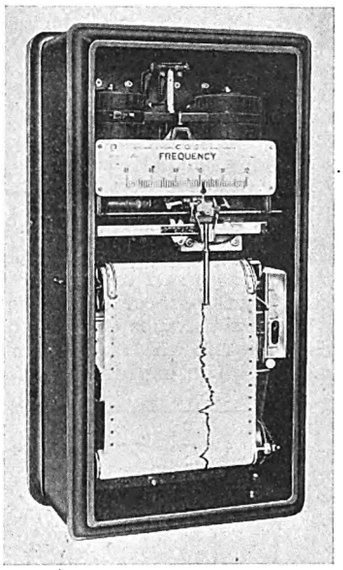
The stand of H. W. SULLIVAN, LTD., Leo Street, London, S.E.15, contained the usual comprehensive display, including a new form of double capacity bridge mounted and screened in one desk, and designed to permit determinations of the out-of-balance capacities of telephone cables. The accuracy of measurement is that which it is thought will be demanded of telephone cable manufacturers in the near future. A multi-functioning switch, having a rotary dial of fifteen testing positions, is incorporated to effect "between quad" unbalance measurements as well as the more usual "within quad" unbalance measurements. This extension of the usual testing is now under consideration by the C.C.I., and at the request of manufacturers the switch has been designed to perform the complete series of tests. Means are provided for the elimination of any initial unbalance due to switch or testing lead. Resulting from the special feature of range extension employed in the differential air condensers, a total unbalance of 1 600-0-1—$\mu\mu$F is obtained with a very high degree of accuracy. Although having such a wide range of capacity adjustment it is possible to measure unbalances of 1 or 2 $\mu\mu$F with ease.

A new range of external thermo-couple junctions, air cooled, having exceptionally heavy overload capacities and suitable for d.c. and a.c. circuits of all commercial, low and high radio frequencies was shown by Messrs. ERNEST TURNER, Chiltern Works, Tolleridge Avenue, High Wycombe. The Wheatstone bridge type is for use on a.c. circuits only. All external junctions have standard external dimensions.

Laboratory standard instruments, etc., were exhibited by the WESTON ELECTRICAL INSTRUMENT CO., LTD., 15, Great Saffron Hill, London, E.C.1, including a new range of small instruments having a sensitivity of 125 Ω per volt.

A high temperature electric furnace, of larger size than hitherto shown, was featured on the stand of WILD BARFIELD ELECTRIC FURNACES, LTD., Elecfurn Works, North Road, London, N. This is heated by means of re-crystallised carborundum heaters accommodated in the specially grooved refractory lining which, it is claimed, adds to the efficiency by ensuring more uniform radiation.

The ZENITH ELECTRIC CO., LTD., Zenith Works, Villiers Road, Willesden Green, London, N.W.2, showed new types of tubular adjustable rheostats on heat-resisting steel and porcelain tubes, including patterns fitted with the latest form of patented sliding contact and guide bar, arranged for bench and switchboard mounting incorporating a patented end bracket clamp. Several types specially designed for meter and instrument calibration were shown.



The Frequencygraph exhibited by Mr. O. E. Malinverno, which is designed to meet the requirements of the British market.

Other electrical trade exhibitors were: Bakelite, Ltd., Creed and Co., Ltd., Dexine, Ltd., Drayton Regulator and Instrument Co., Ltd., Edison Swan Electric Co., Ltd., W. Edwards and Co., Electrofio Meters Co., Ltd., Elliott Bros. (London), Ltd., Foster Instrument Co., Fuller Accumulator Co. (1926), Ltd., A. Gallenkamp and Co., Ltd., Griffin and Tatlock, Ltd., Isenthal and Co., Ltd., Kelvin, Bottomley and Baird, Ltd., Marconi's Wireless Telegraph Co., Ltd., Negretti and Zambra, Schall and Son, Ltd., Telegraph Condenser Co., Ltd., Thermal Syndicate, Ltd., H. Tinsley and Co. Venner Time Switches, Ltd., Watson and Sons (Electro-Medical), Ltd.

In the research and experimental section the BRITISH THOMSON HOUSTON CO., LTD., showed examples of hot cathode mercury vapour rectifiers, in which the space charge of an electron current from an oxide coated filament is neutralised by the ionisation of mercury vapour. It is interesting to note that this modern application of thermionics probably resembles very closely the earliest lime-coated filament valves made by Wehnelt over 20 years ago. In a hot-cathode mercury vapour rectifier the voltage drop between anode and cathode when the valve is passing current, depends upon the vapour pressure of the mercury which, in turn, depends upon the temperature of the coolest portion of the enclosing walls of the device. Usually this portion is near the base of the rectifier, and is protected from sudden changes in the ambient temperature. A rectifier was shown, however, in which the coolest portion is the exposed walls of the tube.

The research laboratories of the GENERAL ELECTRIC CO., LTD., exhibited experimental photo-electric apparatus for the rapid measurement and plotting of the Polar distribution of light sources; similar apparatus for measuring colour temperature or luminous output for incandescent lamps; equipment for indicating the absorption of light in lamp bulbs; electro-acoustic measuring apparatus, etc. A miniature transmission tower testing plant was shown, and this consisted of a model to the scale of $\frac{1}{16}$ in. to the foot, showing the general arrangement of the field, test towers, and gear necessary for the load testing of overhead transmission towers. Other exhibits included a simple method for the approximate determination of the diffusing power of etched glasses. The extent to which an etched glass will diffuse the beam from a projector can be approximately determined by placing a sheet of printed matter behind the glass and measuring the distance to which the print can be removed from the glass before it becomes illegible. It has been found that by using a fixed size of print an empirical but stable relationship can be obtained for any particular projector between this distance and the beam divergence figure. Experimental methods of furnace temperature control by means of photo-electric cells were shown, in which the standard Osram photo-cell unit was arranged with a Caesium cell to control the temperatute of a furnace by the light radiation from the object being heated.

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HOW WELDING ASSISTS THE MAINTENANCE ENGINEER.

Ad hoc Gadgets—Vibration Breakdown—Value of a Welding Plant—Some Instances of Effective Use of Welding.

By CYRIL SYLVESTER, A.M.I.E.E., A.M.I.Mech.E.

THE job of the maintenance engineer of any electrical plant is not to be envied. He is known as the "trouble man." He never knows what trouble is in store for him; he gets more kicks than plums and he is looked upon as an essential nuisance. Immediately a breakdown occurs it is considered that he has neglected his duty; it is thought that electrical machinery should be entirely immune from breakdown. When a machine stops through any unusual means, or a motor driving a length of shafting refuses to function, the maintenance engineer is sent for and the question asked is, "How long will it be before it is going again?" The maintenance engineer has need to be in possession of unlimited resources to satisfy the expectations of many inquirers.

The maintenance engineer has any amount of *gadgets* in his possession which are never seen outside his department—gadgets which expedite his work. Most of them are of his own design. Some of them have been used only once; to meet some special requirement. Others, more frequently used, will accomplish in a few minutes what ordinary apparatus does in an hour. These gadgets have come into existence through experience born of necessity. A dowel pin can be extracted, a key from a pulley removed, or an armature taken from its shaft and other mechanical operations performed by means of the gadgets I have mentioned—and this in quick time.

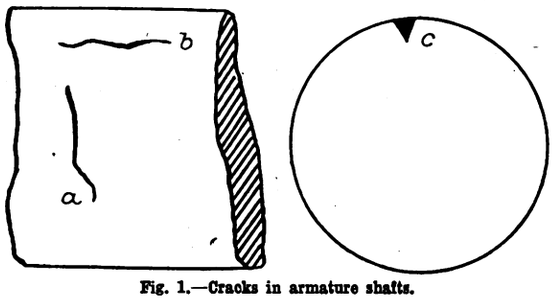

Fig. 1.—Cracks in armature shafts.

In all electrical machinery there is a certain amount of vibration; in some it is more pronounced than in others. Where there is vibration the tendency is for parts to work loose. Loose parts are dangerous even though a machine containing them may have the best of maintenance. It may be said, with some truth, that the majority of mechanical breakdowns to electrical plant can be traced to something or other working loose and releasing that which its function is to secure. It is on occasions like this that the maintenance engineer has to do some serious thinking.

Although a plant may be duplicated as far as possible; that is with what, under ordinary conditions, may be considered as ample "spares," there are many parts of a plant for which no spare part is available. It is here that a repair has to be effected with material on site. For certain classes of breakdown I know of nothing more helpful to the maintenance engineer than a welding plant. I will elaborate upon a few points within my experience where a welding plant has greatly assisted me.

Armature Shafts.

One case concerned a 500-B.H.P. motor installed for starting and running in large Diesel engines. The motor was, of necessity, a slow speed one. It is well known that internal combustion engines, no matter how carefully the shaft is balanced, operate with an impulse movement; this is more pronounced if one or more cylinders are "missing." The effect is that these impulses are transmitted through the couplings to the armature, in this case, of the starting motor.

Such an armature is very heavy and, providing the turning movement is smooth, a large amount of kinetic energy would be stored in it. The effect of the impulses, however, at starting, when the cylinders commence to fire, is to create a tendency to increase speed at a greater rate than the energy can be stored in the armature. This, with the impulse characteristic of the power transmission, causes a continual twisting movement which affects the junction of the armature shaft and the spider, the keys which lock them together.

Continual movement of the keys will distort the keyways so that, very quickly, the keys are no longer square; they become loose in their ways. In the case referred to, the shaft was 6 ins. in diameter, and four keyways were accommodated in it. A new shaft was not at all necessary; the existing keyways were filled in by a process of welding and new ways were cut in other portions of the shaft.

The tensile strength of the welding material was not so great as that of the shaft proper. This, however, was not an important factor since the material in the shaft was more than ample for the power transmitted. The function of the filled-in portion was to provide a round seating for the inside of the spider. After welding, the shaft was skimmed in a lathe. The new keyways were cut with a portable milling machine operated by a one-H.P. motor.

Shearing Due to Cracks.

Another case, while we are on the subject of motor armatures, is the shearing (for no apparent reason at all) of an armature shaft. I have known this shearing effect to occur at a coupling in the middle of a shaft and at the thrust collar, in the latter case it is due to the hardening effect when shrinking the collar on to the shaft; in the former case it is due to cracks in the material.

The cracks cannot be seen under ordinary conditions. They usually appear after the armature has been running for some time, when certain temperatures have been reached. When a bearing has seized on to a shaft, after it has been removed, the crack is apparent from the fact that it is filled in with bearing material. It may be said that, in many cases, the opening out of the crack has been the cause of the seizure; the edge of the crack acts as a milling cutter, material is removed and the bearing becomes hot.

The cracks vary in character. Some are short, some long, some run partially round the shaft as illustrated in Fig. 1 (*a*), others run along the shaft as illustrated at (*b*); sometimes they are at various angles between the two. Every time an armature is changed the shaft should be inspected for cracks. A strong magnifying glass may reveal them; a simpler and surer method is to use red lead. The shaft is first thoroughly cleaned and polished. A thin mixture is then made of red lead and petrol. The shaft is smeared with the mixture, and in a few minutes, when the petrol has evaporated leaving only the lead behind, the shaft is wiped clean. On examination it will be found that the lead has penetrated into the cracks so that, if they cannot be readily seen with the normal eye, the use of a glass will reveal them.

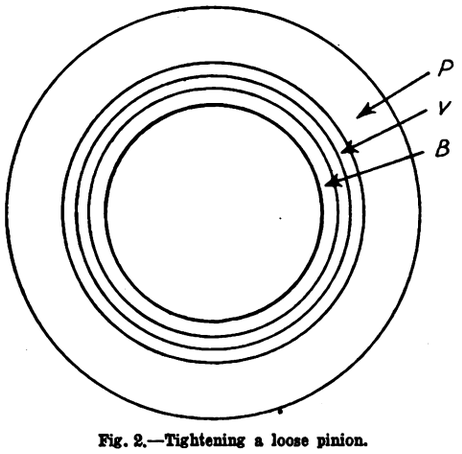

Fig. 2.—Tightening a loose pinion.

The only treatment is welding, and the method adopted is illustrated in Fig. 1 (*c*). A groove, following the crack, is cut in the shaft with a three-cornered file to a depth of $\frac{1}{16}$th of

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an inch. This is filled in with material in a process of welding. The surplus material is turned off, the shaft is ground and further trouble from this cause is eliminated.

The necessity for quick action on the part of maintenance engineers has been mentioned. A favourite gadget to facilitate quick action is the grub screw. If a motor is fitted in an awkward position (from an accessibility point of view) the keyway of the pulley will be fitted with a set screw; this facilitates easy removal in case of breakdown. There are many positions in a large plant where grub screws are used; but they are dangerous and, often, can be dispensed with.

Let us consider the case of an electric traveller in a machine shop. Each motor is fitted with a pinion which engages with a spur wheel. The pinion is fitted to the shaft through the ordinary key and keyways. Traveller motors are subjected

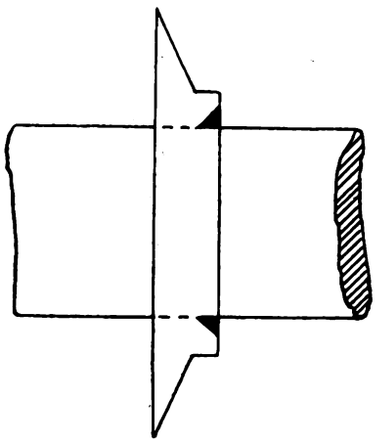

Fig. 3.—Welding a loose shaft collar.

to intermittent loads of a varying character. Their speeds vary from a few hundred revs. per minute to more than a thousand; the breaking effect is often severe, so that, invariably, the pinion key works loose, the pinion becomes loose so that the exterior of the shaft and the bore of the pinion are no longer concentric.

The remedy here is either a new pinion, or *bushing* the bore; the latter method is usually adopted and our friend the grub screw plays a prominent part in securing the bush to the pinion. If the bush is a thin one, the screw will be thin, and (I have seen it on many occasions) it may become sheared, thus leaving the bush free inside the pinion.

This is one of the cases where a grub screw should not be used. Welding is the solution. The bush should be a tight fit in the pinion. Both should be placed in a lathe on a mandrel and a Vee groove cut as illustrated in Fig. 2; here B is the bush; V the groove and P the body of the pinion. Both sides of the pinion should be treated in the same manner and the two grooves filled with material under a process of welding. After welding, the sides may be "faced" and the pinion is then as good and as strong as is necessary for the work it has to perform.

Loose Shaft Collars.

Reference has been made to thrust collars being shrunk on armature shafts. This method is not always satisfactory, since, as a rule, the material with which the collar is made and that of the shaft have different coefficients of expansion. Many collars work loose after a certain temperature has been reached, not only on armatures but on large turbo units. I know of several turbines in this country which are operating with thrust collar fixed to the shaft by the conventional method—the grub screw. On the other hand, I have known collars to be so tight that no method of heating would release them; they have had to be cut off.

Welding obviates the necessity for shrinking or fixing with set screws. If the collar is cut, as illustrated in Fig. 3, in the form of a Vee, and the Vee filled in with material, a good sound mechanical job is made of it. The Vee is cut on the back side, not the bearing side, so that it is not at all necessary to trim the surface of the weld. If it is necessary to remove the collar, if the armature is placed in the lathe a small tool passed along the shaft will part the material so that the collar may be tapped off.

These are but a few of the occasions where a welding plant would assist the maintenance engineer. But their name is legion. Special bolts which have broken can be welded; eccentric holes in couplings can be filled and re-drilled; scored dowel pins can be filled and re-used; and cracked castings can be made as new. One has no cause for anxiety about the strength of a weld. If these are made properly, with the right material, the tensile strength will be almost equal to that of the original material. One thing is certain; the maintenance engineer will have an easier time and the size of his scrap heap will very soon diminish.

TIN RESEARCH.

Industrial Applications Committee's Plans for 1930.

A COMPREHENSIVE plan of research for 1930 is announced by Col. S. Heckstall-Smith, honorary secretary of the Tin Industrial Applications Committee, which is working in co-operation with the British Non-Ferrous Metals Research Association to investigate the industrial applications of tin and discover new and improved uses for the metal.

The most important lines of research will be:—

1. To investigate the non-corrosive qualities of tin in relation to other metals with a view to establishing scientific data as to its industrial value.

2. To investigate improved methods of alloying tin to steel plates with a view to broadening the market for canning of foods.

3. To investigate the value of tin in relation to the lubrication of high speed machinery.

4. To establish the non-toxic qualities of tin as the safest metal to be in contact with milk and other foods.

Colonel Heckstall-Smith points out that 1930 opens up a new era in the tin industry. "For the first time the producers have got together and formed a strong association; they have also declared a policy of supporting research work. The importance of tin research cannot be over-estimated. Already research on other metals has borne fruits of far-reaching significance to the world's industries.

New Lead Alloy.

"Quite recently, for example, a ternary lead alloy was discovered by the British Non-Ferrous Metals Research Association. This alloy, which is destined to find widespread applications in certain sections of the engineering, the building, the electrical and the plumbing industries, is not only stronger and lighter than lead, but possesses a greater resistance to corrosion and vibrations, and, in working, will prove to be considerably cheaper. This British triumph, of which we can be justifiably proud, should open up new fields for tin consumption amounting to many thousands of tons a year. Another valuable contribution from research is the range of British Standard solders containing the right amount of tin, which guarantee industry materials which are stronger and work better than the fortuitous grades previously available.

"We have before us other lines of research which cannot be disclosed at the moment. We believe we are on the eve of finding some vitally important new uses for tin, but prefer to make no claims until we have assured ourselves that preliminary experiments can be amply substantiated."

PRESSBOARD INSULATION.

Economical New Material with many Electrical Uses.

WHAT is claimed to be a new development in pressboard insulation has been made by B. S. and W. Whiteley, Ltd., Pool Paper Mills, Pool-in-Wharfdale. The manufacturers of "Elephantide," as the material is called, state that the product has been developed on sound lines during the last few years and its appearance on the market was in time to benefit the manufacturers of large power transformers for the various electricity schemes. The performance of the material under hot oil—i.e., working conditions—has, we understand, proved satisfactory in all cases. Owing to the unusually large sizes of sheets available the material is economical, and other fields of use in the electrical industry are being developed, with resultant saving in cost of raw material and often an increase in insulation value.

Birmingham Electric Supply Committee has decided to open small branch service depots or showrooms from time to time in various suburban areas for the convenience of customers and prospective customers.

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MANUFACTURERS' EQUIPMENT.

New Plant and Materials for Factory and Workshop—Aluminium-Silicon Alloys—Electric Crane Insulation.

MANUFACTURERS and others may be interested in a modified aluminium-silicon alloy, known as "Alpax," of which we have recently obtained details. It is produced by ROWLAND HILL AND SONS, LTD., of King Street, Coventry, and is stated to be particularly useful when Admiralty Spec. DNC/M/1A and Air Ministry Spec. DTD/25 are called for; when castings should resist exposure to salt spray or immersion in salt water; when high fluid or gaseous pressures demand freedom from porosity and cracks. (In this connection it is stated that "Alpax" castings have withstood, on test, air pressure up to 200 lb. per sq. in., with working pressures up to 75 lb. per sq. in.) Fourthly, when intricate design, lettering or large castings of thin section require from the alloy the utmost fluidity and complete freedom from hot shortness.

Sand castings can be subjected to anodic oxidation, which is effected by the firm's patented electrolytic process. The castings to be treated form the anode in a chromic acid bath, and the film can be deposited on machined, polished and sand cast surfaces. When this process is to be used, it is essential that all machinery and polishing be carried out before treatment, and that, owing to the action of chromic acid on bronze, steel, etc., no bushes or studs be fitted until after the treatment has been given. The oxide film may be usefully waterproofed in instances where the castings have a water line area.

Special Insulators.

ALFRED WISEMAN, LTD., Glover Street, Birmingham, have sent us particulars of their latest output of insulators and fittings for use on electric cranes and in the electrification of mines. The insulators are made of the firm's "Verus" compound, and insulated carriers and collectors for practically every condition of service are included. Among fittings may be mentioned a series of expanding bolts. The cone expanding nut has on it two projections, arranged to slide in the slots of the outer shell in such a way as to prevent the nut turning round. The outer shell is constructed of malleable iron with serrations on the outside. Two of the sides have grooves set at opposite angles of 45 deg., and the other two sides have concentric grooves. This method of arrangement prevents the bolt from turning round as well as from pulling out, when the shell is expanded in the hole. The bottom part of the shell is the same diameter as the outside of the serrations, so that the hole can be drilled parallel, and that the front part of the shell will fill the front of the hole. The washer provided has on its face projections which fit into a slot in the end of the shell. The external parts of the projection become embedded in the face of the wall or ceiling, so that turning cannot occur when the bolt is being tightened up.

As traffic congestion increases, and more and more severe demands are made for rapid electric transport, so are the trains on transmission gearing augmented—for quicker service is usually obtained at the expense of higher rates of acceleration and deceleration. At the same time it is essential that gear noises be kept at a minimum. To meet these conditions, Alfred Wiseman, Ltd., are now manufacturing gears and pinions of a special degree of hardness, but—it is claimed—free from distortion. Such gears and pinions are produced by two distinct methods. The first is to grind the teeth after hardening, the second is to use steel of a kind that can be hardened to a brinell of about 300, and have the teeth cut afterwards. Ground gears and pinions are supplied either split or solid, the split type being made from steel castings, and the solid type from forged steel containing 0·40% to 0·45% carbon. The pinions are always made from forged steel blanks, and both wheels and pinions are hardened and heat treated—after the teeth have been cut—to a brinell hardness of 450 to 500. The teeth are afterwards ground to within fine limits of accuracy. The maximum error of concentricity is stated to be 0·005 in. on gear wheels up to 30 in. diameter, and 0·002 in. on pinion wheels up to 12 in. diameter.

The alternative method—to have the teeth cut after the heat treatment of the steel—can be adopted in both the pinion and the gear wheel, or, if desired, the gear can be made in this form to mesh with a pinion produced by the other process. The more usual practice with the second type of wheel is to have a hardened forged steel ring shrunk on to a soft cast steel centre. The firm also supplies gear cases, paying particular attention to the fitting of the joints and to oiling arrangements. The gear cases are made in malleable iron, pressed steel, welded sheet steel or aluminium alloy. A form which is recommended as being strong and light is constructed of an aluminium-silicon alloy, said to possess a tensile strength of 12–14 tons, and an elongation of 12% in 2 in.

In connection with our remarks in THE ELECTRICIAN of November 8th, on the application of the thermal conductivity method of gas analysis to commercial purposes by the CAMBRIDGE INSTRUMENT CO., LTD. (of 45, Grosvenor Place, London, S.W.1), we give below some details of the way this method may be used to measure the percentage of sulphur dioxide in gaseous mixtures. Such measurement is necessary in various chemical processes, as for ascertaining the percentage of SO_2 in the gases given off from pyrite burners during the manufacture of sulphites and bisulphites. The gases from the burner pass through a cooler and are then by-passed, so that a sample flows past the meter, which is made of tin if there is any chance of moisture being present. There is usually a natural flow of gas which renders an aspirator unnecessary; a lead-lined acid-proof aspirator is supplied when needed. The rate of flow of gas over the meter is indicated on a bubbler, which is connected at the outlet of the system. Any traces of SO_3 in the mixture are removed before the gases reach the meter by passing them through a lead-lined filter.

Another application of the apparatus is the checking of the efficiency of the contact chambers in the contact process of manufacturing sulphuric acid. The method consists of measuring the SO_2 content in the ingoing gases, and in the gases which have passed the contact chamber and the SO_3 absorbers. Two meters may be used to give simultaneous measurements, and the results traced side by side on the chart of a recording instrument, or, alternatively, a single measurement may be made of the difference between the two compositions (that is, of the percentage of SO_2 converted) by using a differential meter, of which one cell is exposed to the entering, and the other to the effluent gases from the contact chamber. The outfit may be calibrated for a range of 0-8% SO_2.

ALLOY WELDING PROCESSES, LTD., of Ferry Lane, Walthamstow, London, E.17, claim that A. W. P. electrodes are of the type known as "flux-coated," with advantages not possessed by all electrodes coming under this heading. The wire used, after having been drawn from steel billets specially cast to the company's specification, is given a coating of nickel in accordance with the firm's patents. This coating it is claimed ensures that the surface is at all times free from rust or scale, it preserves the weld metal from oxide inclusions during the welding operation, and it adds to the tensile strength of the deposited metal, into which a good proportion of the nickel passes. To the nickel-coated rod is added asbestos in the form of an open spiral, and the flux is pressed into the spaces between the turns of asbestos. In electrodes for welding mild steel, the flux, we understand, need only be of a nature which enables it to act as a de-oxidiser; when, however, it is desired to produce electrodes to suit an alloy steel of known analysis, rare metals in powder form are employed, and these mix with the flux prior to extrusion. Such rare metals can be varied at will during manufacture to suit the analysis of the steel to be welded. During the welding operation the correct proportion of rare metals is imparted into the pool of molten metal at the arc, which is thus utilised as a miniature electric furnace to manufacture alloy steels.

Other Welding Plant.

A. W. P. also supply welding plant suitable for all conditions of supply. Special dynamos, which automatically give the necessary drop in volts—from the 60 V required to start an arc to the 25-30 required to maintain it—have also the features that the open circuit voltage can be adjusted from approximately 45 to 80 V and that the welding leads can be attached direct to the dynamo, the only essential separate apparatus being an ordinary shunt regulator.

The "Wagner" rubber-mounted motors, type RAR, distributed by WOLF AND MORGAN, LTD., of 66, Victoria Street, London, S.W.1, are claimed to be practically silent running. Originally designed for refrigeration, these machines fill the requirements of many other operations. They are available

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for d.c. and single-phase a.c. supplies, in sizes ⅛, ¼ and ½ H.P. The d.c. motors are compound wound, and the a.c. are of the repulsion start induction type. The torque developed at starting is stated to be five times the full load torque, with about 2·6 times full load current. The maximum running torque and the pull-up torque are quoted at approximately 260% and 225% respectively. The motors are totally enclosed, have a continuous rating of 40 deg. C. and are fitted with bi-metal yarn packed bearings; they are of the double voltage type. Rubber bushings are backed up with steel on all surfaces, in order to hold the motors securely against forces acting from any direction. The saddle has a channel section, and its base is insulated from the main part of the motor by rubber bushings, which are soft enough to absorb the small remaining portion of mechanical vibration, while at the same time they are firm enough to retain rigidity. Metal thimbles have large surfaces to avoid cutting the rubber bushings, the four thimbles being clamped to the end plates by screws, thus securing the motor firmly in the saddle. Dynamic balancing of the rotor is effected while it revolves at running speed; solder is added at one end and lead rivets are inserted in punchings at the other; the rotor is of large diameter and skewed to ensure freedom from magnetic noise. Governor weights are rubber-cushioned to prevent clicking sound.

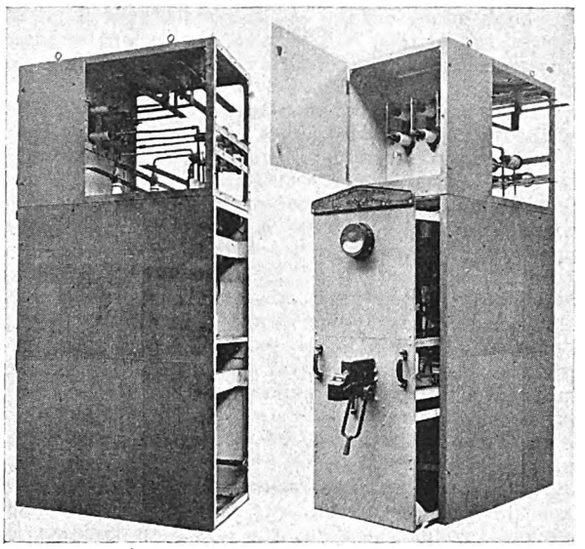
Those interested in battery charging will do well to take note of the equipment recently put on the market by NEWTONS OF TAUNTON, 6, Grape Street, Shaftesbury Avenue, London, W.C.2. The equipment is known as the Newton 8-hour taper charger, and operates on the constant potential system. It is capable of charging portable accumulators from 2 to 12 V. The generator is arranged for driving either by a universal motor or by belt. The principle of operation is that, if the initial voltage applied across the battery or batteries is correct, the increasing counter e.m.f. of the batteries will decrease the current flowing through them in an approximately suitable ratio to the proper values for current at any instant, provided the applied voltage is kept entirely constant. The constant voltages maintained across the busbars are respectively 16 V for charging 12 V units, and 8 V for charging 6 V units. Usually three busbars are supplied, 12 V being obtained across the outer pair and the middle bar acting as a neutral for 6 V charging. It is claimed that with the Newton method batteries in any condition can be safely charged. Much used, badly sulphated or new cells can be dealt with by using the current-limiting leads which are provided; the initial current thus being limited to a safe value.

The patented method of obtaining a constant potential involves the use of a magnetically insulated series field. The bottom pole piece of the bipolar machine is, it appears, split, and for each part a separate field coil is provided. One section of this subdivided pole is magnetically insulated by a special shield, on which the series turns are accommodated. The result is a compound wound machine of such a design that there is no possibility of a reversal of polarity.

Etching Equipment.

An electrical etcher is now being sold by the MARTINDALE ELECTRIC CO., LTD., of The Hyde, Hendon, London, N.W.9. This etching outfit is intended for making gauges, dies, gears, shafting and other articles made of iron or steel, and it is said to be much more satisfactory than the paraffin and acid method. The etcher consists of a transformer with three tops, ground wire and clamp for heavy pieces, contact plate for holding small parts, and handpiece with four writing points. The writing points are ordinary No. 8 copper wire, so that the cost of upkeep is negligible.

For certain conditions of operation it is essential to maintain continuity of supply, yet economic considerations may preclude the duplication of oil circuit breakers. To meet this need, FERGUSON PAILIN, LTD., of Bush House, Aldwych, London, W.C.2, have developed a special truck equipment which utilises an air break isolator to bypass the feeder oil circuit breaker and to maintain supply to the feeder via the bypass busbar and the bus coupler circuit. This scheme enables overhauling of the main switching equipment to be carried out in safety without shutting down, and still provides protection during the period of overhaul. This is accomplished by fitting over-current protection or over-current and leakage protection (if desired) on the bus coupler breaker, the trip coils or protective relay being energised from a multi-ratio current transformer in the same circuit. If the load on the feeders is well balanced, a single ratio current transformer can replace the multi-ratio transformer. As the switching equipment for the main circuit is on the movable portion, all the advantages of the truck principle are retained. For cleaning, inspection or repairs the truck can be withdrawn, after



Side front and rear views of the new truck type switchgear developed by Ferguson Pailin, Ltd.

the bypass circuit is completed, to a place set apart for the purpose.

From the photographs it will be seen that a standard truck cubicle is employed. The main busbars, however, are mounted with the bypass busbars in a detachable cubicle structure of steel, bolted on top of the truck housing. The bypass isolators, which are also located in this cubicle, are pole operated from the front, a hinged door facilitating access to them. The equipment is arranged for the usual methods of operation—either direct, manual, d.c., solenoid or motor control, with automatic reclosing features if desired. The truck is designed for two or three-phase systems up to 900 A at 11 000 V. It is 10 ft. 4¼ in. high, 3 ft. wide, 4 ft. 9 in. in depth, with an additional 5 ft. 0½ in. to withdraw the truck. The corresponding three-phase rupturing capacity is 100 000 kVA.

A new electric hat steamer for factory use is now being put on the market by the DOWSING RADIANT HEAT CO., LTD., of 93, Baker Street, London, W.1. The steamer, which is used for shaping felt hats, is small and compact, and is claimed to represent a great improvement over more elaborate and cumbrous equipment designed for the same purpose. It has two changeable steam-distributing parts: one consists of a pierced rose of large diameter with the support for the hat rising from the centre; the other is a wide-mouthed spout. The lower part of the steamer comprises what is essentially a specialised electric kettle. A gauge is provided to show the depth of water, so that there may be no chance of the container boiling dry. The loading is 800 W, with 2-heat control. Full heat is used for boiling up, while steam is maintained with a consumption at 400 W.

B.E.N. PATENTS, LTD. (92, Tottenham Court Road, London, W.1), have sent us particulars of the "Airline Lubrigun and Air Compressor Combination," which they are marketing in conjunction with TECALEMIT, LTD., who manufacture the Airline Lubrigun. The combination provides facilities both for high pressure greasing and for tyre inflation. It consists of a mobile unit, fitted with a ¾ H.P. a.c. or d.c. motor driving a compressor to give a maximum pressure of 150 lb., with a tank of 7 gals. capacity, tested to 300 lb. The compressor unit is equipped with the Airline Lubrigun, tyre hose and chuck. Control is by an electro-pneumatic switch, which limits the pressure range between 80 and 120 lb. The dimensions are: length 46 in., width 21 in., height 48 in. The weight is approximately 4 cwt.

New import duties upon goods imported into Australia include the following, under the British preferential tariff: On electric fittings and regulating and controlling apparatus, the new duty is 65% (formerly 33%); on ironclad moulded switches the duty is increased by 5s. each, or 20%; the basis of the duty on dynamo-electric machines is altered from 4% on 75 kW to £5 each on 125 H.P., plus 15s. per H.P. over 125 H.P., or 45% whichever is the higher.

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BOOK REVIEWS.

High Voltage Cables. By L. Emanueli. (London: Chapman and Hall.) Pp. vii+107. 8s. 6d. net.

This book originated in a course of lectures given by the author in the lecture hall of the Institution of Electrical Engineers last winter under the ægis of the University of London.

In outline it consists of an examination of cable dielectrics from the successive standpoints of the properties of paper and impregnating compound, shape of field in single and three core cables, the physics of impregnation, and the mechanical and electrical properties of the complete cable. Important physical properties of paper used for cable manufacture are its porosity, absorption and dryness, and in Lecture I these questions are treated very fully. The usual ingredients of impregnating compounds, mineral oil and resin are examined separately and as mixtures, on various physical and electrical grounds, in the second lecture, and some very interesting relationships shown. Lecture III reviews briefly certain well established facts in connection with the magnitude of stresses in cables, while in Lecture IV the actions which take place during impregnation of a cable and the effect of subsequent thermal expansion of the various components are analysed in an instructive manner. The two or three pages on gas films are also useful. As cables cannot be manufactured and laid out straight, the effects of bending are all important, and the final lecture deals at some length with the problems involved.

Considering its admitted limitations, there is little to find fault with in the book, although one would have preferred to see the original and usually accepted term "S.L." retained for the type of three-core cable in which each core is separately lead covered, and the absence of an index is a serious omission from any book claiming the attention of busy engineers. Although Mr. Emanueli's lectures followed within a few weeks of those given by Mr. Dunsheath at University College on the same subject, and the latter has recently published a book (Pitman) with the same title as that of Mr. Emanueli, there is very little overlapping between the two. We can commend both to our readers.

Die Ausbreitung der Elektromagnetischen Wellen. By Dr. A. Sacklowski. (Berlin: Weidmann.) Pp. xii+129. 6 marks bound; 4.5 marks in paper covers.

This book is a survey of the literature dealing with the practical aspects of electromagnetic wave propagation, undertaken by the author at the instigation of the Heinrich-Hertz-Gesellschaft. The last 36 pages are devoted to a bibliography of 474 papers which have appeared in various British, American and Continental journals up to March, 1928; while the book is substantially a digest of the bibliography. The subject is treated in two main parts: the measurement of field strength (methods, results and conclusions) and theories of wave propagation. After sketching in each case the underlying theories and formulas, the author discusses—by reference to the work of the several authors—the methods adopted to substantiate or refute the theories, the measurements taken to promote further investigation, and the conclusions drawn. Methods of measuring field strength are followed by a summary of the conclusions drawn concerning solar and meteorological effects on field strength and its daily and yearly fluctuation. The theories are stated in ascending order of complexity: Without a conducting layer, and with a plane or a spherical earth; with a conducting (Heavyside) layer with and without neglect of the earth's magnetism. As a digest of the consensus of opinion this work should prove invaluable to workers with an intimate knowledge of the practice of wave transmission. The bibliography alone will prove a great help to investigators.

G. Parker Smith.

BOOKS RECEIVED.

"Kurzes Lehrbuch der Elektrotechnik." By Adolph Thomälen. (Berlin: Julius Springer.) Pp. viii+359. 14.50 marks.

"A Text-Book of Illumination." By W. Kunerth. (London: Chapman and Hall. x+269. 15s. net.

"Elements of Electrical Engineering: A Text-Book of Principles and Practice." By A. L. Cook. 2nd ed. (London: Chapman and Hall.) Pp. x+584. 20s. net.

"Schaltanlagen für Drehstrom-Kraftwerke." By J. Waltjen. (Berlin: Julius Springer.) Pp. xvi+267. 39 marks.

"Electric Traction." By A. T. Dover. (London: Sir Isaac Pitman and Sons.) Pp. xx+719. 25s. net.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Generator Interference with Wireless.

[To the Editor.]

Sir,—Can you suggest a remedy for the trouble that we are experiencing. We have just opened a power station in a large village in Dorset. Our generating plant consists of two semi-Diesel engines driving two high speed dynamos (1 100 r.p.m.). Our cable network is all overhead carrying 220 V d.c. The trouble is that whenever we run our generating sets we cause severe interference to all wireless receiving sets within range. Would condensers across the brushes help?—I am, etc.

Q.

January 6th.

[*As interference is probably due to radiation as a result of commutator sparking, the connecting of high capacity condensers across the brushes should be tried. We shall be glad if any of our readers who have satisfactorily eliminated trouble of this kind will give our correspondent the benefit of their experience.*—Ed.]

Propagandist and Technical Advertising.

[To the Editor.]

Sir,—Mr. Tyson's letter is interesting and I thank him for the compliment.

I agree entirely that the editorial columns of a journal are more valuable for propaganda than are the advertisement pages. It is a question, surely, of each man to his own trade. The 60 ampere service is part of the biggest problem which confronts electrical engineering in the future, i.e., distribution of electricity. I remember reading in one of the electrical weeklies the following editorial comment on an article which appeared elsewhere—

". . . points out that the time is fast approaching when the generating and transmission will be in fewer hands and most of its readers will be concerned only with distribution. We cannot agree with the remark that the distribution system is practically ignored by the Technical Press."

Yet I read in another electrical paper—

". . for distribution is one of the most important elements in modern electrical development and one of the most neglected as regards printed propaganda and diffusion of technical knowledge."

It would seem then that it may after all, be a case of the tail wagging the dog!—I am, etc.,

J. F. Simmons.

London.

January 4th.

[*This is a matter in regard to which no attempt at exact demarcation of frontiers could hope to win general approval, but the subject is of interest from several standpoints and we shall be glad to print the views of correspondents who may be courageous enough to try to draw a boundary line.*—Ed.]

[To the Editor.]

Sir,—My congratulations on your excellent first annual review number. All the articles are of great interest, but I would like to raise one point in connection with the review of technical advertising written by Mr. J. S. Simmons. The writer has not touched on the general tendency toward modernistic typography. I admit that his article is meant only as a general review of technical electrical advertising, but we see such appalling examples of the wrong use of typography and entire disregard on the part of some advertisers of the elementary principles of layout that I wonder if you could persuade Mr. Simmons to deal a little more fully with this subject.

I have in mind a double page advertisement which appeared quite recently in one of the electrical journals, where, to me, the attempt at modernistic treatment ended in the grotesque.—I am, etc.,

J. Arthur Dunville.

London, N.

January 6th.

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NEWS IN BRIEF.

Temporary Wiring by Unskilled Persons—North-West Midlands Electricity Authority's Stock—Electrical Engineers Visit to Great Mountain Ash Colliery.

THE electrified extension of the Southern Railway linking Wimbledon and Sutton was opened for passenger traffic last Sunday.

Stoke-on-Trent Electricity Committee has been informed that temporary wiring has been erected by unskilled persons in order to give additional supply for purposes of a theatrical presentation. The consumer has been cautioned as to the danger of such procedure.

It is common for the iron frames of street boxes, in the course of wear and tear, to be above the level of the pavement, and thus constitute a potential cause of accident. The Westminster City Engineer has been instructed to confer with undertakers as to constructing street boxes without metal on the street surface.

Coventry Corporation proposes to instal internal telephones at the Council house, at an estimated cost of £715.

The "Daily Mail" Ideal Homes Exhibition will take place at Olympia, London, from March 24th to April 17th, inclusive.

Telephone subscribers in Moscow, were forbidden to telephone New Year greetings "in order not to overburden the system."

Blackburn Electricity Committee has decided to obtain tenders for the supply of cable, v.i.r. insulated wire, meters and lamps from manufacturers only.

At Tottenham Court Road station on January 3rd, an experiment was made with an escalator moving at 150 ft. a minute instead of the usual 90 ft. a minute.

The Western Union, Commercial, and French Cable Companies, state that 600 miles of new cable, costing over $500 000, will be necessary to mend the cable breaks caused by the earthquake off Cape Breton Island on November 18th.

During the present week £886 000 of the North-West Midlands Joint Electricity Authority's 5% stock, 1950–70, has been offered for subscription at 98½%. The stock is repayable on July 1st, 1970, but the authority reserves the right to repay the whole amount at par on or after July 1st, 1950.

Leeds Improvement Committee has received reports with respect to a competition amongst students at the City of Leeds College of Art for designs for lamp standards proposed to be erected in the Headrow. Premiums awarded are as follows:—1st, £8, Mr. J. L. Crowther; 2nd, £4, Mr. D. B. Smith; and 3rd, £3, Mr. E. Shepherd. Messrs. G. H. Foggitt and Mr. G. E. Carrier acted as adjudicators.

Catalogues of the British Industries Fair are already being sent to 10 000 business men in Europe, North America, South Africa, and the eastern coast of South America. The catalogues contain descriptions of the exhibits of 1 800 British manufacturers, with indexes in nine languages. The Fair will take place at Olympia, London, and Castle Bromwich, Birmingham, from February 17th to February 28th.

At a meeting of the Incorporation Society of British Advertisers, Engineering Section, at the Victoria Hotel, Deansgate, Manchester, on January 17th, at 2.30 p.m., Mr. A. H. Angers, general secretary, will speak on "Unnecessary Advertising Snags," dealing particularly with the negotiations in reference to standardisation of page size in the technical Press and the provision of circulation data. Non-members will be welcomed. Mr. J. Taffs, publicity manager of the English Electric Co., will preside.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated January 10th, 1880, the United States Lighthouse Board was asking for an appropriation of $50 000 to test the merits of electric light for lighthouse purposes.*

Illumination of London Bridge by electricity was being discussed.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of January 13th, 1905, reported the formation of an association of telephone subscribers in Paris to bring pressure on the P.T.T. administration to improve the service.*

An agreement had just been signed between the Italian Government and the Marconi Co. for the construction of a radio station at Coltano to communicate with Great Britain, the Netherlands, Eritrea and other countries.

* * *

TEN years ago THE ELECTRICIAN *of January 9th, 1920, remarked that there was already evidence that many electric supply undertakings would take advantage of the provisions of the Electricity (Supply) Act in order to form joint electricity boards.*

Hydro-electric schemes in the Grampians and on Dartmoor were being projected.

Chelmsford Corporation has instructed the Borough Engineer to provide for the use of electric power in his schemes relating to the sewage and water supply of Galleywood.

Mr. J. H. Parker, who recently resigned his appointment as borough electrical engineer of West Hartlepool, delivered a lecture on "The Future of Electrical Supplies" to the West Hartlepool Conservative Party Study Circle recently.

Under the auspices of the London Technical Group of the E.P.E.A., Miss Caroline Haslett, director of the Electrical Association for Women, lectured at the Institution of Electrical Engineers, London, on Tuesday on "The Place of Women in the Electrical Industry."

The Radio Corporation reports that its Transatlantic business has increased by half since the earthquake off Cape Breton Island in November.

Cable communication to North America has been restored on the Imperial cable between Porthcurnow, Cornwall, and Halifax, Nova Scotia.

Chester Corporation has decided to appoint a superintendent of the electricity showrooms to fill the vacancy caused by the resignation of Mr. W. H. Millatt.

Wakefield Corporation has instructed the Electrical Engineer in conjunction with the City Surveyor to prepare a scheme for the renewal of the lighting and heating installations at the town hall.

Imperial and International Communications, Ltd., announces that over 121 000 telegrams of Christmas and New Year greetings were dealt with in the United Kingdom at special reduced rates.

In a recent address to the Publicity Club of Glasgow, Mr. W. Imrie Smith described electric lighting of to-day as one of the greatest assets in all forms of publicity work. He said the range of electric lighting in advertising was an extensive one, culminating in the blatant sky sign which put its message across with a considerable degree of punch. The attraction of the bright light was deep-rooted in everyone, and the display man was finding that display lighting was one of the cheapest and best forms of advertising.

An Order in Council entitled the Merchandise Marks (Imported Goods) No. 5 Order, 1929, was made on December 17th. It requires, *inter alia*, imported scientific glassware and domestic, fancy and illuminating glassware to bear an indication of origin as from June 17th, 1930. The Order will apply to the goods at the time of sale and exposure for sale. In the case of scientific glassware it will also apply at the time of importation.

Members of the South Wales Branch of the Association of Mining Electrical Engineers have been invited to visit the Great Mountain Ash Colliery, Tumble, to-morrow (January 11th). A paper on "Some Considerations *re* Power Costs," will be read by Mr. S. T. Richards at a subsequent meeting at Swansea Royal Metal Exchange. The annual dinner will take place on January 18th. Particulars from Mr. H. J. Norton, hon. sec., 53/55, Tredegar Street, Cardiff.

Applications are invited for the following appointments: Senior technical assistant, with a knowledge of low power electrical machinery, in the Admiralty Technical Pool; mains engineer at Southend; installation superintendent in Barking U.D.C. electricity department; lady showroom assistant and demonstrator in Fulham electricity department; general manager of Johannesburg municipal electricity department; engineer, with mechanical and electrical experience, for Admiralty cordite works.

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PERSONAL.

MR. W. J. Wiles has resigned from the board of S. G. Leach and Co., Ltd., and joined the staff of Philips Lamps, Ltd.

Mr. and Mrs. W. E. Warrilow announce that they are now resident in their all-electric home, at Amber Way, Nancy Down, Oxhey, Herts. Telephone: Watford 1092.

Canterbury City Council has appointed Mr. Frank Eustace Lewis, the present assistant engineer, as city electrical engineer in succession to the late Mr. C. A. Blascheck.

Mr. F. Rostron, instrument sales manager of Ferranti, Ltd., has been presented with a chiming clock and an electric reading lamp on the occasion of his marriage.

It is understood that the Northern Ireland Government has secured the services of Mr. J. M. Kennedy as consultant to the Ministry of Commerce in connection with electrical development in Northern Ireland.

Mr. A. MacLean, who has been appointed chief assistant to the Sunderland borough electrical engineer, is a partner in the Newcastle firm of Mountain, Wood and MacLean, consulting engineers, who had charge of the electrical installation work at the North-East Coast Exhibition. Mr. MacLean was with the Newcastle-upon-Tyne Electric Supply Co. for nine years.

Mr. R. A. Chattock, who as already announced is retiring from the position of chief electrical engineer of the Birmingham electric supply department, which office he has held for over 25 years, was entertained to a complimentary dinner by the staff of the department on January 3rd. Mr. E. J. Jennings was in the chair, and over two hundred were present. During the evening Mr. Chattock was presented with his portrait in oils, painted by Mr. Bernard Munns, the presentation being made by Mr. F. Forrest.

It has been the custom for many years for the staff of the electricity works of Farnworth U.D.C. to meet the engineer and manager on New Year's Eve, and this year, Mr. A. J. Hutchinson and his wife were jointly presented by the staff with a cut glass rose bowl, and fruit basket, as a memento of the 25 years' service of the former with the council, two years as station superintendent, three years as chief assistant engineer to Mr. R. B. Leach, and 20 years as chief electrical engineer and general manager.

Mr. W. S. Naylor, who has been appointed chairman of the board of directors of the Chloride Electrical Storage Co., Ltd., in succession to the late Mr. William Bannister, has seen the growth of the company from a comparatively small concern to its present dimensions. Mr. Naylor received his early technical training at Finsbury College, where he came under the influence of the late Professor Sylvanus P. Thompson. In 1902 he was appointed assistant manager of the Chloride Co., and four years later became general manager, while in 1921 he joined the board of directors. (See page 49.)

Obituary.

MR. JAMES NICHOLLS OSBORNE, on December 28th, a director of the Paignton Electric Light Co.

MR. JOSEPH WILLIAM WILLMOTE, aged 80 years. He joined the engineering branch of the Electric and International Telegraph Co. in 1862, and had numerous inventions to his credit, including a quick-break electric light switch. He retired in 1909 from the position of Controller of Factories at the General Post Office.

PROFESSOR A. A. MICHELSON, aged 77 years. His experiments in physics were concerned especially with the interference of light and its exact measurement. It is claimed that Einstein's theory was based on the result of an experiment which Michelson made at Cleveland, Ohio, in the 'eighties in collaboration with the late Professor E. W. Morley. He was awarded in 1907 the Nobel Prize and the Copley Medal of the Royal Society.

MR. OTTO NUSSBAUMER, aged, 54 years. Twenty-five years ago he constructed an apparatus without connecting wires which could receive and make audible voices and music over short distances. Unable to obtain sufficient financial support, he abandoned experiments, and present-day wireless telephony owes no direct debt to him, as it is based on a different system. Two years before the first crystal set was put on the market Nussbaumer employed iron oxide crystals for a small receiving set, but he did not realise the importance of his discovery of the crystal's function, and took no step to make public his discoveries. Recogntion was first accorded him last year, when Professor Ettenreich, of Graz, placed his achievements on record.

BUSINESS ITEMS.

THE RELAY AUTOMATIC TELEPHONE CO., LTD., Relay House, Streatham Hill, London, S.W.2, has received an order from the Carlton Hotel, London, to equip the building throughout with a private automatic telephone system.

The MARCONIPHONE CO., LTD., 210, Tottenham Court Road, London, W.1, announces that it has decided that in future it will not supply any of its products to co-operative societies, and is addressing a communication to its wholesalers and retailers accordingly.

An agent in Eindhoven, Holland, desires to secure the representation of British manufacturers of wireless sets and parts, etc. The Department of Overseas Trade has further details. (Reference No. 22.)

The ENGINEERING AND LIGHTING EQUIPMENT CO., LTD., Sphere Works, St. Albans, Herts, announces the acquisition of the Pinnacle Switchgear and Fuse Co., of Weybridge, and payment of all outstanding accounts for goods sold should be made to them in due course, and payment for all goods delivered only on or after November 14th last will be made by them on their usual paydays—10th of each month. Orders and inquiries will be dealt with both from Weybridge and St. Albans in future, and the range of articles manufactured by the two works will be increased.

In view of the recent introduction in this country of golf clubs with steel shafts, WILD-BARFIELD ELECTRIC FURNACES, LTD., Elecfurn Works, North Road, London, N.7, point out that the leading American firms of steel golf shaft makers have for some time past been hardening these shafts in electric furnaces designed by them, and since the legalisation of the shafts in Great Britain, orders have been received for similar equipments for making in this country. These furnaces are of a very special design, and in addition to a new form of automatic control in regard to temperatuie, etc., there is also an automatic quenching device.

H.M. Trade Commissioner in New Zealand, Mr. L. A. Paish, reports that constant reference is being made by New Zealand firms to the catalogues of British manufacturers in his office, and many instances have arisen where connections with British firms have been opened up by this means. He would like to receive catalogues from British firms manufacturing certain lines, including electric refrigerating plant for domestic use, electric hand torches, electric household clothes- and dish-washing apparatus, wireless receiving sets, etc. The catalogues should be forwarded, postage paid, to His Majesty's Trade Commissioner, P.O. Box 369, Wellington.

The Department of Overseas Trade is informed that preparations are being made to hold a Radio Exhibition at Tokyo from March 20th to April 18th, 1930. The Department has received from the Commercial Counsellor a limited number of copies of a preliminary circular letter and summary of the scope of the exhibition, issued by the managing director of the broadcasting station, which it is considered may be of interest to exporters of apparatus used in connection with wireless transmission of sound, television, photography, cinematography, etc. The exhibition will have the support of the Japanese Ministry of Communications and it is hoped to obtain also the support of the Ministry of Education. The Japanese Customs have agreed that imported exhibits shall be admitted free of duty and without deposit against re-export.

Since advising us of their activities during 1929, the ENGLISH ELECTRIC CO., LTD., have received confirmation of two further important orders, both of which emanate from the Canadian market. The first order is for an 18 000 H.P. hydro-electric double overhung impulse turbine and 15 000 kVA 6 600 V, 60 cycle alternator, the speed of the unit being 300 r.p.m. and the effective head 1 010 feet. The set will be designed for an overspeed of 555 r.p.m. and is complete with two main valves of their cylindrical balanced type and a 250 kW auxiliary motor-generator set. The two runner wheels are overhung on the two ends of the extended generator shaft, the general arrangement being somewhat similar to that adopted for the units supplied by this company for the Bhira power house of the Tata Power Co. The unit has been ordered by the Vancouver Island Power Company through the English Electric Co. of Canada and will be installed in a power station on the Jordan River, British Columbia. The other order consists of a 6 000 kVA 6 600 V 60 cycles, 450 r.p.m. vertical shaft generator for water turbine drive for the Power Corporation of Canada for installation at Falls River power station near Prince Rupert, British Columbia. This machine has a direct coupled exciter and is designed for an overspeed of 900 r.p.m.

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THEATRE LIGHTING.

Electrical Equipment of New Wellington, N.Z. Theatre.

WHILE London and the provinces have been recently adding considerably to the ramifications of theatre-land, the Dominions have not been idle. The new "Majestic" theatre in Willis Street, Wellington, is one of the latest additions to the theatre world of New Zealand and is in the circuit owned by Messrs. Fuller-Hayward, Ltd. Nearly 70 000 yards of "Henley" cables were used for the electrification, ranging from 1·044 to 37·083, and over 1 200 yards of flexible cords of the same manufacture. The outside under-verandah lighting consists of nine 5-light fittings, each with five 75 W "Argenta" lamps, and the floodlighting was done with three "Westinghouse" type C.A. 14 chromilite floodlights each with a 500 W lamp and three type C.A. 16 chromilite floodlights each with a 1 000 W lamp.

Main Entrance Showcases.

In the main entrance eight showcases are provided along each side, each being lit with two "Holophane" reflectors with 150 W lamps. The main lighting is concealed above the showcases and consists of 64 (32 on each side) asbestos covered reflectors of the same manufacture and 150 W lamps. Colour screens are provided on the reflectors to allow of a wide choice of colour schemes. Each of the four standards along each side is fitted with a 100 W lamp. The lighting of the entrance foyer is concealed in a specially built cove around the ceiling, consisting of 178 reflectors with 100 W lamps and colour screens. One of the features is the specially designed plaque at the lift which is lighted by a spotlight. The lighting under the circle consists of thirteen 2-light enclosed fittings with 75 W lamps, and there is a small dome in the centre lit with 133 natural colour lamps in red, blue, green and amber, controlled from the main dimmer. The main dome is 52 ft. in diameter and has two specially built coves—the inner has 180 reflectors and the outer has 184. The sunburst over the stage is lit with 100 W natural colour lamps at the bottom and three rows totalling 126 reflectors. The proscenium arch is lit with 120 reflector units and a combination of colours and dimmer control gives a most pleasing effect. The curtain changes colour continually, as the footlights are operated from a special stage dimmer. On the stage are also three rows of battens, each 50 ft. long, equipped with 982 reflectors, and 200 W lamps and colour screens are provided. The balconettes (at either side) are lit with 12 reflectors fitted with colour screens. The orchestra can be flooded in colour from 10 to 1 000 W floods mounted behind the proscenium arch.

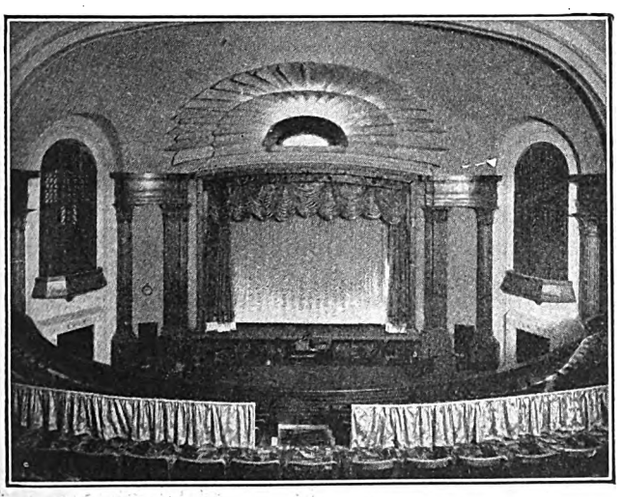
Glass Dancing Floor.

The tea lounge and cabaret are provided with a glass floor for dancing, lit from below with 109 colour screen reflectors, amber lamps otherwise used throughout. The whole of the auditorium lighting is controlled from a Ward Leonard dimmer in the operator's box, with a total capacity of 110 500 W. A separate and similar dimmer is installed on the stage with a capacity of 46 200 W.

A stand-by plant was provided, consisting of 36-42 H.P. twin cylinder, cold starting, direct injection crude oil engine direct connected to a 25 kW shunt wound 230 V 475 r.p.m. generator. This provides emergency lighting and enables the performance to be carried on in the event of failure of the main supply.

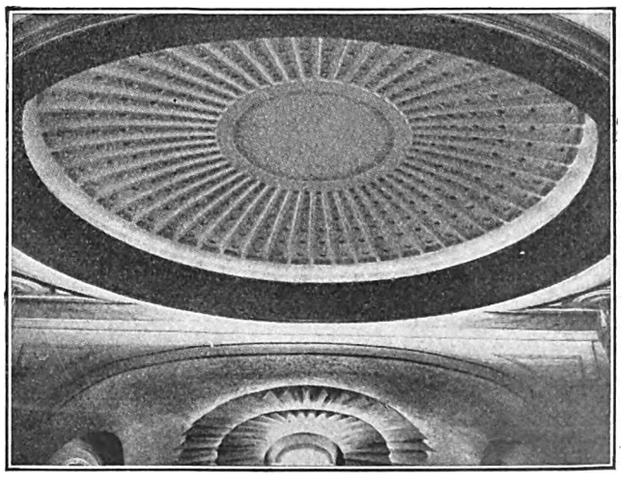
The lighting scheme was designed and the whole electrical installation carried out by Turnbull and Jones, Ltd., who manufactured the bulk of the luminaires, which comprised 36 chandeliers, 4 newels, 8 standards, 32 brackets, 150 feet stage battens, 40 feet footlight and 2 large imitation fires.

Some idea of the elaborate arrangements of the installation and the effective lighting schemes which have been introduced may be gathered from the photographs reproduced below, showing the stage lighting, the main dome and the stairway leading to the circle.



THE MAJESTIC THEATRE.

THESE views of the Majestic Theatre, the latest to be opened at Wellington, N.Z., show the effective lighting schemes which have been installed. The wiring of the building involved the use of nearly 70 000 yards of "Henley" cables and these pictures show some of the more striking of the lighting arrangements adopted. On the left is the stage, with its changing-colour curtain, and below, are, left and right, the lighting scheme for the stairway leading to the circle, and the main dome of the building floodlighted by over three hundred reflector units.



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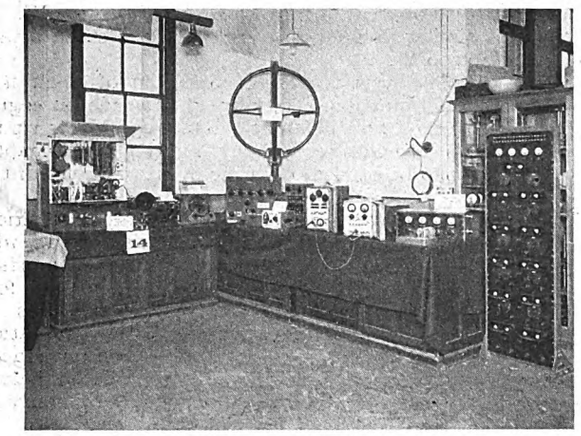
BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

ARMY CONTRACTS.—It is announced that tenders are invited from time to time for various goods, including cables, electrical plant, electrical and wireless stores, scientific instruments, etc., and manufacturers who are not already on the War Office list of tenderers may apply to the Director of Army Contracts, Caxton House (West), Tothill Street, Westminster, S.W.1, for form No. 1, on which formal application for inclusion on the list of tenderers may be made. Firms who wish to tender for the purchase of surplus machinery, scientific instruments, electrical and wireless stores, etc., should also apply to the director, at the same address.



THE stand of Marconi's Wireless Telegraph Co., Ltd., at the Physical Society's and Optical Society's Exhibition, which was held at the Imperial College of Science, London, during this week. A brief review of the exhibition is given on pages 34 and 35.

WEST RIDING EDUCATION AUTHORITY.—Electric light installation in Lofthouse Council School, Rothwell. Specification and plan from Mr. Percy Beaumont, West Riding Education Office, 8, St. John's North, Wakefield.

DUMFRIES CORPORATION, January 11th.—Electrical work in connection with erection of 32 houses at Milldamhead and Noblehill. Specifications from the burgh surveyor, Mr. John Barker.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 13th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (tender form H), and supply of electric lamps (form S). Forms of tender from the Borough Engineer.

DEWSBURY CORPORATION, January 13th.—Supply and erection of rotary convertor plant (1 500 kW and 500 kW). Specification, etc., from Mr. R. W. Grubb, borough electrical engineer, Bradford Road, Dewsbury.

ISLE OF MAN GOVERNMENT PROPERTY TRUSTEES, January 18th.—Electrical installation in Gronk Ruagh Hospital, Ramsey. Specifications from the Government Office, Douglas; deposit £1 1s.

STOKE AND WOLSTANTON GUARDIANS, January 13th.—Electric light and power wiring and fittings, in connection with new nurses' home, London Road Institution, Stoke-on-Trent. Specification, etc., from Mr. T. Wood, clerk to the Guardians, Union Offices, Stoke-on-Trent; deposit £3.

CLUTTON RURAL DISTRICT COUNCIL, January 14th–29th.—Electric light installations in 55 houses. Specifications, etc., from the engineer, Mr. J. Wayne-Morgan, 6, Church Road, Whitchurch, Cardiff, until January 14th.

HULL CORPORATION, January 14th.—Electric light installation at the Colony for Mental Defectives, Tilworth Grange, Sutton. Plans and specifications from Mr. D. Harvey, city architect, Guildhall, Hull; deposit £1 1s.

LONDON COUNTY COUNCIL, January 14th.—Electric light installation at the superintendent's house, Abbey Mills Pumping Station, Stratford. Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £1.

NORTHERN IRELAND GOVERNMENT, January 14th.—Twelve months' electrical supplies to the various Government establishments. Forms of tender and conditions of contract from the offices of the Ministry of Finance (Room 34), 15, Donegall Square West, Belfast; deposit £1.

ORSETT RURAL DISTRICT COUNCIL, January 14th.—Supply and installation of five sewage pumps with electric motors, float controls and switchgear. Specification and further information can be obtained from Mr. G. F. Andrassy, engineer, Council Offices, Palmer's Avenue, Grays, Essex, until January 14th.

DUNDEE CORPORATION, January 15th.—Supply of two 300 kVA outdoor type transformers and one 200 kVA outdoor type transformer. Specifications from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

BARMING HEATH MENTAL HOSPITAL, MAIDSTONE, January 16th.—Electrical installation, for lighting, heating, etc. Electrical energy will be supplied from the mains of Maidstone Corporation. Specification, etc., from Mr. E. E. Hoadley, Corporation Electricity Works, Maidstone; deposit £2 2s.

BIRMINGHAM GUARDIANS, January 16th.—Electrically-driven hydro-extractor, with motor and accessories; electrically driven glad iron, with motor and accessories, etc. Further particulars from the master, Mr. E. P. Hill, Erdington House, Birmingham.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 17th.—One year's supply of cables, electricity meters, cable terminal and other boxes, switches, wires, lamps and sundries. Specification, etc., from the Town Clerk, Municipal Buildings, Upper Street, London, N.1.

CHELTENHAM CORPORATION, January 18th.—Supply of electric light fittings, etc., for one year. Tender forms from Mr. J. S. Pickering, borough engineer. Municipal Offices, Cheltenham.

MANCHESTER WATERWORKS COMMITTEE, January 18th.—Supply and erection at Haweswater, Westmorland, of three 275 H.P. oil engines, direct coupled to three 200 kW d.c. generators, etc. Specifications, etc., from the Engineer, Waterworks Offices, Town Hall, Manchester; deposit £2 2s.

WEST RIDING COUNTY COUNCIL, January 18th.—Electric light installation in the mixed department of Riveton Park Council School. Specifications from Mr. A. Rayner, 151, Cross Hill, Ecclesfield.

Switchgear.

CENTRAL ELECTRICITY BOARD, January 20th.—Supply and erection of 3·3 kV, 6·6 kV, and 11 kV switchgear, for connecting the Board's supply to undertakers' busbars. Specification (N.W.E.—G.S.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

BELFAST GUARDIANS, January 21st.—Electric lighting installation in connection with alterations and additions to nurses' home at Belfast Infirmary. Specification can be seen and form of tender obtained on application to Mr. R. H. Wilson, clerk to the Guardians.

METROPOLITAN WATER BOARD, January 21st.—Supply and erection of four steam turbines, with pumps, and two electric generators, for Surbiton pumping station. Specification, etc., from the Chief Engineer (Room 173), 173, Rosebery Avenue, London, E.C.1; deposit £3 3s.

BATH CORPORATION, January 22nd.—Supply of 60 000 lb. boiler, 7 000 kW turbo-alternator, and e.h.t., h.t. and l.t. cables required during 12 months. Specifications, etc., from Mr. J. W. Spark, city electrical engineer, 7, Dorchester Street, Bath; deposit £2 2s.

HULL CORPORATION, January 22nd.—Supply and fixing of two 9 in. centrifugal pumps, with a.c. motors, switchgear, piping, etc. Forms of tender and other particulars from Mr. T. Thomas, city engineer, Guildhall, Hull; deposit, £1.

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GRIMSBY CORPORATION, January 23rd.—Manufacture, supply and erection of 10 000 kW three-phase turbo-alternator, with condensing plant. Specification, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby; deposit £2 2s.

LIVERPOOL CORPORATION, January 23rd.—Twelve months' supply of C.L.I. wrought-iron standards, brackets, etc., and No. C.L.2 c.i. lamp columns, and malleable c.i. pitching irons, etc. Tender forms from the City Lighting Engineer, 17, Highfield Street, Liverpool. State name and number of schedule for which form is desired.

LIVERPOOL CORPORATION, January 23rd.—Twelve months' supply of materials to the electric supply department, including cables, compounds and tapes (Form E.S.1), insulated cables (E.S.2), meters (E.S.3), incandescent lamps (E.S.5), a.c. motors and starting gear (E.S.7), electric cookers and kettles (E.S.11), etc. Tender forms from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

COMMISSIONERS OF H.M. WORKS, January 24th.—Erection of submarine cable jetty at Dover. Specification, form of contract, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit, £1 1s.

SLOUGH URBAN DISTRICT COUNCIL, January 24th.—Installation of two sets of motor-driven centrifugal pumps. Particulars and forms of tender from Mr. A. Bromley, water engineer, William Street, Slough.

NORWICH CORPORATION, January 28th.—Supply and erection of refrigerating plant at the Isolation Hospital. Specification, etc., from Mr. J. S. Bullough, city engineer, Guildhall, Norwich.

CENTRAL ELECTRICITY BOARD, February 1st.—Supply and erection of 33 000 V overhead transmission lines in South-East England. Specification (No. S.E.E.—S.L. 3) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

BLOEMFONTEIN MUNICIPALITY, January 10th.—Supply of automatic electric traffic signals (contract No. 5). (Reference B.X. 5 887.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 14th.—Two air compressors (capacity not less than 800 cu. ft. of free air per min.), and two electric motors. (Reference A.X. 8 784.)

POSTMASTER-GENERAL'S DEPARTMENT, January 14th.—Supply of copper, bronze, tinned copper and cadmium copper jointing sleeves (schedule No. C.547). (Reference B.X. 5 997.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of ringing motor-generator sets, for automatic telephone exchanges. (Reference B.X. 5 839.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of telephone indicators (schedule C. 518). (Reference B.X. 5 822.)

TENERIFFE (CANARY ISLANDS) MUNICIPALITY, January 14th.—Supply of tramcars, rails and tramway equipment. (Reference A.X. 8 872.)

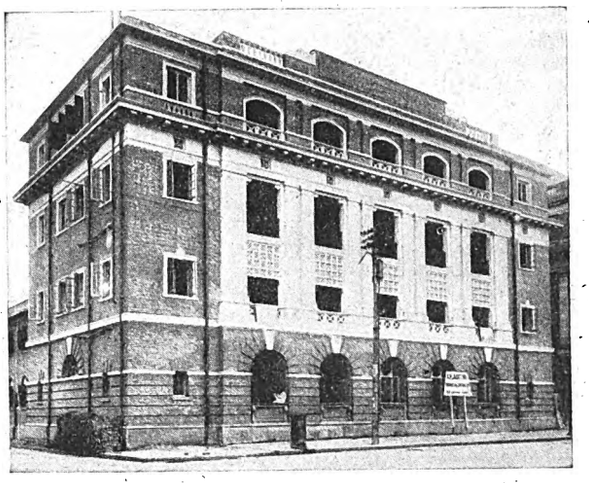
BELGIAN POSTS AND TELEGRAPHS, January 15th.—Supply 105 km. of cotton covered wire, 200 km. of corded two conductor wire, 1 200 km. of enamelled two and three conductor wires, 2 km. of 63-conductor telephone cable, and 50 km. of silk and cotton covered enamelled wire. Cahier des Charges Special, No. 3 456 (fr. 6¼) from the offices of the department, La Salle Madeleine, Brussels.

CAPE TOWN MUNICIPALITY, January 15th.—Supply of direct-coupled, electric motor driven, centrifugal pump for sewage works (specification No. 475/1 829). (Reference A.X. 8 836.)

COPENHAGEN MUNICIPALITY, January 15th.—Supply of two 6 000 V h.t. switchgear installations. (Reference B.X. 6 004.)

INDIA STORE DEPARTMENT, January 15th.—Supply of wood separators for train-lighting cells. Form of tender (5s.) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)



THE new police building at Lall Bazaar, Calcutta, where the electrical installation comprises 311 light and 115 fan points and three electrically driven centrifugal pumps for water supply. From the 440 V main service boards "Henley Wiring" sub-mains are run to ironclad H.O. type distribution boards supplied by the General Electric Co. (India), Ltd. As the building is in the same compound as other police quarters, the water pumping arrangements have been rearranged and centralised, two 10 000 gall. per hour filtered water pumps being supplied by Mather and Platt, Ltd., for use with an unfiltered water 3 000 gall. per hour pump by Worthington Simpon, Ltd. The electrical work was carried out by Geo. Rosamond and Co., to the specification of the P.W.D., under Mr. J. D. A. Vincent, executive engineer, Electrical Division.

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943). (Reference B.X. 5 879.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 16th.—Supply of telegraph material, comprising g.i. tubular cross arms, copper tapes and binders, galvanised steel spindles, etc. (Reference A.X. 8 990).

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 16th.—Supply of crude oil engine driven electric generating sets (tender No. 1 589). (Reference B.X. 5 926.)

WAITEMATA (N.Z.) ELECTRIC POWER BOARD, January 18th.—Supply of three-phase 11 000 V 50 cycle transformers. (Reference B.X. 6 027).

INDIA STORE DEPARTMENT, January 21st.—Supply of 43 205 battery cells, etc. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 21st.—Four electric motor driven ventilating fans. (Reference A.K. 8 857.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 21st.—Spare parts for automatic telephones. (Reference B.X. 5 917.)

SOUTH INDIAN RAILWAY CO., January 24th.—Supply of cables and accessories, in connection with Madras improvements. Specifications and forms of tender (£1, not returnable) from the Company's offices, 91, Petty France, Westminster, S.W.1.

NEW ZEALAND POSTS AND TELEGRAPHS, January 27th.—Supply of breastplate transmitters. (Reference B.X. 5 956.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 28th.—Supply of condensers. (No. P. and T. 151/2 087). (Reference B.X. 6 031.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates (Schedule No. C. 533). (Reference B.X. 5 899.)

DUNEDIN DRAINAGE AND SEWERAGE BOARD, February 1st.—Supply of two centrifugal or propeller pumps, with electric

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motors and accessories (contract No. 737). (Reference A.X. 8 961.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct-coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 3rd.—Supply of protector blocks (carbon and porcelain). (Reference B.X. 5 948.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

INDIA STORE DEPARTMENT, February 5th.—Supply of 30 000 wood separators for train lighting cells. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW ZEALAND POSTS AND TELEGRAPHS, February 5th.—Supply and delivery of indication alarm fuses. (Reference B.X. 5 947.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3.) (Reference B.X. 5 844.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T., 151/2 025). (Reference B.X. 5 955.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, February 13th.—Supply of electric tube butt welding set. (Reference B.X. 6 005).

LOUIS TRICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of distribution system (poles, conductors, transformers, meters, sub-station equipment, etc). (Reference B.X. 6 003).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of switchboard plugs (schedule C. 548). (Reference B.X. 5 998.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttleton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

BARNSTAPLE T.C.—Rowland Bros., steel gulley cart, £9 17s. 6d.

BARKING URBAN DISTRICT COUNCIL.—A.C.E.C., supply of cable, £1 800.

BOOTH STEAMSHIP CO., LTD.—Siemens Electric Lamps and Supplies, Ltd., supply of Siemens electric lamps for 12 months.

BOMBAY CORPORATION.—International General Electric Co., Inc., supply of an electric refrigerator, for medical college, Rs. 852.

BOOTH STEAMSHIP CO., LTD.—Siemens Electric Lamps and Supplies, Ltd., for supply of Siemens electric lamps for 12 months.

ILFORD CORPORATION.—Brush Electrical Engineering Co., Ltd., supply of three tramcar bodies, £1 270 each (recommended).

DONCASTER CORPORATION.—Building and Colliery Supply Co., Ltd., wiring 180 houses at intake for electric light, £742 10s.

HULL CORPORATION.—Ateliers de Constructions Electrique, supply of cable, for telephones department, £494 3s. 8d. (Recommended.)

DUMFRIES CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., main switchgear, etc., for the new turbo-alternator plant, £533 12s. 6d.

MIDLOTHIAN EDUCATION COMMITTEE.—Inveresk Electrical Engineering Co., Ltd., electrical installation in new Grammar School, Musselburgh.

WEST LOTHIAN EDUCATION COMMITTEE.—Fraser and Borthwick, Ltd., electric lighting installation in extensions at the Academy, Linlithgow.

POWELL'S RIVER CO. (BRITISH COLUMBIA).—S. Cameron Co., Ltd., equipment of first section of 17 000 H.P. hydro-electric station on Lois river.

LONDON COUNTY COUNCIL.—Dorman, Long and Co., Ltd., supply of tramway rails and fishplates during 1930-31, £53 896. Also tendered : Cargo Fleet Iron Co., Ltd., £54 828.

LONDON COUNTY COUNCIL.—Frodingham Iron and Steel Co., Ltd., supply of tramway conductor rails during 1930-31, £7 232. Also tendered : Dorman, Long and Co., Ltd., £7 600.

ROTHERHAM CORPORATION.—Hogan and Wardrop, supply of cable, £6 410 ; A. Reyrolle and Co., Ltd., supply of 5 h.t. switches, £128 each, plus £9 11s. 3d. per switch for automatic control.

BIRMINGHAM B.C.—Brightside Foundry and Engineering Co., Ltd., new fire main, heating, domestic and cold water services at Western Road House, £7 766 ; Reynolds and Bradwell, electric work, £1 739 2s.

UXBRIDGE URBAN DISTRICT COUNCIL.—Blackstone and Co., Ltd., 38 to 43 B.H.P. oil engine, to drive centrifugal pump, three electrically-driven vertical spindle pumps, etc., for Harefield pumping station, £1 897.

LEEDS CORPORATION.—English Electric Co., Ltd., supply of sub-station switchgear, £6 338 8s. ; Relay Automatic Telephone Co., Ltd., installation of automatic internal telephone system at the health department, £358 6s.

CAPE TOWN CORPORATION.—Auto Electric Supply (Cape), Ltd., supply of decorative lamps for the pavilions and pier, £162 10s. ; South African General Electric Co., Ltd., supply of motor-generator set, for bioscope at pavilion, £116.

H.M. OFFICE OF WORKS, ETC.—T. Glark and Co., Ltd., electric wiring at East Malling fruit storage testing station, and supply of ironclad switchgear, New Houses of Parliament, Stormont, Belfast ; Gaillard, Robinson and Co., electric light re-wiring, Bethnal Green (London) Museum.

GLASGOW CORPORATION.—John Thompson (Wolverhampton), Ltd., supply of six new boilers for the tramway department's Pinkerton power station, £90 327. After consultation with specialists, Municipal Transport Committee has reaffirmed recommendation to accept this tender.

GENERAL POST OFFICE.—Alton Battery Co., Ltd., enlargement of batteries, Fenny Stratford telephone repeater station ; Siemens Bros. and Co., Ltd., supply, drawing-in, etc , of cable, London-Gallows Corner ; Standard Telephone and Cables, Ltd., telephone exchange equipment, Wembley.

METROPOLITAN RAILWAY.—Westinghouse Brake and Saxby Signal Co., Ltd., re-signalling of line from Uxbridge to Rayners Lane. Contract includes supply and installation of 22 main colour light signals, fog repeater signals, 22 electric train stops, 50 condenser-fed track circuits, illuminated diagrams, a.c. relays, lever locks, apparatus cases, cable, line wire, insulation, etc.

BIRMINGHAM CORPORATION.—Etna Lighting and Heating Co., Ltd., electric lighting at Little Bromwich Fever Hospital ; R. H. Newton, extension of electric lighting system at Hartfield Crescent school ; Pritchett and Gold and E. P. S., Ltd., renewal of batteries at Salterley Grange sanatorium ; L. Scrutton, electric light installation at Hockley Welfare Centre ; Ellis and Ward, Ltd., installation electric lighting apparatus, at Gunter Road school ; George Ellison, Ltd., supply of switchgear ; Harland Engineering Co., Ltd., switchgear extension at Summer Lane station and Bourneville and Alma Street sub-stations ; General Electric Co., Ltd., switchgear for Chester Street sub-station ; conversion of turbo-alternator at Hams Hall power station from 25 to 50 cycles, and supply of 3 000 kW motor generator ; Davidson and Co., Ltd., erection of grit collecting plant at Prince's power station ; Thomas Piggott and Co., Ltd., works in connection with grit collecting installation at Prince's generating station ; Belliss and Morcom, Ltd., supply of motor-driven air-compressor for Hams Hall power station ; English Electric Co., Ltd., supply of frequency changers and switchgear.

TRANSFORMER EXPORTS.

With reference to the series of electrical export pictures which were reproduced on page 813 of the December 27th issue, our attention has been drawn to the fact that picture No. 6 illustrates a 33 000 volt transformer by Ferranti, Ltd., and not the English Electric Co., Ltd., as stated.

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WORK IN PROSPECT.

CARLISLE—New cinema to seat 2 000. Particulars, P. Browne and Sons, architects, Pearl Buildings, Newcastle-on-Tyne.

CARDIFF.—150 houses. Particulars, the City Engineer.

CAVERSHAM.—Rebuilding of "Star Inn." Particulars, Chas. Smith and Son, architects, 154, Friar Street, Reading.

CHARMINSTER.—43 houses. Particulars, Mr. F. J. Dolamore, Borough Engineer.

CLYDEBANK.—320 houses. Particulars, Mr. J. W. Johnson, town clerk.

CUPAR.—Additions to Bell-Baxter School. Particulars, Mr. G. Sandilands, architect, Education Offices, Kirkcaldy.

EPPING.—Remodelling of Church of England School. Particulars, Mr. J. Stuart, county architect, Springfield Old Court, Chelmsford.

GUILDFORD.—Shops and offices to cost £5 000. Particulars Mr. Fred Hodgson, High Street, architect.

HALESOWEN.—Extension, etc., of Halesowen Grammar School. Particulars, Mr. A. T. Butler, 31 Priory Street, Dudley.

HALIFAX.—New high school for girls. Particulars, Mr. A. C. Tipple, borough engineer, Halifax.

HARROW.—Extensions to Harrow Hospital to cost £22 478. Particulars, H. Neal, Ltd., Northwood, contractors.

HOUNSLOW.—89 houses. Particulars, P. Chase Gardener and Co., architects, Hounslow. 24 houses. Particulars, G. Wimpey and Co.—Factory. Particulars from J. Monro and Son.

LONDON (KENSINGTON).—24 flats. Particulars, the Borough Engineer, Town Hall, Kensington, W.8.

METHIL.—Additions to St. Agatha's R.C. School. Particulars, Mr. G. Sandilands, architect, Education Offices, Kirkcaldy.

NEW BRIGHTON.—Erection of Yacht Club, bandstand, etc., on Promenade Pier. Particulars, the Borough Engineer, Town Hall, Wallasey.

THE NATIONAL REGISTER.

Further Ten Names Added to the List of Registered Contractors.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on January 3rd, applications from twelve electrical installation contractors for registration were considered. Of this number two were declined and ten accepted, the names of the successful applicants being given below, together with their addresses :—

Douglas, Alan H., 434, Great Cheetham Street, Higher Broughton, Salford.

Burgess, Arthur, Old Street, Stalybridge.

Langley, F. W., and Co., Slippery Street, Broad Street, Hanley, Stoke-on-Trent.

Westaway, John, 10, Kenworthy Lane, Northenden, near Manchester.

Coupland, Victor, 761, Hessle Road, Hull.

Jones, Peter, Ltd., Sloane Square, London, S.W.1.

Cornall, Thomas, Ltd., 8 and 10, Haymarket Street, Bury.

Morgan, Edward G., Radio House, Ystrad Mynach, Glam.

Ive, Leonard J., 7, Clarendon Corner, Watford, Herts.

Coulehan, John C., 19, Percy Street, Hull.

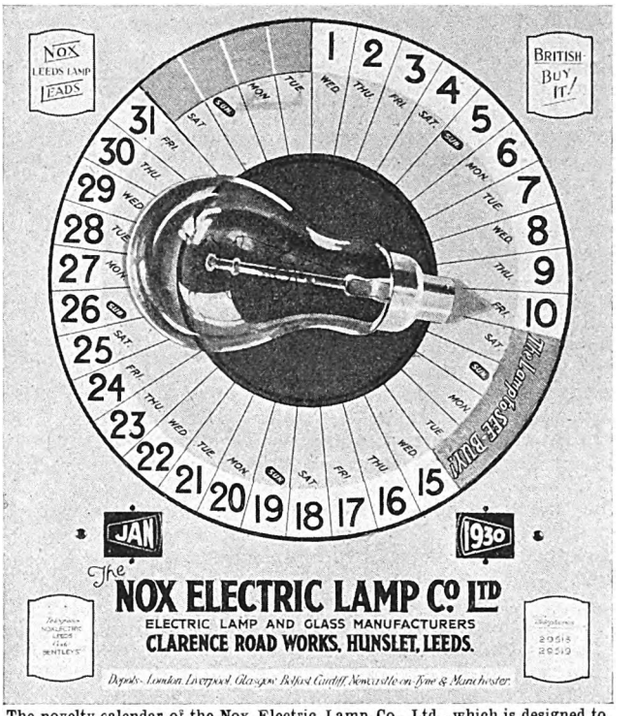
TRADE CALENDARS, ETC.

We have received 1930 calendars from the London Electric Wire Co. and Smith's, Ltd., Church Road, Leyton, London, E.10; Haslam and Stretton, Ltd., Thor Works, Tredegar Street, Cardiff; the United Steel Companies', Ltd., Sheffield (and diary); the Hart Accumulator Co., Ltd., Stratford, London, E.15 (and blotter); the Lea Recorder Co., Ltd., 28, Deansgate, Manchester (diary); the Wholesale Fittings Co., Ltd., 23, Commercial Street, London, E.C.; the Lancashire United Transport and Power Co., Ltd., 81, Renshaw Street, Liverpool, and Wm. Geipel, Ltd., 156, Bermondsey Street, London, S.E. (diary).

A calendar of outstanding originality has been received from the NOX ELECTRIC LAMP CO., LTD., Clarence Road Works, Hunslet, Leeds. This calendar, printed on tin, is arranged with variable indicators for months, years, figures and days, giving sufficient combinations to cover eleven years. The general appearance of the calendar will be appreciated from the illustration in the next column, while the colour scheme may be understood to be particularly attractive.

TRADE PUBLICATIONS.

A "UNIVERSAL" reference book containing over 200 pages and dealing with electrical appliances, heating, cooking, washing, cleaning, lighting for the home, commercial, industrial and shop window lighting, etc., has been published by L. G. HAWKINS AND CO., 30/35, Drury Lane, Kingsway, London, W.C.2.



The novelty calendar of the Nox Electric Lamp Co., Ltd., which is designed to last eleven years. See note on this page.

Three new publications by the MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, London, W.C.2, are leaflet No. 1109 describing type T.N.7 short wave transmitter, leaflet No. 1070/3 dealing with Type X.M.D.1a, 250 W fixed wavelength telephone sets, and leaflet 1108 concerning type Y.A.4 20/50 W portable equipment.

The SUN ELECTRICAL CO., LTD., 118, Charing Cross Road, London, W.C.2, has issued an abridged edition of the fittings catalogue. This has been produced in order to show the change in fittings designs since the issue of the main fittings catalogue, list No. 473, and whilst it does not completely replace that catalogue, the models illustrated in the new list are more in line with modern ideas.

"THE WIRELESS TRADER" YEAR BOOK.

New Edition with Many New Features—Summary of New Marconi Licence Terms.

THE sixth edition of "The Wireless and Gramophone Trader" Year Book and Diary has just been published. Revised and improved in many directions it provides a veritable encyclopædia of information—every page of which will be of value during 1930 to wireless and gramophone traders. A comprehensive summary of the new Marconi licence has been included, together with a list of the nineteen scheduled patents and a brief explanation of the nature and scope of each. Considerable gramophone trade information has been added, including a classified list of the various makes of records on the market, showing at a glance their manufacturers, labels, reference codes and prices. The trade lists have all been revised and corrected. In three of these sections, viz., the list of manufacturers' names and addresses, the classified buying guide section, and the alphabetical list of proprietary names—the wireless and gramophone trades have been combined instead of appearing in separate lists as in the previous edition of the Year Book. In the remaining sections (the alphabetical and territorial lists of factors) the wireless and gramophone trades have been kept separate. The Year Book is to subscribers 3s. 6d., post free, and to non-subscribers 5s. 6d., obtainable from the Trader Publishing Co., Ltd., St. Bride's House, Salisbury Square, Fleet Street, London, E.C.4.

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ELECTRICITY SUPPLY.

Llantarnam Supply Scheme—Loan for Assisted Wiring at Preston—Dewsbury's Bulk Supply—Inauguration of Withernsea Undertaking—Preferential Charges by Irish Electricity Supply Board—The Ben Nevis Pipe Line.

THE Electricity Commissioners have granted the Sevenoaks and District Electricity Extension Order.

Barnoldswick's electricity department has received 300 applications for supplies, and 259 houses and shops have been connected to the mains.

Barnsley Electricity Committee recommends a scheme for centre suspension lighting of streets, at an estimated cost of £600, at Dodworth Road.

Plymouth Electricity Committee, on December 31st, approved cable extensions in 18 streets and roads in Plymouth and Devonport, at a cost of about £2 881.

Llantarnam U.D.C. has decided to enter into an agreement with the South Wales Electrical Power Distribution Co. with regard to a supply of electricity for the district.

Marylebone (London) Electricity Committee recommends the provision of cables and switchgear at a cost of £20 500 in connection with future bulk supplies to Hampstead B.C.

Rotherham Electricity Committee has authorised the expenditure of such sum of money as may be necessary to increase the steaming capacity of the boilers at the electricity works.

The sanction of the Electricity Commissioners to the borrowing of £10 000 by Preston Corporation for the wiring of consumers' premises on the hire purchase system is being sought.

The electrification of the Llewellyn (Nixon's) Merthyr Vale colliery is being carried on with all possible speed, but delay had taken place with different landowners in connection with the transmission line.

Eastbourne Electricity Committee has referred tenders for distribution lines to East Dean and Friston to the consulting engineer, the lowest being that of W. T. Henley's Telegraph Works Co., Ltd., at £2 537 9s. 8d.

Southend T.C. has applied for sanction to borrow £12 000 for house services, £4 300 for reconstruction of the d.c. switchboard at the main generating station, and £100 000 in connection with the change over of the system.

Uxbridge and District Electric Supply Co., Ltd., has obtained land at the Middlesex Sanatorium Estate for the erection of a transformer chamber in connection with the proposed supply of electricity to Harefield Village.

Dewsbury T.C. has for many years taken a supply of electricity in bulk from the Yorkshire Electric Power Co., and has now decided to close down its own generating station and to purchase the whole of its requirements from the company.

The Torquay Extension (No. 2) Order has been made by the Electricity Commissioners, and Torquay electricity department has been instructed to make a survey and submit a scheme or schemes to deal with the additional area as soon as possible.

The West Lancashire R.D.C., which gives a supply of current in the Maghull and Lydiate areas, has obtained sanction to borrow £5 015 for the purchase of domestic apparatus for hire to consumers and £1 000 for the wiring of houses on the instalment plan.

The supply of electricity at Withernsea was recently inaugurated. The undertaking was promoted by the Holderness Trust, Ltd., some 18 months ago, and has been carried through by the South-East Yorkshire Light and Power Co. at an estimated cost of £40 000 to £50 000.

Bermondsey (London) Electricity Committee reports that the first 1 500 kW rotary convertor has been removed from the generating station and erected and connected in the new central electricity station. The dismantling and re-erection of the machine was carried out by the Council's own staff.

Dalkey U.D.C. has protested against the preferential charges proposed to be made in certain areas for the supply of electricity. In replying to a similar complaint by Ennis U.D.C. the Electricity Supply Board stated that the Board felt that where they had taken over existing stations they should reduce the cost of current.

Chester Corporation has adopted the Electricity Committee's recommendation to carry out the change-over of the system of supply from d.c. to a.c. during the next three years, at an estimated expenditure of £70 000, and to apply to the Unemployment Grants Committee for a grant of 50% of the interest on the capital expenditure.

The West Midlands Joint Electricity Authority has approved a £300 000 scheme for the distribution of electricity in the north-eastern sector of Shropshire. This embraces an area of over 100 square miles and affects a population of 68 000. The work will be commenced immediately sanction by the Electricity Commissioners is obtained.

Guildford Electricity Committee has decided to renew the cable supplying the Whitelanes district, where the demand is developing rapidly.—The Electrical Engineer recommends that in future the Corporation compensate consumers whose wireless eliminators are affected by the change in the system of supply, to the value of the eliminators affected.

Leeds Corporation has passed plans submitted by the Central Electricity Board showing the line of overhead cable proposed to be erected, extending from the generating station at Kirkstall to the city boundary in the directions of Bradford and Wakefield.—The Corporation has voted £20 000 for additional switchgear for the Kirkstall station.

Ripon Electricity Committee has decided to make a special charge in respect of residential hotels, where the minimum demand is 3 kW or more, at the rate of £9 per kW per annum, plus 1½d. per kWh, such special charge to apply to lighting only.—Mains are to be laid in Harrogate Road, at a cost of £1 523.—The Committee seeks sanction to borrow £3 000 for distribution mains.

It has been decided that a transforming station, under the South-East England Electricity Scheme, shall be established in Lodge Lane, Marylebone, in connection with the transmission lines from Walthamstow to Marylebone, via or with connections to Hackney, Poplar, Stepney, Shoreditch, Islington and St. Pancras; from Marylebone to Fulham; and from Grove Road to Marylebone.

Mr. C. H. Yeaman, city electrical engineer, Stoke-on-Trent, reports that all technical officers had been reminded of instructions previously issued regarding the necessity for cables to be laid at a safe distance from gas mains. It has been agreed that the employees of the electricity department be transferred to the North-West Midlands Joint Electricity Authority with effect from April 1st, 1930.

An application has been received by Dungannon U.D.C., from the Dungannon Gas Co., requesting the Council's consent to the granting of a special Order by the Electricity Commissioners to supply electricity in the urban district and the adjacent area. The Council, however, has consented to a similar application by Messrs. Graham Bros., Dromore. The Council is to have an option to purchase the plant within ten years.

Burnley Corporation has received a letter from the Electricity Commissioners suggesting the acceleration of electrical schemes to relieve unemployment. The electrical engineer, Mr. J. E. Starkie, has reported that work in connection with the change system of supply from d.c. to a.c. in parts of the area can be put in hand, at an estimated cost of £50 000. A committee is to consider and report upon the matter.

The Staveley Coal and Iron Co. has recently achieved a record at its electricity generating station at the Staveley works, 1 730 000 kWh having been generated in one week for light and power for works, collieries and housing estates. Nearly the whole of the electricity was produced by generators driven by the company's gas engines, which consume blast-furnace gas, and are said to be the largest of their kind in the world.

The Borough Electrical Engineer has reported to Tynemouth Electricity Committee that s substantial reduction both in charges for current and in meter rents has already been made, and the assessments of the electricity works have been enormously increased, with the result that the rates and taxes this year will be increased from £2 722 to £6 000. The Committee has, however, decided to make a further reduction of 6d. in all meter rents.

The remaining barrier of rock excluding the water of Loch Treig from the 15-mile-long tunnel through the Ben Nevis range was electrically fired last Friday by Mrs. Murray Morrison, wife of the managing director of the British Aluminium Co. Under our picture of the pipe line at Fort William in our last issue we referred to it, in error, as a part of the Grampian electricity scheme, instead of the British Aluminium Co.'s Fort William scheme.

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COMPANY NEWS.

Few Important Changes in Stock and Share Prices—New German Electrical Company —Telephone Manufacturers' Arrangement—New Companies.

NO very great activity is yet in evidence in the market for electrical shares—supply, transportation or manufacturing—and but few important changes have occurred in quotations since our tabular comparison last appeared, on the eve of the Christmas holidays. A feature has been the renewed weakness of the 7% cumulative preference shares of the British Electric Transformer Company. These stood a year ago at 15s., and for the last two or three months at about 2s. below that level. Just before Christmas they changed hands at 10s., and last week at as low as 9s. The English Electric Co.'s ordinary shares have recovered somewhat, and after having been below 4s. are up again to 5s., which, however, compares with 7s. 6d. at the beginning of 1929. Associated Electrical Industries ordinary have also recovered during the past week from 25s. 6d. to 27s., and Ever Readies from 18s. 6d. to 18s. 9d. Electric Construction debentures have put on over 4 points from 67 to 71½, and Edison Swan debenture stock is up from 82½ to 84½.

Hydro-Electric Securities opened this year weak, but this week have recovered to 40. International Holdings remain a shade over 5. Radio Corporation of America shares are under 44. The anticipated rise in Cables and Wireless stocks is a long while coming, and the only sign this week has been an improvement in the 5½% cumulative preference stock from 96 to 98½. Marconi Marine shares remain steady at 45s.

Calcutta Electricity Supply shares have been sold lately, and the price of the ordinary shares this week has fallen 3s. 9d. to 45s. 7½d.; and of the 5% cumulative preference shares from 21s. 3d. to 20s. Clyde Valley Power shares continue to sag, and are now at 35s., as against over £2 a couple of months ago. Metropolitan Supply ordinary shares have fallen during the past week from 37s. 6d. to 36s. 9d. London Power and Whitehall Investment debentures are both firmer. Lancashire 6% 1st preference are 6d. better at 27s. 6d., as also are Adelaide preference at 21s.

Underground Electric Railways Company of London ordinary shares have weakened from 21s. 6d. to 21s. London Electric Railway 4 per cent. debentures are 1½ points higher.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6½	" " C. Cum. Pref. ..	21/-	20/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	57/6	57/6	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	45/7½	49/4½	56/-	32/6
5	" " 5% Cum. Pref.	20/-	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	68½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	35/-	36/3	41/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	42/6	42/6	68/6	25/9
6	" " " " 6% C.P.	22/-*	22/-*	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " " 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	89	89	92	80½
—	Hydro Electric Securities ..	40	38½	87	20
—	International Holdings	5⅛	5⅛	35⅛	6⅛
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/6	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/-	27/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	26/-	26/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	98	104	95
10	Melbourne Electric Ord. Stk. ..	171*	171*	180	150
1/9½	Metro. Elec. Sup. Ord.	36/9	37/6	53/-	24/9
4½	" " " 4½% C.P. ..	17/-*	17/-*	18/3	16/3
6½	Mid. Counties E.S. Ord.	27/-	27/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	10½*	10½*	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	220	187½
(e)	St. James & P.M. Ord. (£1) ..	26/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
9	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. Loudon E.S. Ord.	25/6	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9*	18/9*	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92*	92*	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	57/6	57/6	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	86½*	86½*	85	70½
5	British Col. Elec. Rly. Pref. Stk...	89½	88½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	121½	121½	152	117
7·67	" " " " 6% Pf. Stk.	123½	123½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/6
5	" " " 5% Cum. Pf.	13/9	13/9*	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	77½
5	City & S. London, Cons. Ord. ..	67	67	64	52
4	" 4% Perp. Deb. ..	76½	76½	81	76
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71¼	71¼	75½	42½
4	" " " " 4% Pf. Stk.	71½	71½	77	68
4	" " " 4% Deb. ..	76½*	75*	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	50½	50½*	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	73*	73*	73½	62
5	" " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	62½	62½	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72	72	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	111½*	110½*	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	82½	82½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	68*	68*	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	21/-	21/6	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	27/-	25/6	58/6	26/3
8	" " " 8% C.P....	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	73½*	73½*	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	10/-	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	76/3	76/3	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	22/9	22/9	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-*	25/-*	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6*	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½*	82½*	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	21/-
4	" " 1st Mt. Deb. ..	71½	67	75	68
20	Enfield Cable Works Ord.	97/6	97/6	82/-	60/-
7½	" " " 7½% Cum. Pf.	26/3*	26/3*	27/9	24/6
—	English Elec. Ord.	5/-	3/9	15/9	5/-
—	" " 6% C.P.	7/6	7/6	18/9	7/-
—	" " Conv. Deb. ..	86*	88	103½	86
5½	" " 1st Mt. Deb. ..	69½*	69½*	107½	63
6	" " Conv. Deb. ..	69½*	69½*	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	18/6	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	46/3	46/3	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3*	11/3*	13/9	10/1
25	W. T. Henley's Ord.	118/9	118/9	120/-	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord.	25/-	25/-	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½*	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	225*	225*	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	61½	61½	63½	56½
6	" " " 6% Prefd. Stk...	101½	101½	105½	91
7½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	75½	75½	—	—
—	"B" Ord. Stk.	37½	37½	—	—
—	5½% Cum. Pref. Stk. ..	98½	90	—	—
3½	Eastern 3½% Pref. Stk.	62½	62½	70½	59
4	" 4% Deb.	70	76	81½	74
4	Eastern Extension 4% Deb. Stk.	76	76	80	74½
22	Great Northern Telegraph (£10)	29¾	29¾	43½	26
10	Indo-European (£25)	52½	52½	48½	30
—	International Teleph. & Teleg. ..	$75*	$75*	161½	48½
15	Marconi Int. Mar.	45/-	45/-	90/-	16/6
4½	New York Telep. 4½% Mt. Bds...	97½	97½	101	96
12	Oriental Telephone Ord.	38/9	58/9	65/-	41/-
—	Radio Corporation of America ..	43½	45	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	89½	82
4	Western Tel. 4% Deb. Stk. ..	77*	77*	82	76

(a) 19$\frac{5}{14}$d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. *Ex dividend. (g) 2s. 2$\frac{3}{4}$d. per share.

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Directors' Reports, etc.

PENN-OHIO EDISON CO.—Intm. div. on common stk. $\$\frac{1}{2}$ will be payable on Feb. 1.

COMMONWEALTH POWER CO.—Intm. div. of $1 on common stk. will be payable on Feb. 1.

ALTRINCHAM ELECTRIC SUPPLY, LTD.—Intm. div. 1s. $3\frac{6}{7}$d. p. 1s. dfd. sh. is announced.

NORTHERN OHIO POWER AND LIGHT CO.—Qrtrly. divs. of $1\frac{1}{4}$% on 6% pfd. and $1\frac{3}{4}$% on 7% pfd. are announced.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—Regular qrtrly. div. of 30 cents p. sh. will be payable on Jan. 15.

HYDRO-ELECTRIC SECURITIES CORPORATION.—Regular half-yearly div. of $2\frac{1}{2}$% (at rate of 5% p.a.) on shs. of "B" pfd. stk. will be payable on Feb. 1.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—The corporation has secured a controlling interest in the Compania Peruviana de Telefonos.

BRITISH COLUMBIA ELECTRIC RAILWAY CO., LTD.—A div. on 5% cum. perpetual pref. stk. for half-year ended Dec. 31 of $2\frac{1}{2}$% will be payable on Jan. 15.

ASSOCIATED TELEPHONE AND TELEGRAPH CO.—Qrtrly. div. of $1 p. sh. on class "D" stk and qrtrly. div. of $1 p. sh. plus additnl. and participatg. div. of 25 cents on class "A" stk. are announced.

BENGAL TELEPHONE CO., LTD.—Net pft. for year ended June 30, 1929, Rs. 798 209. Written off multiple jacks and switchboard cable in stores, Rs. 75 000; div., 8%; fwd., Rs. 56 203, agst. Rs. 32 897.

BRIDGWATER AND DISTRICT ELECTRIC SUPPLY AND TRACTION CO., LTD.—Transfer books of 7% cum. pref. shs. will be closed from Jan. 18 to 31, inclusive, for preparatn. of div. warrts. for half-year endg. Jan. 31, 1930.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has granted official quotations to 40 000 £1, fully paid, $6\frac{1}{2}$% cum. pref. shs. of Davis and Timmins, Ltd., and 5 313 £1, fully paid, ord. shs. of the Underground Electric Railways Co. of London, Ltd.

CHILI TELEPHONE CO., LTD.—It has been decided to change the company's financial year so that it shall end, in future, on Dec. 31. At next gen. mtg., early this year, accts. will be submitted covering period from Apr., 1928, to Dec. 31. Service of company continues to expand and number of subscribers is increasing.

NORTH AMERICAN CO.—Company has decided upon a 1930 constructn. budget calling for £11 400 000. £5 000 000 of new cap. has been raised, a large proportn. of which will be used for new hydro-electric statn. on Osage River, Missouri, wh. will cost about £6 000 000, and its initial capacity will be 129 000 kW.

LOCHABER POWER CO.—A mtg. of the proprietors will be held on January 28th, at 2.30 p.m., at Adelaide House, King William Street, London, E.C.4, to consider the Provisional Order, for which application has been made, to extend the time for completion of certain works authorised by the Company's 1921 Act, to extend the area of supply, etc.

EVER READY TRUST AND FINANCE CO., LTD.—Rpt. for period Nov. 14, 1928, to Dec. 31, 1929, states that, after meeting exes., rev. acct. shows blce. of £43 837, less income tax, £8 675. Written off prelim. exes., £11 040; placed to cap. res. acct., £9 536; fwd. £14 586. The div. on the 500 000 8% cum. pref. shs. of £1 each, fully paid, in Lissen, Ltd., has been credited in the accts.

STANDARD ELECTRICITATS GESELLSCHAFT A.G.—This company, which has a cap. of Mk. 25 000 000, has been formed by the International Standard Electric Corporation, New York, the A.E.G. and the Felten and Guilleaume Co. The new company holds the majority of shs. in the Ferdinand Schuchhardt Berliner Fernsprech und Telegraphenwerk A.G. and the Mix and Genest Aktien Gesellschaft, Berlin.

ASCOT DISTRICT GAS AND ELECTRICITY CO.—Under the Bill in Parliament deposited by the company it is proposed to convert the original ord. £10 shs. into consolidated sliding scale stk., and to convert into maximum div. stk. the 2 930 additional ord. 7% £10 shs. and the whole of the 3 000 6% pref. £10 shs. Maximum divs. stk. is to be entitled to a fixed maximum div. of 7%, unless div. paid on sliding scale stk. shall be at a less rate than 5% p.a., in which case a proportionate reductn. will be made. It is also proposed to create additnl. cap. to extent of £40 000, etc.

ARRANGEMENT BETWEEN TELEPHONE MANUFACTURERS.—A fusion of mfg. interests has been arranged between the Relay Automatic Telephone Co., Ltd., and the Sterling Telephone and Electric Co., Ltd. The mfg. facilities at Relay House, Streatham Hill, London, will be considerably augmented to deal with the dual output of the two companies, which will mfre. automatic telephone apparatus and manual telephone apparatus, respectively. Inquiries in connection with the Sterling Co.'s products should now be addressed to Relay House, Streatham Hill, London, S.W.2.

SOUTHERN CANADA POWER CO.—Erngs. for year ended Sept. 30, $1 001 812 net, agst. $855 073; divs. on pfd. stk. absorbed $298 538, agst. $297 063, and on common stk. $388 734, agst. $308 912. To depreciatn. res., $209 590, agst. $181 000. Fwd. $339 281. Number of connected customers increased from 23 552 to 25 543. Sales of merchandise departmt. amtd. to $416 344 agst. $302 000. Many new and importt. industries have been established in territory served by company. Output of electricity 154 528 950 kWh agst. 138 160 340. For first time company has earned approximately 5% on its assets.

PERAK RIVER HYDRO-ELECTRIC POWER CO.—In order to enable the company to complete its power scheme, the Federated Malay States Government has offered a loan of £850 000, carrying int. at the rate of 5% p.a. The loan will rank as a charge immediately after the first guaranteed debs., and will be repayable by means of a sinkg. fund. The terms of the loan provide that the company's articles of association be amended to confer voting rights on the 500 000 £1 pref. shs., which are all held by the F. M. S. Governmt., which will thus have votg. control by virtue of its holdg. of ord. and pref. shs. The terms also provide that the date of repaymt. of 7% deb. stk. be extended to July 31, 1961.

TATA HYDRO-ELECTRIC POWER SUPPLY CO., LTD.—Rpt. for year ended June 30, 1929, states that electricity sold amtd. to 102 000 000 kWh, agst. 114 000 000. Rev. Rs. 40 00 000 (agst. Rs. 45 00 000), net pft. Rs. 16 41 203 (agst. Rs. 21 44 592), ord. div. 7% (same), Rs. 1 012 written off brokerage on debs. and loss on investmts., Rs. 1 35 000 to depreciatn. on investmts.; fwd. Rs. 1 55 192, agst. Rs 5 63 224. In view of facts that all expenditre. on plant is met from rev. and that separate funds are maintained for dam amortisatn. and depreciatn. on investmts. and that depreciatn. fund has now accumulated to Rs. 68 56 592, directors are advised that depreciatn. allowance hitherto made of Rs. 7 50 000 is too high, and that it would be sufficient if Rs. 6 lakhs are set aside every year. The rpt. contains a confirmatn. of the recent announcemt. that the American and Foreign Power Co. has acquired a half sh. in the agencies of the four hydro-electric companies of which Messrs. Tata Sons are agents. The agencies will be transferred to "Tata Hydro-Electric Agencies." Total assets are Rs. 5 88 03 941.

ANDHRA VALLEY POWER SUPPLY CO.—Revenue for year ended June 30, 1929, Rs. 48 00 000 (agst. Rs. 52 00 000), net pft. Rs. 7 36 183 (agst. Rs. 6 56 285). Rs. 1 35 000 is provided for depreciatn. on investmts. and Rs. 7 777 written off loss on investmts. sold. Div. on pref. shs. 7% (same); div. on ord. 2% (same); tax free. Fwd. Rs. 29 188 (agst. Rs. 100 082). Electricity sold during year 114 000 000 kWh, agst. 118 000 000. In view facts that all expenditre. for maintenance, repairs or renewals is met from rev., and that separate funds are maintained for dam amortisatn. and depreciatn. on investmts., and that depreciatn. fund has now accumulated to Rs. 42 63 130, directors are advised that depreciatn. allowance hitherto made of Rs. 11 lakhs is too high and that it would be sufficient if Rs. 9 lakhs are set aside every year. Question of reducing rates to cotton mills in Bombay has been receivg. directors' attention for some time, and they have offered to them what amts. to about 10% reductn. in power rates, 20% reductn. in cost of plant supervisn. and 33% reductn. in minimum charge for power. Millowners are considering matter. Assets total Rs. 5 97 98 699. This is one of the four hydro-electric companies of which Messrs. Tata Sons have hitherto been agents. The American and Foreign Power Co. has acquired a half sh. in the agencies, which will be transferred to "Tata Hydro-Electric Agencies."

Company Meetings.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—Mr. G. E. Rowland, presiding at the meeting on December 31st, said constituted as a holding company, they were dependent upon their subsidiary companies for their revenue. The report showed that 11 companies made in the aggregate £235 596 profit, while two companies showed losses of £19 838, the result being that the subsidiary companies as a group traded at a profit of £215 758. During the six months to September 30th last each firm in their group traded at a profit. The

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companies deducted off the £215 758 profit, on plant, buildings and maintenance account, £71 033; for depreciation, £46 679; for writing down stock values, £41 900; for taxation, £6 341; and dividends and interest on shares and debentures held by outsiders in certain subsidiary companies, £15 837; leaving a balance £33 968. Two subsidiary companies did not last year write off any depreciation, as adequate provision had previously been made. Generally it could be stated that the concern recovered last year from the set-back that followed the coal lock-out of 1926, and that the progress prior to that date had been resumed. One satisfactory feature of the parent company's accounts was that its liabilities during the year were reduced by the substantial sum of £305 156, due largely to the completion of the sale of the Aldwych House property and of the sale of the debentures later issued to them. The export sales organisation is now in full operation. Their overseas branches in Argentina, Chile, India, Australia and Africa were making very satisfactory progress. A branch in New Zealand would be opened in January. The report and accounts were adopted.

BOGOTÁ TELEPHONE CO., LTD.—Mr. H. S. Bennett, presiding at the meeting on December 31st, said since the company became identified with the Cable, Telephone and General Trust, Ltd., in May last, an energetic policy had been adopted to supply service to the waiting applicants in Bogotá, and to plan for the future, so that Bogotá would have a telephone service of the highest order, which the city's importance and size warranted. For the purpose of expediting the completion of the work of installing the new switchboard in the main exchange, and also of laying and connecting up the underground cables through which the lines to the subscribers' premises pass, the engineering staff in Bogota had been doubled in size, and part of the new switchboard was already in use. During the year now under review approximately 1 000 new stations were added and for the first five months of the current financial year they had already connected up almost a like number of new stations, and they were confident that practically all the waiting subscribers would be connected up after the completion of the installation of the switchboard in March next. An addition has also been ordered for the new Chapinero exchange. In addition to the foregoing, an engineering survey had been completed and plans were in preparation for the supply of adequate equipment to meet the demand for the next ten years. Also an arrangement has been made with the Cia. Telefonica Central for connection between the Bogotá local system and the long-distance toll lines now under construction, so that their Bogotá subscribers would be provided with facilities for through communication with the important seaport of Buenaventura and also with the intermediate cities of Cali, Manizalés, Ibague, and Girardot. The future earning capacity of the company must depend largely on their ability to obtain an increase in the present tariff rates, and in this connection he had no further news to convey. The Bogotá Municipality was essentially a body of progressive business men who had the interests of their city at heart, and as the telephone service played such an important part in modern progressive business development, it was only to be expected that the municipality would permit them to earn a revenue which would show an adequate return on the heavy capital outlay necessary in bringing the service into the highest class.

New Companies.

DALE'S, LTD.—Cap., £500. Electrical and wireless engineers, etc. Reg. office: 155, Dale Street, Liverpool.

E. ROWLAND AND CO., LTD.—Cap., £3 000. Electrical and wireless dealers, etc. A director, E. Rowland, Chadleigh, Cecil Road, Ashford Common, Middlesex.

TREE-TOP ELECTRICAL SERVICES AND SUPPLIES, LTD.—Cap., £2 000. Electrical engineers, contractors, etc. Reg. office: 46, Gordon Street, Glasgow, C.1.

LOW PRESSURE LAMPS, LTD.—Cap., £100. Manufacturers of and dealers in incandescent electric lamps, arc lamps, etc. Reg. office: 36, New Broad Street, London, E.C.2.

AIR-WAY, LTD.—Cap., £20 000. Manufacturers of and dealers in electrical apparatus, appliances, parts and accessories, etc. Reg. office: 15/19, Cavendish Place, London, W.

V. W. CO., LTD.—Cap., £300. Welders, engineers, manufacturers, importers and exporters of wireless apparatus, etc. Reg. office: 192, High Street, Stratford, London, E.15.

PEMBROKESHIRE ELECTRICAL POWER & DISTRIBUTION CO., LTD.—Cap., £100. Suppliers and distributors of electricity. Solicitor: J. E. M. Crouther, 15, Abingdon Street, London, S.W.1.

LEICESTERSHIRE AND DERBYSHIRE TRACKLESS HARE CO., LTD.—Cap., £500. To acquire licence or licences to use electric hares, etc. A director: A. A. Allgood, 1, Market Place, Whitwick, Leics.

BATTERY SERVICES, LTD.—Cap., £1 000. Manufacturers and repairers of motors, magnetos, dynamos and other electrical equipment, etc. Reg. office: 98a, New Bridge Street, Newcastle-on-Tyne.

JOHN LINTON AND CO., LTD.—Cap., £300. To acquire the business of an electrical and mechanical engineer heretofore carried on by J. R. W. Linton at Sale, Ches. Reg. office: Newstead, Northenden Road, Sale, Ches.

SWINDON RADIO RELAY EXCHANGE, LTD.—Cap., £2 300. To construct and maintain wireless signal stations for reception or distribution of wireless or radio signals or waves, etc. Reg. office: 14, Victoria Road, Swindon.

CONRAD PARLANTI, LTD.—Cap., £1 000. Architectural craftsmen, etc. A director: S. Grundy, Woodbank, Teddington Park Road, Teddington, electrical engineer. Reg. office: Somerset Works, Somerset Road, Teddington.

MIDWINTER AND CO., LTD.—Cap., £1 500. Finance brokers, business consultants, etc. A director: S. C. Midwinter, 1, Palgrave Mansions, Devonshire Place, Eastbourne, electrical engineer. Reg. office: 265, Strand, London, W.C.2.

MYCALEX (PARENT) CO., LTD.—Cap., £25 000. To acquire certain patents and the trade mark "Mycalex" used in connection therewith; to carry on business of manufacturers of and dealers in mica, mycalex and all kinds of insulating material, electrical engineers, etc. Solicitors: F. P. Woodcock, 5, Holborn, London, E.C.1.

C. H. THOMPSON, LTD.—Cap., £500. To acquire business of Thompson and Mitchell and Northern Arch Electric Welding Co., carried on by Mrs. E. H. Hilton and W. R. Ingoe at Booth Street, Middleton Junction, Lancaster, and to carry on the business of engineers, welders, etc. Reg. Office: Booth Street, Middleton Junction, Lancaster.

J. M. PIRIE AND CO. (LONDON), LTD.—Cap., £6 000. To acquire the business of architectural metal workers carried on by J. M. Pirie and Co., Ltd., and/or N. T. Holme, and to carry on same and business of manufacturers and designers of electric light fittings, etc. Solicitors: Stow, Preston and Lyttelton, 12, Lincoln's Inn Fields, London, W.C.2.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

OSCILLOPHRAGM.—503 122. Class 8. Wireless telephonic loud speakers. Graham Amplion, Ltd., St. Andrews Works, Slough; manufacturers of Wireless Apparatus and loud speakers. May 28th, 1929. (By consent.)

505 073. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but including electric cables or kinematograph films, and not including any goods of a like kind to kinematograph films. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. August 6th, 1929. To be associated with No. 472 162 (2 536) and others. Registration of this trade mark shall give no right to the exclusive use of the letters "L.E.C."

ANTHYGRON. 506 888. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Siemens-Schuckertwerke Aktien-Gesellschaft, 101 to 110, Nonnendamm-Allee, Berlin-Siemensstadt; manufacturers. October 14th, 1926. To be associated with No. 506 886 (2 697) v and others.

HUM-DINGER.—503 668. Class 8. Fixed and variable electrical resistances. Claude Lyons, Ltd., 76, Old Hall Street, Liverpool; manufacturers. June 14th, 1929.

GRAMPLIFIER.—507 160. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching Harold Edgar Du Pre, 42, King Street, Jersey; merchant. October 23rd, 1929.

UFATONE.—507 393. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including gramophones. Universum-Film Aktiengesellschaft, Kochstrasse 6 and 8, Berlin, S.W.68; manufacturers. October 31st, 1929. To be associated with No. 507 392 (2 699) i and another. (By consent.)

CHROMALOX.—498 282. Class 13. Electric immersion heaters; and heating devices in the form of strips and rings, being parts of electrical heating apparatus; all being metal goods not included in other classes. Geo. Bray and Co., Ltd., Bagly Works, Leicester Place, Leeds; lighting engineers. December 20th, 1928. To be associated with No. 490 053 (2 614), xviii.

DYALMO.—505 352. Class 6. Electric lighting, power and ignition machines and parts thereof for motor vehicles and cycles. The M-L Magneto Syndicate, Ltd., Victoria Works, West Orchard, Coventry; manufacturers. August 16th, 1929.

SOLAR.—502 340. Class 8. Wireless telephonic apparatus, gramophones and parts thereof, and gramophone records, but not including electric batteries or accumulators, and not including any goods of a like kind to any of these excluded goods. The British Homophone Co., Ltd., 67 to 69, City Road, London, E.C.1; manufacturers. May, 1st, 1929. To be associated with No. 503 112 (not yet advertised).

S.P. (Sign).—504 861. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Siemens Planiawerke Aktien-Gesellschaft für Kohlefabrikate, Herzbergstrasse 128 to 137, Berlin-Lichtenberg; manufacturers. July 29th, 1929. To be associated with No. 504 862 (2 698), xviii and another. (By consent.)

PENTECTOR.—507 888. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Lissen, Ltd., Lissenium Works, Friars Lane, Richmond, Surrey manufacturers. November 18th, 1929.

KAPPIT.—507 455. Class 8. Electric cables. Callender's Cable and Construction Co., Ltd., Hamilton House, Embankment, London, E.C.4; manufacturers. November 4th, 1929.

PHOTOMIRENTA.—505 349. Class 13. Electric lamps and electric lighting fittings, all being metal goods not included in other classes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Emmasingel 13d, Eindhoven; manufacturers. August 16th, 1929. (Date claimed under International Convention, April 23rd, 1929.)

PHILILUX.—505 343. Class 13. Electric lamps and electric lighting fittings, all being metal goods not included in other classes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Emmasingel 13d, Eindhoven; manufacturers. August 16th, 1929. (Date claimed under International Convention, April 23rd, 1929.) To be associated with No. 505 345 (2 698) and others.

PHILIARAY.—505 345. Class 13. Electric lamps and electric lighting fittings, all being metal goods not included in other classes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Emmasingel 13d, Eindhoven; manufacturers. August 16th, 1929. (Date claimed under International Convention, April 23rd, 1929.) To be associated with No. 505 343 (2 698) and others.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CAMDEN ELECTRICAL CO., 163, Camden Road, Tunbridge Wells, electrical engineers. £16 4s. 1d. November 4.

CASTELLINA CO. (1926), LTD., 9, Hallam Street, Great Portland Street, W., electricians. £11 13s. 2d. November 19th.

COATES, Dennis, Anson Street, Rugeley, wireless dealer. £17 13s. 5d. November 20th.

CROOK, Robert, Isherwood, Hammonds Yard, King Street, Huddersfield, electrical contractor. £16 15s. 6d. November 19th.

DOWLING AND PRIMAVESI, 14/16, New Rents, Ashford, electrical engineers. £23 0s. 6d. November 21st.

FERRIDAY, L., Empire Arcade, Stockton, wireless dealer. £33 2s. November 12th.

FERRIS, Mr. L., 14, St. Mary's Place, Newcastle-on-Tyne, magneto agent. £25 1s. 8d. November 22nd.

INGHAM, George, 128A, Town Road, Rodley, Leeds, wireless dealer. £22. November 6th.

JACKSON AND CO., 54, Broadway, Leigh-on-Sea, electrical engineers. £16 8s. 2d. November 19th.

OVERTON AND SON, 139, Canterbury Street, Gillingham, wireless dealers. £10 16s. 6d. November 5th.

RAMSDEN, Mr. W., 37, Hollins Park Mount, Roundhay, Leeds, electrical contractor. £47 7s. 11d. November 20th.

RIVER RADIO, Petersham, wireless dealers. £13 18s. 5d. November 6th.

ROBERTS, T., 125, Upper Commercial Street, Batley, wireless apparatus dealer. £10 6s. 9d. November 25th.

SENIOR, Stewart, 961, Abbeydale Road, Sheffield (trading as SENIORS WIRELESS STORES), wireless dealer. £22 4s. 7d. November 15th.

STEGMAN AND CO., Brighton Railway Approach, Clapham Junction, electrical engineers. £15 7s. 4d. November 6th.

SYKES, William, 62, Bolton Road, Ramsbottom, electrical contractor. £15 19s. November 20th.

Receivership.

HARMONY, LTD.—A. G. Cox, of 7, Duke Street, Adelphi, W.C. was appointed Receiver on December 18th, under powers contained in debenture dated June 22nd, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Registered December 21, £400 000 debentures, inclusive of £286 000 already registered (secured by Trust Deed dated December 10, 1929); general charge. *£286 000. March 12, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

FREEZONE, LIMITED, electrical refrigerator manufacturers, 839, Harrow Road, Willesden Junction. A meeting of the creditors in this voluntary liquidation was held on January 3rd at the offices of Barton, Mayhew and Co., C.A., Alderman's House, Alderman's Walk, Bishopsgate, London, E.C.2, when it was reported that liabilities amounted to £7 516 and assets, after allowing for the mortgage on the premises and for preferential claims, were £4 512. The assets consisted of leasehold properties, £2 537; plant and tools, £237; furniture, £66; stock in trade, £1 727; debtors, £500; and cash at bank, £105. The mortgages on the premises were £510; whilst the preferential claims absorbed £150. It was reported that the present position had been brought about by lack of capital and for some time past the company had been endeavouring to obtain liquid resources. Negotiations were pending for a possible offer for the business as a going concern, and if expectations were realised, there would be 20s. in the £ for the creditors. Unfortunately, the matter could not be decided one way or the other until the beginning of February, and the directors had adjourned the shareholders' meeting in order that the creditors could consider the position. The product of the company was well-known but owing to a lack of money it had been impossible to carry out an advertising campaign. It was decided that the meeting should be adjourned for six weeks in order to see whether the negotiations could be carried through.

London Gazette, etc.

Winding-up Petition.

SYMPHONY GRAMOPHONE AND RADIO CO., LTD. A creditors' petition for winding-up has been presented by the Plessey Co., Ltd., Vicarage Lane, Ilford, Essex, electricians, electrical engineers and manufacturers, and is to be heard at the Royal Courts of Justice, Strand, W.C.2, on January 20th.

Companies Winding-up Voluntarily.

TALGARTH ELECTRIC SUPPLY CO., LTD.—By special resolution, December 27th. H. Ashton, Victoria Hall, Llandrindod Wells, corporate accountant, appointed as liquidator.

UNIVERSAL ACCUMULATORS, LTD.—By special resolution, December 31st. C. A. Frith, appointed as liquidator.

Bankruptcy Information.

JAUNDRILL, Alexander, 21, Duke Street, St. Helens, Lancaster. radio and gramophone dealer. Receiving order, January 2nd, Debtor's petition.

Notice of Dividend.

GARNETT, William Terrell, trading as W. T. GARNETT'S CABLE Co., Barkerend Mills, Bradford, electric cable and wire manufacturer. Supplemental dividend, 4⅜d. per £, payable January 11th, Official Receiver's office, 12, Duke Street, Bradford.

Notice of Intended Dividend.

BARNETT, Timothy, 934, Woodborough Road, Mapperley, lately 622, Mansfield Road, Sherwood, Nottingham, electrical contractor. Last day for receiving proofs, January 20th. Trustee, R. B. Rhodes, 18, Low Pavement, Nottingham.

Partnership Dissolved.

LEWIN AND MURRAY (Arnold LEWIN and John Thomas MURRAY), electric light, heat and power engineers, 3, Lord Street, Halifax, Yorks, by mutual consent as from December 31st, 1929. Debts, received and paid by A. Lewin, who will continue the business under the style of A. Lewin and Co., Ltd.

Application for Discharge.

WORSNIP, William, 36, Market Hall, Walham Green, London, wireless dealer. Hearing, January 28th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Order Made on Application for Discharge.

HOLMES, Harold, 60, Ward's End, Loughborough, Leicester, sanitary plumber and electrical contractor. Discharge suspended for two years until December 4th, 1931.

METAL AND CHEMICAL PRICES.

		TUESDAY, January 7th. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 10 0	£1	
Electro Wirebars	,,	£83 15 0	5s.	
H.C. Wires, basis	per lb.	11d.	—	¼d.
Sheet	,,	11 11/16d.	—	
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2d.	—	⅛d.
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅜d.	—	—
Wire ,,	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	5s.
Foreign or Colonial	,,	£21 7 6	—	5s.
Tin—				
Ingot	per ton	£175 2 6	-	2s. 6d.
Wire, basis	per lb.	2s. 4½d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 10 0	—	5s.
Mercury	per bottle	£23 5 0	5s.	—

Sulphur—Flowers, Ton £12 0 0 Roll, ,, £10 10 0 *Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Copper Sulphate* .. Ton £25 to £25 10 0 *Boric Acid* (Crystals) ,, £30 0 0 *Sodium Chlorate*—Per lb., 2½d. *Sodium Bichromate*—Per lb., 3½d.

Rubber—Para fine, 8¼d.; plantation, 1st latex, 7 15/16d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

The market has been subject to holiday influences, and according to James Forster and Co. little business has been transacted during the past fortnight. No new feature has arisen except a sudden advance of 5s. per ton in the December position on the last day of the year. The American market is quiet, with the price unchanged at 6·25 cents per lb.

Closing prices on January 3rd were £21 8s. 9d. for January, £21 10s. for February, March and April, practically unchanged since our last report.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

319 717 P. D. Tyers. Electric gramophone pick-ups. (26/6/28.)
314 403 Associated Telephone and Telegraph Co. Telephone systems. (19/10/27.)
320 016 J. Y. Johnson (I. G. Farbenindustrie Akt.-Ges.). Manufacture and production of magnetic cores of high permeability. (14/7/28.)
319 885 S. M. Rutnagur. Electric traction for railways. (24/9/28.)
320 026 D. E. Washington. Electrical accumulators and storage batteries. (31/3/28.)
320 096 F. Chevrier, and M. L. Grille. Process and apparatus for the electrolytic preparation of antiseptic and cicatrising solutions. (4/4/28.)
320 097 P. Frenell. Electric piston motors. (5/4/28.)
320 045 A. H. Midgley. Electromagnetic cut-outs, switches, and the like. (18/4/28.)
289 834 Ganz-Fele Villamossagi Reszvenytarsasag. Alternating current supply systems. (3/5/27.)
294 977 Lorenz Akt.-Ges., C. High frequency oscillation generators. (3/8/27.)
290 167 Siemens and Halske Akt.-Ges. Carbon microphones. (7/5/27.)
320 031 M-O Valve Co., Ltd. and J. W. Ryde. Electric gas-discharge rectifiers. (25/5/28.)
320 051 H. J. Tibbles and Rely-a-Bell Burglar and Fire Alarm Co., Ltd. Means for securing in position the electric conductors of alarm circuits. (29/5/28.)
320 032 M. Latour. Motor control system. (30/5/28.)
320 078 A. Robinson and Co., Ltd., J. F. Gill, and J. N. Chaviara. Telegraphs for use in ships, power stations, and the like. (31/5/28.)
320 055 C. Rickards, Ltd., and J. D. Henderson. Illuminative advertising apparatus. (26/6/28.)
320 036 J. G. Miller, and Bullers, Ltd. Clamps for holding cables or the like. (27/6/28.)
320 081 S. G. Brown. Sound reproducing or transmitting instruments. (28/6/28.)
320 038 Imperial Chemical Industries, Ltd., and T. R. Warren. Automatic control of turbo-alternators. (29/6/28.)
294 642 British Thomson-Houston Co., Ltd. Adjustable magnet devices. (29/7/27.)
320 039 J. A. Crabtree. Electric switches of the tumbler type. (30/6/28.)
307 040 Siemens and Halske Akt.-Ges. Circuit arrangement for telephone installations. (3/3/28.)
320 082 British Thomson-Houston Co., Ltd., H. Jack, and F. H. Clough. Systems of ship propulsion. (2/7/28.)
320 061 Automatic Telephone Manufacturing Co., Ltd., F. Kessler, and A. G. Forster. Inter-connecting arrangements for use in telephone systems. (2/7/28.)
293 862 Siemens-Schuckertwerke Akt.-Ges. Vacuum switches for dealing with high electric outputs. (14/7/27.)
320 070 F. A. Lindemann. Line source of light varying with applied electrical energy for observing or recording rapid variations in current or potential. (3/7/28.)
320 073 A. R. Dunton and Associated Electrical Industries, Ltd. Sealing devices for the covers of transformer tanks and other vessels. (3/7/28.)
320 075 Igranic Electric Co., Ltd., and G. F. Dandridge. Formers for electric coils. (3/7/28.)
320 086 Siemens Bros. and Co., Ltd., E. A. Petithory and F. Baker. Telephone instruments. (3/7/28.)
320 091 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Secrecy systems for signalling. (4/7/28.)
312 980 Siemens-Schuckertwerke Akt.-Ges. Geared electromotors for driving manicuring-apparatus or the like. (4/6/28.)
320 108 G. Zwicky. Counter-current evaporators for refrigerating machines. (5/7/28.)
294 241 British Thomson-Houston Co., Ltd. Synchronism-indicating means. (22/7/27.)
295 017 Associated Telephone and Telegraph Co. Remote-control systems. (6/8/27.)
294 980 Associated Telephone and Telegraph Co. Electric remote-control systems. (3/8/27.)
320 114 Automatic Telephone Manufacturing Co., Ltd., W. O. Passmore, and C. E. Beale. Telephone systems. (6/7/28.)
320 117 Klaxon, Ltd., and J. F. Monnot. Manufacture of electric commutators and similar current-interrupting devices. (6/7/28.)

Applications for Patents.

September 24th.

28 957 N. V. Philips' Gloeilampenfabrieken. Reeling wire in helicoidal form. (25/9/28, Holland.)
28 960 United Reproducers Patents Corporation.—Sectional electrostatic reproducer. (14/1/29, U.S.)
28 911 E. W. Whatmore. Coil ignition.
28 929 L. D. Wood. Bracket for supporting electric motors.
28 992 Western Electric Co., Ltd. (Bell Telephone Laboratories, Ltd.) Submarine signalling.

September 25th.

29 026 C. P. Allinson. Mains operated wireless receivers, etc.
29 100 Automatic Telephone Manufacturing Co., Ltd., and A. E. Caswell. Telephone systems.
29 086 J. L. Baird and Television, Ltd. Television apparatus, etc.
29 091 H. Bernstein. Disinfecting telephone instruments.
29 050 British Thomson-Houston Co., Ltd. Light sensitive apparatus. (4/10/28, U.S.)
29 051, 29 052 British Thomson-Houston Co., Ltd., and J. C. Read. Protective systems for mercury arc rectifiers.
29 001 British Thomson-Houston Co., Ltd. Electrical test board.
29 083 A. R. di Fraine. Wave trap for wireless receiving apparatus.
29 066 General Electric Co., Ltd., and W. H. Peters. Transformers.
29 061 J. Hazel. Shades for electric lamps.
29 097 K. Kesl. Contact devices for electrical apparatus.
29 011 F. W. Lanchester. Electric gramophones.
29 014 F. A. Lindemann. Device for converting sound waves into electric fluctuations.
29 033 J. Lucas, Ltd., and O. Lucas. Containers for spare lamp bulbs, etc., for vehicles.
29 078 T. Patermann. Electric hair driers.
29 087 C. Russ. Cap for electric plug contacts.
29 029 L. E. Salas and Standard Telephones and Cables, Ltd. Dielectric material.
29 030 T. R. Scott and Standard Telephones and Cables, Ltd. Electric cable.
29 027 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.) Carrier current telegraph systems.
29 028 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.) Electromagnetic devices.
29 045 F. Storch. Electromagnetic apparatus. (25/9/28, Germany.)
29 073 Universal Gramophone and Radio Co., Ltd., and L. Young. Gramophone pick-ups.
29 071 Electric Furnace Co., Ltd. Resistance furnaces.

September 26th.

29 215 C. S. Agate and W. A. J. Thorn. Electric switchgear.
29 186 R. Ambronn. Apparatus for determining direction of magnetic fields of the earth, etc. (20/11/28, Germany.)
29 144 F. Argyrides and C. Joannides. Electrical time recording and synchronising.
29 191 British Thomson-Houston Co., Ltd. Electric measuring instruments. (27/9/28, U.S.)
29 127 A. O. Couyoumdjian. Electromagnetic speech amplifiers, etc.
29 249 J. Davies. Tuning devices for radio receiving sets.
29 211 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken.) X-ray installations.
29 132 B. W. and G. B. Handley. Electric switches.
29 129 Jenaer Glaswerk Schott and Gen. Ignition devices for mercury vapour apparatus.
29 188 Siemens-Schuckertwerke Akt.-Ges. Telephone, etc., cables. (5/10/28, Germany.)
29 218 Telehor Akt.-Ges. Production of alternating currents for driving synchronous motors. (7/11/28, Germany.)
29 171 F. H. Wingrave. Control mechanism for electric signs.
29 128 H. Wintle. Electric heating elements.
29 120 Wright, Bindley and Gell, Ltd. Electric heating elements.

September 27th.

29 288 Akt.-Ges. Brown, Boveri et Cie. Metal vapour rectifiers. (5/10/28, Germany.)
29 371 Associated Electrical Industries, Ltd. Electric circuit interrupters. (27/9/28 U.S.)
29 299 F. E. G. Bailey and B. Scher. Electrically operated sound producers.
29 279 L. Blundell and W. Curtis. Wireless receivers.
29 338 British Thomson-Houston Co., Ltd. Precision electric lamp. (27/9/28, U.S.)
29 330 British Thomson-Houston Co., Ltd. Means for amplifying electric impulse. (17/10/28, U.S.)
29 295 J. P. Bowen. Submarine or aerial oscillators.
29 380 N. H. Claugh, Gramophone Co., Ltd., and Marconi's Wireless Telegraph Co., Ltd. Electrical correction shaping, etc., arrangements.
29 257 O. Emersleben and Loewe-Radio Ges. Resistance-coupled amplifier. (28/9/28, Germany.)
29 296 E. M. S. McWhirter and Standard Telephones and Cables, Ltd. Printing telegraph apparatus.
29 343 A. H. Mason. Remote control of wireless, etc., apparatus.
29 360 D. von Mihaly. Scanning, etc., discs of television apparatus.
29 310 F. Schwien. Electric indicator of tyre deflation.
29 369 Stickstoffwerke Ges. Galvanic batteries. (28/9/28, Germany.)
29 384 Telefunken Ges. fur Drahtlose Telegraphie. Wireless telegraphy. (28/9/28, Germany.)

COMING EVENTS.

Friday, January 10th.

Institution of Electrical Engineers (North-Western Centre).—Free Trade Hall, Manchester. Faraday Lecture by Captain P. P. Eckersley on "Broadcasting by Electric Waves." 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster, London, S.W. Paper by Mr. H. J. N. Riddle on "The Track Circuit in Railway Signalling." 7.30 *p.m.*

Saturday, January 11th.

Association of Mining Electrical Engineers (South Wales Branch).—Visit to the Great Mountain Colliery, Tumble. Paper by Mr. S. T. Richards on "Electricity in Mines—First Aid."

Sunday, January 12th—18th.

Radio Week.

Monday, January 13th.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting. 3 *p.m.*

Institute of Transport.—15, Savoy Street, Victoria Embankment, London. Paper by Mr. A. Davies on "The Co-ordination of Transport."

Institution of Electrical Engineers (Western Centre).—Royal Hotel, Cardiff. Annual dinner. 6.15 for 7 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Efficiency." (Opened by Mr. A. Morgan). 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Paper by Mr. H. W. Taylor on "Voltage Control of Large Alternators." 7 *p.m.*

Institution of Automobile Engineers.—Queen's Hotel, Birmingham. Paper by Mr. H. K. Whitehorn on "Petrol-Electric Vehicle Characteristics." 7 *p.m.*

Electrical Contractors' Association (Hastings Sub-Branch).—Lewcock's Restaurant. Ordinary meeting.

Tuesday, January 14th.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting.

Institution of Electrical Engineers (North Midland Centre).—King Street, Leeds. Informal discussion on "Colliery Electrification" (To be opened by Mr I. Scott Mackenzie). 7 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—North British Station Hotel, Edinburgh. Paper by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by means of Thermal Storage." 7 *p.m.*

Paisley Association of Electrical Engineers.—Visit to Messrs. The Seedhill Finishing Co., Paisley. 7.30 *p.m.*

Wednesday, January 15th.

Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Discussion on "How Far is Recent Criticism of Overhead Transmission Lines Deserved." 5.30 *p.m.*

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary meeting.

Institution of Electrical Engineers (Wireless Section).—Savoy Place, Victoria Embankment, London. Paper by Mr. H. A. Thomas on "A Method of Measuring the Overall Performance of Radio Receivers." 6 *p.m.*

Institution of Electrical Engineers (Sheffield Sub-Centre).—Royal Victoria Hotel. Paper by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by means of Thermal Storage." 7.30 *p.m.*

Thursday, January 16th.

Institution of Electrical Engineers (Hampshire Sub-Centre).—University College, Southampton. Papers by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by means of Thermal Storage," and Mr. T. G. N. Haldane on "The Heat Pump—An Economical Method of Producing Low-Grade Heat from Electricity." 7.30 *p.m.*

Friday, January 17th.

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Domestic Hot Water." Speaker, Mr. C. H. Smith. 7.30 *p.m.*

Saturday, January 18th.

Association of Mining Electrical Engineers (South Wales Branch).—Cox's Café, Cardiff. Annual dinner.

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THE ELECTRICIAN

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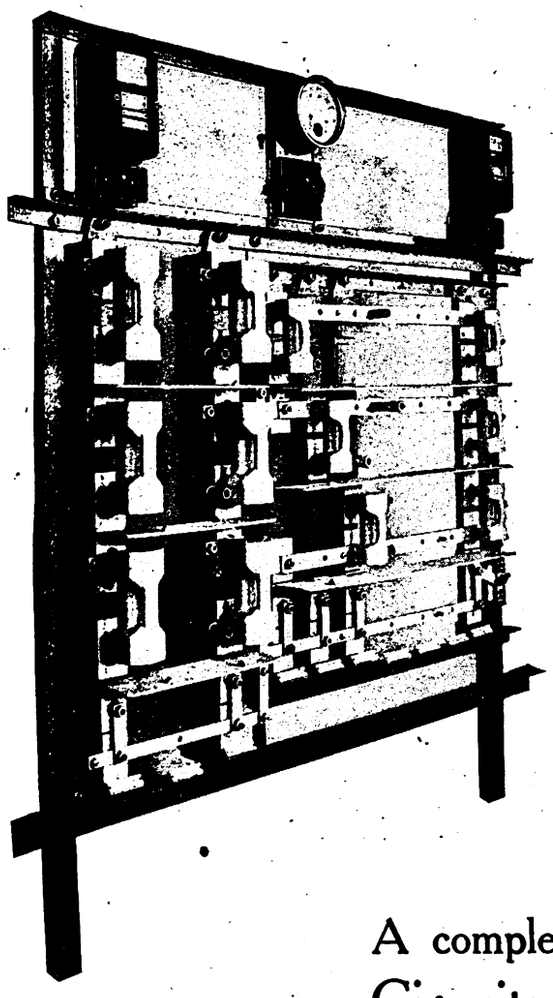

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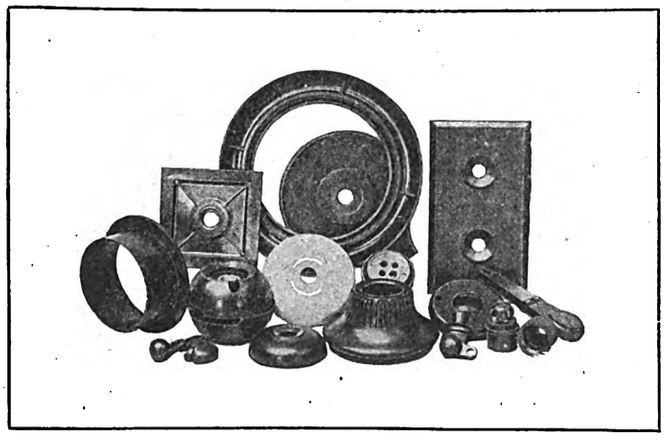

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Current Topics.

Passing of Two Pioneers.

THIS week the British electrical world has lost two notable figures. Dr. DE FERRANTI and Mr. HENRY ALABASTER both died on Monday, the former at Zurich and the latter at his home in Surrey. To each in his different sphere of activity the electrical industry owes much, and their passing will be widely mourned. Mr. ALABASTER, who had attained the ripe age of 83, was chairman and managing director of the Electrical Review, Ltd., until a few months ago, and he remained a director of the company to the end, so that like Dr. DE FERRANTI, who was 18 years younger, he died in harness. Dr. DE FERRANTI'S pioneering and inventive genius has left a deep impress on British electrical engineering and manufacturing. He was the real originator of a "Brighter London" by his work in developing a satisfactory supply of electricity for lighting in the Metropolis.

S.W. England and S. Wales Scheme.

THE seventh and the largest of the electricity schemes yet submitted by the Commissioners to the Central Board was published on Wednesday. The scheme covers an area of nearly 18 000 sq. miles, and embraces important coal mining districts, seaports, china-clay districts and tin mining. At present there are 165 authorised undertakings in the area, operating between them 107 stations, and it is proposed by the Commissioners to reduce this number to eight "selected" stations, including new units in the neighbourhoods of Southampton and South Wales. Eleven other stations are suggested as "temporary" stations while Portishead and Upper Boat (Treforest) will supply the base load. The stations will be interconnected by a series of high pressure main transmission lines, designed in a series of ring mains, comprising 739 circuit miles of line and 25 transformer stations. Incidentally, it is interesting to note that the interconnection of the stations in the area will release for revenue earning purposes 180 000 kW of plant now kept as spare, representing in capital about £3 060 000. The scheme contemplates standardising the outputs of 20 undertakings at an estimated cost of £764 450, the two chief undertakings coming under such standardisation being the South Wales Electrical Power Distribution Co., and the Cornwall Electric Power Co.

Cost of the Scheme.

THE cost of the scheme to the Board for the erection of the transmission system is estimated at £4 163 484, while, in addition, there will be an expenditure by undertakers of about £1 934 360 in extensions. It is estimated that the full advantage of the scheme can be secured with a saving of about £1 383 506 on capital expenditure, up to 1936-7, as compared with the capital expenditure that would be necessary if the present system were continued. After this date the saving on capital expenditure would be progressively greater as compared with individual development. The Commissioners have outlined a provisional plan of working the stations, with the necessary estimates. These suggestions are of course tentative, since the working of the scheme, including the fixing of tariffs, is the responsibility of the Board, but, taking the figures as they stand, the Commissioners estimate that in five years there will be a saving to the undertakers in the area of about £1 390 475, or an average of roughly £280 000 per annum. Schemes have now been published covering 94 per cent. of the area and 98 per cent. of the populations of England and Wales, in addition to Central Scotland. The East England (Norfolk and Suffolk) scheme is in hand, completing England and Wales, but North and South Scotland have still to be dealt with.

Menace of Higher Taxation.

ON Monday the board of directors of the Manchester Chamber of Commerce passed a resolution expressing the apprehension which is generally felt by British business men regarding the uncertainty concerning the policy of the Government in the forthcoming Budget. The resolution emphasised the profound conviction of the board that rigid economy in national expenditure is more than ever necessary to-day, and pointed out

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that the fear of fresh burdens of direct taxation being imposed is undermining confidence in the future. It is impossible to overstress the importance of this matter. British industry and trade have been struggling to recover their former position in the world under a load of taxation such as none of our competitors has to carry. Several times since the war we have seemed to be on the point of making a real advance, only to be forced back by some fresh adverse circumstance. A year ago the outlook appeared moderately reassuring, but the spring brought the first tremors of the series of financial crises which was to shake confidence more and more as 1929 unrolled itself, and the result of the general election was another disturbing factor. Seven months' experience of Labour government has not been calculated to assist the recovery of confidence in the outlook. Large fresh commitments involving a heavy and annually increasing drain on the public funds have been the only contribution towards the solution of the problem of unemployment which Mr. MACDONALD'S administration has yet produced. The first instalment of the bill has still to be presented to the taxpayer, who has good ground for viewing the prospect with serious misgiving.

The Last Straw.

MEANWHILE in Europe and North America there is quite a different story to tell. The German Government is planning a 25 per cent. reduction of income tax, to be remitted in three stages during the next three years. Taxation in France is being reduced by £22 000 000, in Italy by £5 500 000, and in the United States it is proposed to decrease taxes on incomes by £32 000 000. In Norway and Sweden also reductions of taxation are foreshadowed. It is a disheartening contrast to turn back to contemplate the position in this country. While Mr. THOMAS is looking to the City to provide the means of reconstructing and reviving depressed industries, the Government, of which he is a member, is following a financial policy which is anything but an inducement to the investor to supply fresh capital for undertakings which will have to bear the brunt of the additional taxation that is threatened. Lower taxation would be the greatest stimulus to British trade and industry that could be devised ; conversely, an increase in the heavy existing burden would, in many cases, prove to be the last straw.

Our Overseas Trade.

BRITISH electrical exports during the year 1929 increased by £1 213 311 when compared with 1928, the respective totals being £19 534 706 and £18 321 395 ; imports, on the other hand, by the same comparison advanced by £1 957 862. The Board of Trade Returns, details of which are published on another page of this issue, show that during the year just closed exports of electrical machinery tended to fall off when compared with 1928, whereas imports of similar machinery increased. The year's favourable trade balance of exports over imports was £11 134 777 and though this is a little less than the balance in 1928, it should be borne in mind that prices have been lowered during the past year. It is therefore quite possible that though the trade balance of 1929 was slightly less in cash value than that of 1928, the volume of shipments of goods during the year was well in advance of 1928. Further, 1929 was, so far as this country is concerned, marked with many manufacturing difficulties, such as the severe frosts of February and March and the drought of the summer. Both these climatic features tended to slow up the heavy electrical industry, the first by making transport extremely difficult, both here and on the Continent, and the second by depriving many works of their usual plentiful water supply. On the whole, the electrical industry may be said to have made the most of the year just closed and, though imports increased during that period, the fact that the increase was largely made up of raw materials, makes it possible to attribute such advance mainly to increased manufacturing developments in both the home and export markets.

Electrical Trade with Australia.

WE have from time to time drawn the attention of electrical manufacturers to what would appear to be neglect of the Australian market and make no apology for again referring to the subject. The importance of the Australian market on the other hand justifies what ever publicity we may be able to bring to bear upon it with a view to improving the position. Electrical goods shipped from this country to Australia during the year ended June last declined in value by over £1 000 000, and the unfavourable economic conditions in the Commonwealth will probably cause a further downward tendency in the current year. This drop in British imports into Australia is, however, not confined to the electrical industry, and it is very unsatisfactory to learn that over 60 per cent. of Australia's imports in 1928–29 emanated from countries other than the United Kingdom, indicating all the more clearly the tremendous scope for increased effort by British manufacturers. So far as the electrical industry is concerned our chief competitors are the Americans, and success has attended them largely because of the personal contact methods of selling adopted. The merits or otherwise of the American products we already know, and if the British manufacturing industry paid equal attention to the Australian market there is no doubt that we should have a different story to tell.

A Five-Day Week.

INDUSTRIAL circles are apparently waking up to the advantages offered by a five-day working week, for the executive members of no fewer than thirty trade unions met last week, under the chairmanship of Mr. JOHN BEARCH, of the T.U.C., and adopted a resolution requesting the General Council to press for a five-day week for all Government employees. In support of this resolution it is argued in trade union circles that a long week-end rest improves the efficiency and morale of the worker, and as a result the weekly output is not diminished. The idea of a five-day week is, of course, not new, and it may be recalled that BENN BROTHERS, LTD., the publishers of THE ELECTRICIAN, were pioneers in giving all their employees the whole of Saturday for recreation. The effect of this privilege on the staff is not only to inspire greater enthusiasm for work, but to indicate that the management has their well-being at heart. There are many firms which have an "every-odd Saturday-off" system, and these, although perhaps not bold enough at the moment to bring themselves into line with the five-day week movement, will, no doubt, do so in the not too far distant future.

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S.W. ENGLAND AND S. WALES SCHEME.

Seventh Electricity Scheme to be Submitted to the Central Board—Nearly 18 000 Square Miles Affected—Eight "Selected" Units, Including Two New Stations.

THE seventh of the electricity schemes to be submitted by the Electricity Commissioners to the Central Electricity Board was published on Wednesday and is known as the South West England and South Wales Electricity Scheme.

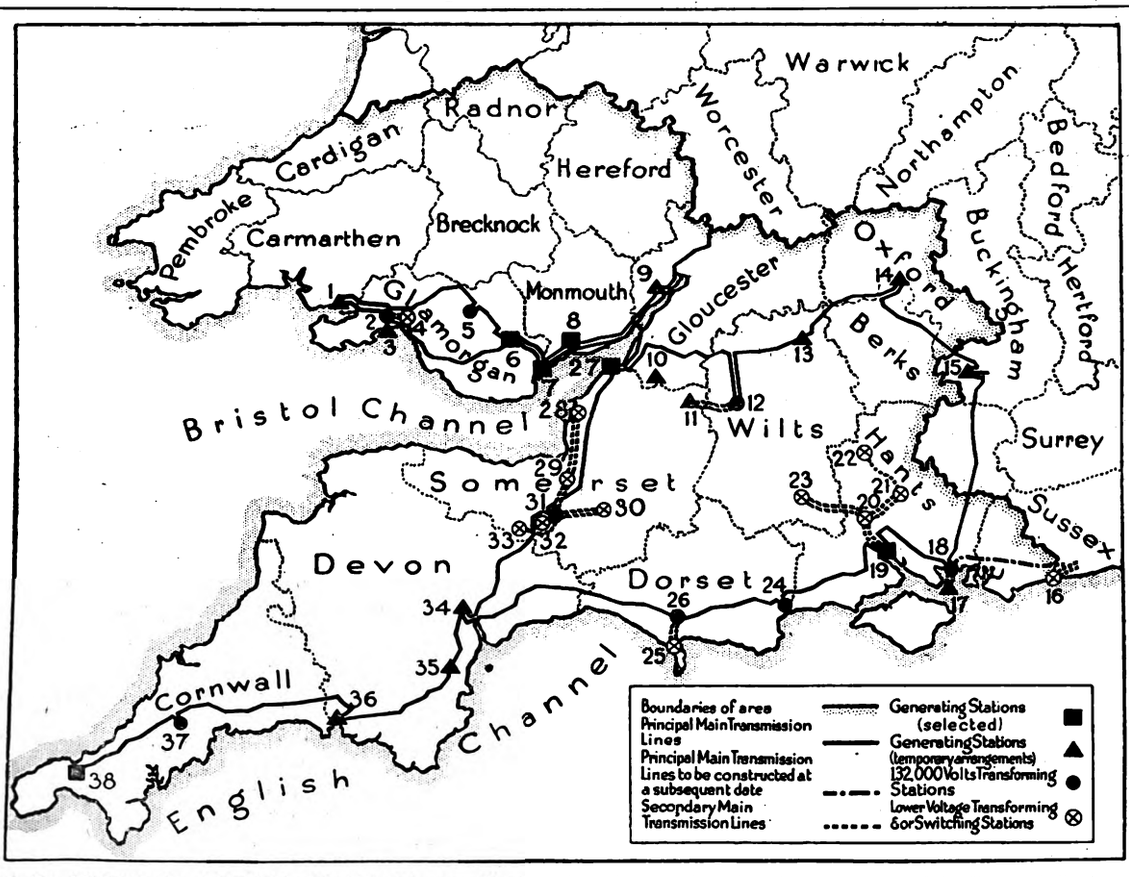
The aggregate maximum load on the undertakings in this area during the winter of 1927-28 was 207 156 kW, and is estimated to reach a total of 496 311 kW in the year 1935-36, being an increase of about 140%. By the winter of 1942-43, the aggregate maximum load is estimated to amount to 828 500 kW, or nearly four times the observed maximum load in the year 1927-28. It must be borne in mind that a considerable portion of the area has hitherto been without a supply of electricity; that many newly-authorised distribution areas are at an early stage of development; and that there is considerable scope for electrical expansion.

The sales of electricity to consumers in 1942-43 are estimated to reach a total of 2 188 million units, representing 359 units per head of population based on the 1921 Census. In view of the potentialities of the domestic demand for electricity in this extensive area, and allowing for the gradual accession to the public supply systems of demands hitherto met by privately owned generating stations, particularly in some of the colliery districts and other industrial parts of the area, the Commissioners have felt justified in allowing for the above increased rate of growth of output between the years 1935-36 and 1942-43.

It is not unreasonable to expect that the electrification of parts of the railways in this area, particularly in South Wales, will be carried out during the next ten or twelve years. No allowance, however, for railway traction requirements has been made in the estimates of output. The sources of supply and points of access to the transmission lines of the Central Electricity Board or of the larger undertakers are so located that supplies to the railway companies for traction and other purposes can be readily afforded when the necessity arises.

The large area to which the scheme relates comprises the whole of South Wales; the counties of Hereford, Monmouth, Somerset, Devon, Cornwall, Dorset, Wiltshire and Southampton; parts of the counties of Berks, Gloucester, Oxford and West Sussex; and the Isle of Wight; and embraces the whole or part of the areas of supply of 165 authorised undertakers. It is of interest to note that the extent of the area is about 17 090 square miles, as compared with areas covering from 5 000 to 9 000 square miles in the case of preceding schemes. The population of the last Census was approximately 6 164 880, representing an average density of about 360 persons per square mile, or less than half the average density of about 810 per square mile for the areas covered by the six previous schemes taken collectively. It includes densely populated areas in the coal mining districts; the maritime towns of Southampton, Plymouth, Falmouth, Bristol, Newport, Cardiff and Swansea; the growing industrial districts around Swindon, Bristol, Bath, Stroud, Frome, Melksham; the china clay districts in Cornwall and Devon; and the tin mining district in West Cornwall. There is an increasing tendency with the advent of cheap power to establish new industries in the southern portions of Great Britain, and this process should be facilitated by the recent authorisation of important distribution undertakings in this area for affording supplies to many towns which have hitherto been without any. While the Isle of Wight is included within the area, the scheme does not make any specific provision for the connection of the supply system in the island to the transmission system of the Central Board, the supply system within the island having already been approved by the Commissioners.

The cost of generation in this area in 1936-37 on the completion of the scheme will form approximately 81% of the total cost of the units delivered by the Central Board to authorised undertakers for distribution in turn to their bulk and other consumers. The remaining 19% represents the expenses incurred by the Central Board and includes the



Illustrating the S.W. England and S.W. Wales Electricity Scheme. **The routes to be taken by the main and secondary transmission lines are indicated, while the "selected" stations are (3) Treforest, (7) Cardiff, (8) Newport, (10) Portishead, (19) Southampton, and (38) Hayle The sites of two new stations have not yet been decided upon. The "temporary" and transformer stations are also indicated in the map, the numbers representing (1) Llanelly, (2) Swansea, (4) Neath, (5) Mountain Ash, (6) Pontypridd, (9) Lydney, (11) Bath, (12) Melksham, (13) Swindon, (14) Oxford, (15) Reading (16) Littlehampton (17) Portsmouth, (18) Fareham, (20) Romsly, (21) Winchester, (22) Andover, (23) Salisbury, (24) Bournemouth, (25) Weymouth, (26) Dorchester, (27) Avonmouth, (28) Weston-Super-Mare, (29) Bridgwater, (30) Langport, (31 and 32) Taunton, (33) Wellington, (34) Exeter, (35) Newton Abbot, (36) Plymouth, and (37) Summercourt.**

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capital and other charges upon the Board's transmission system and their general administration expenses. These figures do not include any charges incurred on the standardisation of frequency, which have to be met separately.

A careful analysis was made of the technical and financial data applicable to each station in the area, taking into account the capital expenditure on the station and other standing charges as well as the estimated cost of future extensions in certain instances, so that the Commissioners could select those stations which are or are likely to become the most efficient and able to deliver the cheapest energy to the transmission system. The stations determined to be selected stations are :—Cardiff, (Cardiff Corporation); Hayle, (Cornwall Electric Power Co.); Newport, (Newport Corporation); Portishead, (Bristol Corporation); Southampton, (Southampton Corporation); Upper Boat, (South Wales Electrical Power Distribution Co.); representing six out of the 107 public generating stations now in operation in the south western area. The scheme also provides for the working, if necessary, of 11 other generating stations under temporary arrangements between the Central Board and the owners, namely the stations at Bath, (Bath Corporation); Exeter, (Exeter Corporation); Feeder Road, (Bristol Corporation); Llanelly, (Llanelly and District Electric Supply Co., Ltd.); Lydney, (West Gloucestershire Power Co., Ltd.); Moredon, (Swindon Corporation); Newton Abbot, (Torquay Corporation); Oxford, (Oxford Electric Co., Ltd.); Plymouth, (Plymouth Corporation); Portsmouth, (Portsmouth Corporation); Swansea, (Swansea Corporation).

Base Load Output.

In providing for the future demands in the area it is contemplated that the base load output will be allocated as far as possible to the selected stations at Portishead and Upper Boat; and that the remaining requirements will be met by the four other selected stations with the assistance of those worked under temporary arrangements.

While the scheme only provides for the operation as required of 17 stations for the purposes of the Central Board, it nevertheless contemplates that certain of the remaining public generating stations in outlying portions of the area will continue to be operated independently for the time being until by reason of further development it becomes economically practicable for the undertakers concerned to obtain supplies in bulk either directly or indirectly from the system of the Central Board. The stations of some 20 undertakers coming within this category contain at the present time only 5 800 kW of generating plant in aggregate, and in 12 cases the undertakings are likely to be connected up for bulk supplies within a reasonable time.

It will be observed that the scheme does not make any provision for the utilisation of electrical energy from any of the privately owned generating plants in the colliery districts of South Wales. When the transmission system is constructed, however, the Central Board may be able to effect suitable arrangements for the use of any surplus energy which may be available from such sources. It is contemplated that a new selected station will be required on the south coast in the south-east portion of the area by or about the year 1938, and that a second new selected station will be required in South Wales by or about the year 1940.

The scheme provides for overhead primary transmission lines to be operated at a voltage of 132 000 V between phases, the carrying capacity of each primary line covered by the estimates being not less than 50 000 kW. Ring mains have been regarded, as heretofore, as an essential feature in the design of the system and have been adopted (except for the time being in the case of the spur line from Exeter to Hayle) so as to afford alternative routes to points of supply. In the case of the old spur line to Cornwall, the extension of the Hayle generating station from time to time will provide the alternative source of supply to any of the "grid" points fed from that line. In determining the size of conductors for the primary overhead lines, regard has been had among other matters to the amount of power to be interchanged between selected stations; the amount of standby plant provided at each station under the scheme; and the necessity for running the most economical (base load) stations fully loaded at all times so far as the aggregated load curve for the area will permit, and for limiting the amount of load allocated to the less economical stations.

The scheme involves the provision of about 739 circuit miles of primary transmission lines, or one mile for every 1 280 kW of generating plant estimated to be installed in the area for the purposes of the scheme during the next 13 years. In the case of previous schemes, the amount of generating plant estimated to be installed during the same period per circuit mile of primary transmission line ranges from about 2 860 kW to 5 180 kW, with a general average of about 3 580 kW. The present scheme thus necessitates between two and three times the amount of primary transmission lines per kilowatt of generating plant installed, as compared with the average for previous schemes, this feature reflecting the greater extent of the area served and also its sparser character and generally lower stage of electrical development.

The transmission system for the south western area will eventually connect up through Reading, and possibly along the south coast also, with the system of the Central Board in South East England; and through Worcester with the system of the Board in Central England, thus becoming a contributory portion of the comprehensive system for Great Britain. The cost of the primary transmission system and transforming stations associated therewith (and of certain secondary transmission lines to be provided by the Central Board) is estimated to amount to £4 163 484.

While the transmission lines shown on the map and any further secondary transmission lines which may subsequently be constructed by the Central Board will constitute the means of affording direct supplies in bulk to the authorised undertakers connected to the system, various other secondary transmission lines which have already been or will be constructed by some of the principal undertakers in this area will also serve for the giving of supplies in bulk to other undertakers not directly connected to the Board's system. In addition, the various towns and villages in the different areas of supply will be served by networks of high tension lines for transmission and distribution which have been or will be constructed by company undertakers such as the South Wales Electrical Power Distribution Co., the West Gloucestershire Power Co., Ltd., the Llanelly and District Electric Supply Co., Ltd., the Bournemouth and Poole Electricity Supply Co., Ltd., the Wessex Electricity Co., the Cornwall Electric Power Co., the North Somerset Electric Supply Co., Ltd., and the Exe Valley Electricity Co., Ltd.; by municipal undertakers such as the Corporations of Southampton, Torquay, Bristol, Bath, Taunton, Exeter, Portsmouth, Gloucester, Cheltenham and Newport; and by other authorised distributors in Devon, Somerset, Dorset, etc.

Frequency Problem.

The Commissioners have come to the conclusion that it is necessary for the proper interconnection and working of the selected generating stations in the area that the frequency of the systems of the authorised undertakers in South Wales and Cornwall should be changed to the standard of 50 cycles per second.

The expenditure involved is materially less than that contemplated in other areas where standardisation has already been decided upon and is in process of being carried out. The estimated net cost of standardisation in the south western area when fully effected is £764 450.

It is estimated that by the end of 1936–37 the capital expended under the scheme on transmission and standardisation of frequency will be: By the Central Board: transmission lines and transforming stations, including capitalised interest, £4 163 484; standardisation of frequency, £764 450; by owners of selected stations: on extensions of existing stations (117 500 kW of generating plant plus equivalent boilers, together with additional boiler plant equivalent to 150 500 kW) £1 934 360, making a total expenditure of £6 862 294.

On the basis of individual development by the various authorised undertakers in the absence of the scheme, involving no standardisation of frequency, it is estimated that provision would have to be made by 1936–37 for further generating plant in new and existing stations amounting to 322 725 kW (inclusive of the above-mentioned figure of 117 500 kW) and additional boiler plant etc. to meet the load in the area and to allow for further immediate growth, representing an estimated capital expenditure of £4 085 900. To this figure there would have to be added further expenditure by certain of the company undertakers on main transmission lines, amounting to about £335 450, thus bringing the total expenditure in the area in the absence of the scheme to about £4 421 350. By the year 1936–37 a proportion of the existing spare plant in the several generating stations will have been released for revenue earning purposes under the scheme, such released plant amounting in all to about 180 000 kW and representing an original expenditure of about £3 060 000.

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ELECTRIFICATION AND RURAL AMENITIES.

C.P.R.E. Deputation's Requests—Minister of Transport's Reply—Proposals for Collaboration—Control of Architecture—Unfairness of Singling Out Electricity for Special Restrictions.

REPRESENTATIVES from the Council for the Preservation of Rural England were received at the Ministry of Transport last week by Mr. Herbert Morrison, M.P., the Minister of Transport. The suggestions and recommendations contained in the Appendix to the Council's letter to the Prime Minister, dealing with the National Electricity Scheme in its relation to the safeguarding of rural amenities, formed the basis of the discussion. The deputation was headed by the Earl of Crawford and Balcarres, K.T. (President of the C.P.R.E.).

The deputation made it clear at the outset that they had no desire to place unreasonable impediments in the way of cheap electricity, and they submitted that power distribution can be achieved without disfigurement of the country provided the routes are wisely chosen and the works and buildings well designed, and that the present system does not ensure this.

Points Brought Forward.

They urged (1) That the Ministry of Health as the National Regional Planning Authority should be consulted in the first instance, on the utility side, the C.P.R.E. and C.P.R.W. as the guardians of rural amenity on the amenity aspect, and the Air Ministry with regard to the future provision for civil and military aviation requirements.

(2) That a really authoritative and impartial statement be issued by some disinterested scientist of repute as to what is and what is not "technically possible."

(3) That as there is a general feeling at present that wayleaves are being obtained on insufficient information as to the effect of the scheme on the locality, all schemes, whether of the Electricity Board or of local undertakers, should be exhibited in plan at a reasonable number of public places in the areas affected and that it should be an obligation on the undertakers to make their plans known in the first instance.

(4) That advantage should be taken of the existence of the C.P.R.E. Advisory Panels to obtain the assistance of architects who are conversant with local conditions.

(5) That the layout of transmission lines should not be left solely to engineers, but that they should be associated with regional planners.

(6) That before taking lines over commons, playing fields, National Trust properties and areas of great beauty which are peculiarly sensitive to disfigurement, enquiry should be directed to ascertaining (*a*) whether no practicable alternative route is available, and (*b*) whether injury could be obviated or minimised by carrying underground at least those stretches of the transmission lines which would pass over ridges or other prominent features of the landscape, or by insisting upon diversions so that the route shall follow depressions and not disfigure the skyline where the open space cannot be avoided.

(7) That the open sub-stations shall, where indicated, be surrounded by a suitable belt of indigenous trees.

(8) That in cases where glades have to be cut through afforested land for cables, masts or turbine pipe lines, the ground so denuded shall be replanted and every effort made to heal scars made by pipe lines on the mountain sides as in Wales.

(9) That regard be paid to the colour of insulators.

It was also suggested that the policy of erecting a small number of "super power stations" throughout the country was not economical on the ground of the great waste of our national fuel reserves and capital expenditure, and that the theory that power should be generated by burning fuel where the bulk of the heat can be most usefully employed might bear investigation.

In replying to the deputation, the Minister said that he would first of all like to thank them for the broad view that they had taken of the whole subject. It seemed to him that their aims and his were in essence identical. They were all agreed that the development of the country's resources must not be held up, and that this development should take place in such a way as to have the greatest practicable regard to the preservation of amenities. It was not open to him to give any general ruling as to the attitude he would adopt, but that he must consider each case on its own individual merits. He could, however, assure them that the question of amenity would always have due regard paid to it, and he instanced two recent cases in which he had refused his consent to overhead lines on that score.

As regards the national grid, the policy, recommended in the Weir Report and embodied in the Act of 1926, of generating electricity at a series of large and efficient stations interconnected with one another had been definitely accepted as the best technical practice. The suggestion referred to of relying on a series of small "waste-heat" stations did not accord with technical opinion, and he did not think that any good purpose could be served by an enquiry into the possibilities of this proposal. It must be taken that the national grid was to go ahead and in respect of these high tension main transmission lines he did not see any difficulty in arranging a certain measure of consultation with the central body of the Council for the Preservation of Rural England. He would propose that, as soon as the scheme for any area was available for publication, a copy should be sent to them by the Electricity Commissioners. This would give the Council the earliest possible notice of the general lay-out; the Central Electricity Board and the Commissioners would be ready to consider any representations which the Council might wish to put forward.

The schemes of local undertakers were in a different category. In these cases he did not necessarily know of the proposals until the undertakers applied to him for consent to an overhead line, and in many cases the undertakers completed their negotiations with the local bodies concerned so as to have the whole matter agreed before bringing it before him. In these circumstances it was impossible for him to deal with any bodies other than the elected local authority which had a definite statutory *locus*. He suggested that it should not be difficult for the local representatives of the Preservation Council to obtain information and to work through the ordinary Local Government machinery. Any attempt to give a semi-official *locus* to other bodies could only lead to inordinate and unjustifiable delays.

The Minister then pointed out that he had no power to control the architectural features of transformer stations and sub-stations, but he and the Electricity Commissioners did, and would continue to do, all they could to encourage a proper standard. Cause for complaint in this direction was not restricted to the electrical industry, and it was not altogether fair to single it out for special restrictions; it ought to be dealt with on a wider basis.

As regards greater attention being paid to the siting, screening and nature of construction of sub-stations, overhead lines, pipe lines, etc., he was in complete sympathy with the Council's views. He thought, however, that the undertakers, especially the better of them, already paid attention to these points, but he would be glad to co-operate with the Council in drawing up a circular on this matter which could be sent to all undertakers. In particular, this circular could press for the employment of an appropriate and competent architect in connection with buildings of any importance.

Recognition Difficulties.

The Minister informed the deputation that he did not think it was feasible to recognise regional town planning committees as bodies to be specially consulted on the question of overhead lines. As he had already stated he must deal with the elected local authority which had a statutory *locus* in the matter and was often the town planning authority, and in any case as constituents of the regional committees, could consult them on matters of regional planning if they so desired. The Ministry of Transport and the Electricity Commissioners were already in close touch with the Town Planning Department of the Ministry of Health and with the Air Ministry on these aspects of the question.

There seemed to be a rather exaggerated impression amongst some people that electrical development would involve a close network of lines covering the whole of the country. Such a picture was fantastic. Apart from the big structures of the grid, which were very limited in number, the ordinary rural transmission lines were not very conspicuous; in fact, many existing lines in rural areas generally escaped observation altogether.

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OIL-FILLED ELECTRIC CABLES.

Their Design and Construction—Special Merits—How Oil Pressure is Maintained—Lower Cost—Multi-core Possibilities—Enormous Factor of Safety.

AT a meeting of the London Branch of the Association of Mining Electrical Engineers on January 7th, Mr. R. E. Horley, of the Pirelli General Cable Works, Ltd., read a paper on "Oil-Filled Electric Cables," Mr. J. R. Walton (Branch Vice-President) was in the chair.

Mr. Horley remarked that at the present time 132 000 V cables were being laid in London between Kidbrooke and Deptford, Wimbledon and Battersea capable of transmitting 80 000 kVA. To-day, underground cables could be manufactured for pressures as high as 220 000 V, although only a few years ago the highest voltage considered practicable was 22 000.

Heating up of Cables.

Three-core cable insulated with dried paper impregnated with a very viscous compound gave satisfactory service for many years up to 22 000 V, and it was thought that the same type of cable, insulated for higher pressures up to 33 000 V, would be equally satisfactory. In Europe and America many cables for this pressure were manufactured and laid, but after a time breakdowns became very frequent. The reasons for the failure were then obscure, and many authorities for a time abandoned the idea of transmitting power at such high pressures. As the result of considerable research into the problem it was ascertained that when a cable of normal construction and impregnated with the ordinary viscous compound is in service, the current heats up the cable. The comparatively large volume of compound held in the insulation then expands, and distends the lead sheath. When the cable cools down during periods of lighter loading, the compound contracts, but the lead sheath does not, so that spaces are left between sheath and cores. In time, compound drains out of the insulation into these spaces, resulting in the formation of voids within the cable insulation. If dielectric power factor tests are taken after the cable has been in operation for some time, the power factor is found to have increased, indicating change in the degree of impregnation of the insulation. Electric breakdown or discharge across voids or spaces in the cable results in the production of a waxy substance, the generation of gases including hydrogen and the formation of water by chemical combination. Although the waxy substance has been found to have excellent insulating properties, the formation of water is, no doubt, one of the chief causes of cable deterioration. Again, the low mechanical pressure to which the dielectric is submitted, especially when the load is off, leads to a low dielectric strength and consequently possible breakdown. In addition, the gaseous films, especially when the mechanical pressure is low, are highly ionised and build up conductive laminæ which produce distortion in the electrostatic field along the surfaces of the paper tapes. At high stresses it has also been found that gases migrate through the paper sheets under the action of the ionic bombardment and build up an ionised path in the direction of the stress.

These points have been studied with great care in the design of the oil-filled cable system. In this system, single cables are used so that the stresses are radial. The impregnating medium is a mineral oil of low viscosity, and the system is designed so that when the oil expands due to the increase in the cable temperature, the extra volume, instead of distending the lead sheath, is accommodated by means of external reservoirs which return the oil to the cable when it contracts during periods of lighter loading. The cable is thus maintained full of oil under all working conditions. The oil is fed into the cable through a central channel formed by stranding the conductors round a plain narrow metal strip so that a cavity is formed at the centre of the core. This cavity is kept completely filled with oil by means of feeding tanks at a pressure which is maintained just above atmospheric pressure at all points in the cable. The oil used for impregnating the cable is clarified by passing it through a centrifugal machine and degasifying it. The degasifying of the oil is most important, having regard to the effect of gaseous films in a cable dielectric.

Owing to the preparatory treatment of the impregnating oil and the improved method of impregnating the cable, the stress per mm. of insulation that can be used with safety is about 50 % higher than the maximum stress that may be safely employed in cables of ordinary construction. The thickness of dielectric in oil-filled cables is thus considerably less than that of normal type cables.

The special feeding tank for dealing with the expanding or contracting oil is in effect a reservoir of certain capacity connected to the cable, and placed at a height above it in order to obtain the necessary hydrostatic pressure as determined from calculations upon the profile of the line. It is essential, however, that the oil in the reservoir shall not be in contact with the surrounding air in order to maintain it in its degasified condition, and, further, it must be kept practically at atmospheric pressure independent of the quantity of oil in the reservoir. These conditions have been fulfilled by constructing the reservoir in the form of flexible walled cells made of corrugated nickel plates, the number and size of the cells depending upon the amount of oil required for the operating conditions in the cable at the particular point. A number of tanks may be paralleled together by means of valves and manifolds to give the necessary volume of oil.

It has been determined that the pressure at any point within the cable must not be allowed to drop below atmospheric and, therefore, the length of cable that may be fed from one source is limited. The length of section, however, may be considerably increased by installing a pressure tank, its function being to assist the feeding tank in providing accommodation for expanding oil and returning oil to the cable upon cooling. It differs in principle from the feeding tank in that it does not depend upon gravity for its action, and, therefore, need not be placed at a height above the cable. The size of the pressure tank depends upon the two following considerations: (1) When the cable is cooling down; how much air imprisoned in the cells of the tank must there be so that its increase in volume between its normal static pressure and the minimum pressure required to send oil to the farthest point fed from the feeding tank will be equal to the volume of oil required by the length of line the pressure tank is feeding? (2) When the cable is heating up; how much air in the cells is required so that starting at the static pressure the tank can accommodate the excess oil due to expansion of oil in the cable without being compressed to a higher pressure than the safe maximum working pressure of the tank?

Whichever of these two calculations gives the higher result decides the size of the tank used. With regard to the cost of the system, in spite of the expense involved in the oil-feeding accessories, the total cost is less than that of a normal cable capable of transmitting the same amount of power owing to the fact that it is possible to transmit much greater loads with safety.

Discussion.

Mr. S. Austin Stigant asked what provision was made for taking care of the expansion set up in the cable itself as the result of variations of load. Further, he said he had not yet seen any references to the application of the oil-filled system to multicore cables; were there any inherent difficulties in applying it to such cables? He also asked to what extent the introduction of the hollow-core oil-filled cable increased the current-carrying capacity, and to what extent, if any, the dielectric stress on the cable could be increased by virtue of the larger diameter of the central core? Had difficulties been experienced arising from the sludging of the oil in the hollow core? Mr. F. Heppenstall, discussing the problem from the users' point of view, referred to the reliability of oil-filled cables. The oil-filled cables in America, which would carry 100 000 kW at 132 000 V, were the largest cables in the world when they were put into operation. The power company which had installed them was liable to a penalty of $400 for every minute during any cessation of current and there was no spare cable. Those facts were sufficient testimony to the reliability of 132 000 V oil-filled cables. Another attribute of such cables was that they were extremely robust. He believed there was no reason why oil-filled cables should not operate at any temperature up to 80 deg. or, possibly, 100 deg. C.

Mr. A. F. W. Richards asked what oil was used for the cables, and whether any provision was made for the heating of the oil containers? Even in this country we experienced variations of temperature from zero Fahrenheit to probably 140 deg.

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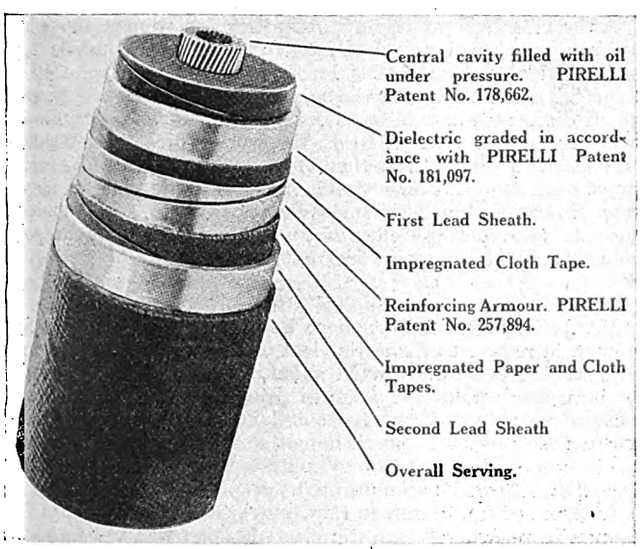
Fahrenheit in the sun ;- did these variations affect the viscosity of the oil sufficiently to upset the balance ?

Mr. J. R. Cowie (Branch Hon. Secretary) said that the pressures exerted on a terminal sealing bell or an ordinary end box could be surprisingly high. Figures put before him had shown that the pressures on terminal end boxes varied from 80 to as much as 400 lb. per sq. inch. One of the main problems was what would be the pressure on the end joints or end boxes or sealing bells at the points at which the cables were joined up with other apparatus. It had been found that an oil which was shown to possess a reasonably high dielectric value when tested by the well-known methods might contain a dangerous percentage of moisture. Were special precautions taken to ensure that the oil used was reasonably free from moisture ?

Mr. Horley, replying, said that in London the oil-filled cables were laid in the familiar triangular formation, but did not remain in the same relative positions throughout the whole of the length between joints. Over part of the route the top cable was laid over against the bottom cable and was then brought back to the original relative position before the



An oil-filled cable, cut to show details of construction.

next joint was reached. Each cable was treated in that way so that there was a definite amount of slack between any two joints, allowing scope for expansion. He did not consider that this precaution was really necessary. There was no reason at all why multi-cored cables of the oil-filled type should not be made. In fact, there was a 60 000 V oil-filled three-core cable working in Milan. This was an ordinary belted type cable, but the oil channels were formed in the lead sheath itself, between the belt and the lead. The joints were of the ordinary straight-through type. It was working quite satisfactorily. So far the attention of his company had been concentrated upon 66 000 and 132 000 V cables, and if cables of that type were made with three cores the diameters would be greater than those of single-core cables, and the lengths of cable which could be handled would be shorter, so that the number of joints would be increased. In America three-core cables of the oil-filled type were used even down to 11 000 V.

The extent to which oil filling increased the carrying capacity of cables obviously varied with the size of conductor, but in the normal type cable the temperature rise accepted was usually about 30 deg. C., starting at 15 and rising to a maximum of 45 deg., some makers claiming that they could deal with a temperature of 50 deg.; but an oil-filled cable could deal with a temperature rise up to about 60 deg., so that there was a wide margin. The specification for the London installation had demanded heat cycles up to 100 deg. C. on cable laid in the ground. His company had carried out those cycles without trouble. With the apparatus at their disposal they could only go to 135 deg. C., and after that it was demonstrated that the cable was just as good as before. The oil containers were not maintained at a temperature of 100 deg. C. because if such large temperature ranges were used, the pressures to be dealt with would increase ; that would mean either the provision of much more apparatus or else the strengthening of the cable to a very large extent. Further, a certain amount of trouble would probably be occasioned in the joints. The jointers of oil-filled cables were given special training.

There was no danger of sludging of the oil, because sludging was caused by oxygen in the air. All the air was carefully removed from the oil-filled type of cables before they were laid and they were hermetically sealed. The oil used was a high-grade transformer type of oil, the best that could be bought.

Dielectric Stresses.

With regard to dielectric stresses, if we had erred at all, we had erred too much in the direction of safety. For oil-filled cables his company were using only half the amount of insulation used on the normal type cables. For a 66 000 V cable they were using only 8½ mm. of insulation. Such a cable, working at 66 000 V had a pressure to earth of about 38 000 V. They had carried out life tests at 160 000 V for 500 hours, and the cable had been totally unaffected thereby, so that the factor of safety was enormous. Life tests had been carried out on the 132 000 V cable at 350 000 V, and there had been long period tests also up to 400 000 V, so that there again the margin of safety was very great. They were of opinion that the normal type 132 000 V cable could be run at 220 000 V, and their 66 000 V cable could be run at 132 000 V. They were also making a 33 000 V oil-filled cable in which they were using 5 mm. of insulation, which contrasted with the 8½ mm. to be found in the normal type of cable.

The type of oil used had a freezing point of minus 30 deg. C., so that difficulties in regard to the oil would not arise when laying the cables during the winter. Because the oil was so fluid they could be bent to sharper angles than the normal type of cable. The cables were full of oil when wound on the drums finally and when being laid, and there was no fear as to the effects of bending. There was no heating of the containers, because the cold had very little effect on the oil. In calculating the size of tanks and the pressure they examined the oil at all temperatures at which the cables were likely to operate and at temperatures beyond the operating temperatures, and took into account the viscosity, because there was a moment during the cycle in which the pressures rose to a maximum. This occurred when switching on at about one-third full load.

With the oil-filled cables there was no difficulty in maintaining the terminals fully impregnated. If a terminal were near a large change in the profile of the line, they could put in a stop joint and a small pressure tank to take the pressure on the terminal. In America, experiments were carried out in which two or three lengths of oil-filled cable were connected to an experimental overhead line. These were shocked with voltages of 500 000 several times, and the cable was then dissected in order to ascertain if it had suffered, but it had not, and it was concluded that the factor of safety was enormous.

HYDROGEN-COOLED MACHINES.

Commercial Application in America—Wind Reduction Claims.

MANY and marked advantages are claimed for the hydrogen-cooling of electrical machines. The innovation is now stated to be definitely established upon a commercial basis and to have passed from the experimental stage into industrial practice. The General Electric Co. of New York claims to occupy a pioneer position in this respect, and according to the company's official organ, the "General Electric Review," for November last, windage loss is reduced upwards of 90 per cent, owing to the lower density of hydrogen as compared with air, the better heat conductivity of the lighter medium (7¼ times higher than air) facilitates the removal of 30 per cent. more heat by forced convection, there is considerable reduction in damage arising from corona discharges, electrical stress concentrations are eliminated, and oxidation of insulation being obviated, flexibility, and, with it, durability, of the insulations are maintained indefinitely. In the result a notable increase in output is secured, i.e., 30 per cent. at atmospheric pressure and 50 per cent. at 15 lb. gauge. Add to this, practically noiseless running and the fact that such machines are at once totally enclosed and waterproof, it needs little imagination to see that the vogue of the hydrogen cooled machine is one of increasing magnitude. Such cooled machines are, the makers claim, eminently suited for outdoor installation, and reference is made to the fact that machinery already in operation includes units of between 10 000 and 15 000 kW capacity, while orders for others are in hand.

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WOMEN IN THE ELECTRICAL INDUSTRY.

Scope in Many Directions—Educational and Training Difficulties—Opportunities in Rural Electrification—Design of Domestic Apparatus.

AT a joint meeting of the London Technical Group of the Electrical Power Engineers' Association and the Electrical Association for Women at the Institution of Electrical Engineers, London, last week, a lecture was given by Miss C. Haslett (Director of the Electrical Association for Women) on the prospects for women in the electrical industry. Mr. P. Rycroft (Chairman of the London Technical Group of the Electrical Power Engineers' Association) presided.

Miss Haslett said that the electrical industry seemed to her especially to offer women interesting scope for employment in many directions. A few women had achieved distinction as electrical engineers, but for some years to come she thought there would be only a comparatively small number who would train fully as engineers, although there were undoubtedly many directions in which women so trained could be of practical use to the industry. The difficulty of getting practical workshop or power station experience was still great, and the fact that women were prohibited by law from working after 8 p.m. was also an obstacle. It was hoped in the next session of Parliament that it would be removed. Trained women, however, were now to be found in electrical works doing experimental work in connection with electric fires and similar apparatus; others were doing statistical and designing work.

A number of women had seats on boards of directors of small supply undertakings—one woman held the position of sales manager to a firm manufacturing electric tools and many were acting as secretaries and assistants to electrical engineers. With one exception, no woman held any responsible position in electrical publicity, although there should be openings in this field.

The fact that more women had not taken to the technical side of the industry was largely owing to two main reasons—(1) that engineering had not been considered, until recently, a suitable profession for women, and (2) that the general education of girls had not assisted them towards a technical or scientific career. This last obstacle was serious and had been discussed with the Board of Education with the result that some attempt was to be made to give girls training in electrical matters while they were at school.

It was in regard to the domestic uses of electricity that there was the greatest scope for the services of women, because all problems connected with domestic electrification were involved in problems related to household management and hygiene, and we were only on the threshold of the possibilities in this direction. More and more as the public were educated in the uses of electricity in the home there would be the need for women who themselves were highly trained. The successful women of the future would not need to train fully as an engineer but would need to have an everyday working knowledge of electrical terminology and electrical economics; above all, she must have the right kind of personality.

Training Classes

Every supply undertaking employing women should regard it as its duty to give its women employees opportunities for becoming as fully acquainted as possible with the technical side of the business so that they might answer all those queries which the consumer was apt to wrap in obscure language. It was a pity that in this country we had not evolved a better term than "demonstrator" or "saleswoman." She would like to see some term evolved equivalent to that used in America such as "director, home service department." Until the electrical industry offered more attractive salaries they would not get the best type of women to take up this class of work. Speaking of the type of work which women can undertake on the supply side, Miss Haslett specially mentioned canvassing houses and discussing the costs with housewives, and on the question of training for this class of work pointed out that the Electrical Association for Women had, in collaboration with the Ministry of Labour, begun classes for women at the Borough Polytechnic in electrical housecraft. In the matter of rural electrification also there was great scope for women's activities. The Women's Institutes throughout the country were becoming very interested in the question of domestic electrification and were demanding lectures and information. There would seem here to be scope for a woman attached to the supply authorities who could go out to the villages, before work was put in hand, in order to discuss with those in the neighbourhood the reason why overhead lines were necessary and the way in which co-operation might be secured in obtaining wayleaves. In this connection Miss Partridge had been doing valuable work and had herself trained a number of apprentices who were capable of wiring houses and explaining intelligently to the country folk the mysteries of electricity. There seemed also to be considerable opportunity for the use of electric caravans, staffed by one or two women, to travel about the country districts, giving lectures and cinema and lantern slide displays.

Another interesting opening for women was as electrical buyers in large retail shops. There were now one or two women so engaged and women who had a knowledge of the woman public could possibly buy to great advantage.

After reference to the opportunities for women in public work connected with electricity on borough councils and municipal committees, Miss Haslett emphasised the need of the electrical industry for the services of both men and women in all directions and pleaded for freedom for all individuals, whether men or women, to do the work which their training and abilities most fitted them for, without artificial restrictions. In the next few years many efficient women might emerge into the limelight in the electrical world, and we might also envisage the possibility of a woman Minister of Transport or a woman Minister of Electricity.

Discussion.

Mr. Jeffery agreed that there were many opportunities for women in regard to domestic electrification both in the towns and rural areas, and women should certainly be able to do an immense amount of work in regard to the design of apparatus used in the average small home. Much of the apparatus now in use in small homes seemed to be designed for use in homes where there was unlimited money and where the domestic help was also unlimited.

Alderman Mrs. Hammer (Hackney) said that the need for women in regard to domestic electrification was very urgent. Women liked to talk to women about anything domestic, and for that reason alone a woman would get ten orders to a man's one. We were lamentably behind in this country, and every home without electricity should be visited by a woman who could show the housewife what could be done by electricity. Such women should be properly trained and properly paid.

Mr. W. J. Oswald said he disagreed with the idea that there was some physical disability for women in regard to the workshop training necessary before the higher positions in the industry could be acquired. There was no doubt that women could qualify for those positions where the demand was not so much for practical as scholastic training. It seemed to him also that women could exercise a great influence upon the design of electrical apparatus for the home.

Councillor Mrs. Gregory (West Ham), in discussing the education of girls in electrical matters, said that women could be born engineers just as much as men could be born chefs, and it was necessary to discover if a girl had the ability and inclination to enter the electrical industry when she was 13 or 14. Mrs. Gregory added that she had an all-electric home and that one aim of her life was to see all other working women similarly situated.

Mr. Drew said that his firm made electrical instruments and some of the work was so delicate that it could only be performed by women. Some of their women employees were very clever, but the firm could not get them to go any further, and if the Electrical Association for Women could persuade girls to go in for some sort of technical training, the firm would welcome it. If the girls cared to study they might occupy good positions, and the firm would be only too pleased to promote them.

Miss Haslett, replying, said she was certain women were suffering from an inferiority complex because of their early up-bringing, but women had been as much to blame as anybody. As regards training, a course had been started that evening at the Borough Polytechnic for women who were not engineers but were secretaries to engineers, inspectors of factories, etc., or who held other positions where a knowledge of a technical side would help them towards promotion.

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IMPORTANCE OF COLOUR IN LIGHTING.

Two Aspects to be Studied—Reflection and Translucence—Illumination and Decoration—Possibility of Attaining Perfect Balance by Day and Night—Blending Fittings with Furnishing—Wide Choice Available.

By W. A. GIBSON MARTIN.

THERE is an ever-increasing demand for colour. Shop window displays, city streets, everyday clothing, places of entertainment, the homes of the people—all are a tribute to the insistent use of colour. Manufacturers are aware of the demand and research is urged forward in the endeavour to make goods attractive to the eye, and, therefore, more saleable.

Goods which apparently had reached saturation point in their own market were clothed in colour, and new uses were found for them. No wholesale house can afford to overlook the advantage of showing goods in a wide range of colour. No retailer dare overlook the tremendous opportunity which colour offers to allow him to hold old and attract new customers. To the electrician, who is so closely connected with the art of display and with the lighting and decoration of the home, a knowledge and appreciation of colour is imperative.

Colour must be studied by the electrician from two aspects. There is the appearance of colour as daylight falls *upon* it: and there is the appearance of colour as light is passed *through* it. As a colour scheme must be satisfactory from both aspects, the electrician is more concerned with the effect of colour than those business concerns which supply articles affected by one aspect only. The electrician, however, is deprived of certain valuable properties provided by black and white, which are not colours in the proper sense of the term, although they are extremely useful in giving brilliance or relief with certain combinations of colour. The electrician also, is deprived of the neutral colours grey and brown, both of which are invaluable in colour work. Of course, it is quite possible to give the effect of black, white, brown and grey as light falls *upon* an electric fitting, but there obviously cannot be a black light, a white light is unattainable with present incandescent lamps, and neither grey nor brown light would be satisfactory.

With the advance in colour-appreciation amongst the general public, there has arisen a craze for self-expression: unusual, not to say freakish, suggestions are often made which the electrician mindful of his professional reputation cannot carry out. Electricity is a substitute for daylight. Those who want harsh greens and solid blues in electric lighting do not fit green or blue glass in the windows through which daylight comes. They confine their efforts in this direction by merely "tinting" daylight, using a fine curtain net close to the glass. Therefore, in choosing a substitute for daylight, they should use colours which will provide a light as closely resembling daylight as possible, using suggestions of colour to bring the *appearance* of the fitting into harmony with the colour scheme without altering to any extent the light from the fitting.

The colour problems of the electrician are further complicated by the fact that light passing through fabric (as in the case of a totally enclosed fitting covered in cotton or silk) is quite different from light which passes through glass. If the source of light is totally enclosed in fabric, the result is a diffused light particularly sympathetic to the decorative scheme and to the eye. This method of lighting as applied to ballrooms was fully described in THE ELECTRICIAN of January 18th, 1929, when the principles underlying the use of colour in fabric fittings were given in detail. Light passing through glass is direct, as distinct from diffused light; and, as direct light is preferred at the moment for most purposes, the suggestions in this article refer to direct and not to diffused lighting.

Proper Use of Coloured Light.

As a general guiding principle, the dominating light for a colour scheme should be as similar to sunlight as possible, restricting the use of coloured lighting to small or auxiliary fittings as a means of decoration rather than as an illuminant. The amateur carrying out a blue and green colour scheme in a room with a south-west exposure would have blue or green light from the fittings, whereas gold, amber or ordinary bulbs are the only practical choice, a touch of blue or green being introduced in the decoration of the fittings in a way which will still allow plenty of gold or amber light to flood the room. When two or more warm colours are used together, it has been suggested that the light may be rose, for instance, or even wine colour, but, again, ordinary bulbs with gold or white fittings are necessary to give sufficient illumination. In rooms decorated in purely secondary or tertiary colours, the same method should be used for lighting.

Colours may be divided according to their relation to the primary colours, red, blue and yellow; or according to their order in the spectrum, red, orange, yellow, green, blue, indigo, violet; or according to their warmth or coolness, red, orange and gold being considered warm colours and blue and green being referred to as cold colours. The last is the most useful classification for modern colour schemes, and particularly for the electrician: as will be at once recognised, cold colours can be used to a very limited extent, and, even then, only for purposes of contrast or decoration.

High Level of Artistry.

Given sufficient light of gold, yellow or amber, illuminating the room evenly and thoroughly, the electrician can use other colours to bring up the decorative scheme to a high level of artistry. Wall brackets can be used to spread a soft red light on panels, to throw a blue light over a piece of furniture in red Chinese lacquer, or a delicate green light on a picture. Standard lamps may be used to brighten up alcoves, to repeat a colour-note in a corner, and to give a specially desired light on embroidered curtains. Lights may be concealed in cornices, plate racks and pillars, to bring out decorative details of carving. In designing a decorative scheme in colour, the house furnisher is compelled to compromise because of the difference between day and artificial light. A colour which is perfect in daylight does not appear nearly so effective after dark: a colour which is ideal in artificial light is crude in daylight. The electrician who has a knowledge of colour can avoid the necessity for a compromise: he can arrange the lighting so that the colour scheme is perfectly balanced by night or day.

The metal portions of electric fittings can now be had in almost any finish. Amongst new finishes there are Oriental red and blue, old ivory and green bronze. This opens up a new method of providing colour while still giving plenty of normal light. The Oriental reds and blues are just what have been wanted for Chinese rooms, for use with Eastern carpets and hangings, and for rooms with valuable Oriental curios, as well as for studies and libraries. Old ivory is a beautiful finish for ultra-modern rooms. Green bronze finish will harmonise with verdure tapestry walls, with the artificial silk fabrics which are now used for curtains, bedspreads and coverings. No longer will the metal parts of a fitting appear an anachronism.

In these days of universal colour-appreciation, the electrician is particularly well-equipped to meet the demands of the public. If that demand is studied, guided along the best channels from the practical point of view, and encouraged to develop along the right lines, the electrician will become something of an artist in the production of beautifully coloured lighting effects.

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154 KV TRANSFORMER ORDER.

Twenty-five Units to be Made by British Firm.

WHAT is claimed to be the largest industrial transformer order ever placed in this country has been obtained by the HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., of Walton-on-Thames. These transformers, comprising twenty-five units, have an operating voltage of 154 000 V and will, we understand, be the highest voltage power transformers so far manufactured in the country. The transformers have been ordered by the NORTHERN ALUMINIUM CO., LTD., of Bush House, London, and the value of the order is nearly £150 000. Tenders were invited from the leading Canadian and European manufacturers. The contract was negotiated and completed in London by Mr. W. V. Esperson, managing director, and Mr. D. S. Anderson, chief purchasing agent, of the Northern Aluminium Co., Ltd., and by Mr. W. W. Hughes, chairman and managing director, Mr. W. C. Kennett and Mr. H. W. Biskeborn, of the Hackbridge Electric Construction Co., Ltd. Mr. S. E. Clotworthy will be the electrical engineer representing the purchasers during the course of manufacture.

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COST OF ELECTRIC COOKING.

Misleading Comparisons—The Case of Water-heating—Advantages of Electricity for Grilling and Roasting—Figures which should be More Widely Circulated.

By S. F. BICKELL, A.M.I.E.E.

CONDITIONS in the world of electric cooking are rapidly changing. Gone are the days when the chief engineer of a supply authority was able to handle personally the commercial side of the undertaking, together with the generation and distribution. To-day a new and important post has been created amongst the personnel of the utility company, the holder of which is designated " Consumers' Engineer."

The first duty of the Consumers' Engineer is to advertise his wares, and it may be well to consider carefully the advantages of electricity as a household servant, compared with alternative source or domestic power.

Relative Efficiency.

So much is said of the relative cost of cooking by gas and electricity that one is inclined to accept figures quoted without troubling to confirm or refute them. The gas authorities make much of the fact that a unit of electricity at 1d. provides only 3 410 B.Th.U.'s, whereas gas at 10d. per therm develops 100 000 B.Th.U.'s, or 10 000 for 1d. This is somewhat disconcerting until one begins to consider the relative efficiency of the two mediums, and in making a comparison it is manifestly unfair to select any one operation as symbolical.

It is frequently the practice, however, even within the electrical industry itself, to select one specific application for attention, such as the boiling of water or the heating of a room. This is just as unfair and misleading as to select, say, the relative overall efficiencies of ovens. For a true comparison identical houses should be considered, the one employing electricity, the other gas, for all lighting, heating and cooking.

Electric vacuum cleaners, bed warmers, fans, curling irons, or hair dryers, compared with similar devices operated by gas, have a relative efficiency of 100% to 0%. In other words, electricity is able to provide those amenities of life which other fuels cannot do, and the aggregate of these benefits from the point of view of labour saving, convenience, hygiene, added luxury, saving in decorations, and so forth, will be found heavily to outweigh those few cases wherein electricity falls behind when comparing actual fuel consumption per operation.

Placing these benefits on one side, however, and dealing solely with the question of cooking, we find ourselves faced by the generally accepted inferiority of electricity as a medium for heating water. Consider the results shown in Table 1. To boil two pints of water by means of an electric boiling plate costs 0·253d. and by gas 0·106d., with gas at 10d. per therm and electricity at 1d. per unit. These figures are used to show that the heating of water by electricity is uneconomical. Domestic cooking can be divided into three operations, namely, roasting (or baking), grilling, and boiling. The latter term is loosely applied to embrace the heating of water, but actually very little water is required to be boiled on the electric cooker. The average family requires approximately ½ gallon of boiling water per day per head for culinary purposes, which covers tea making, vegetable cooking and other uses. Three pints of this quantity represent " first-boil " operations, the remaining pint " second-boil."

From Table 1 we see that the comparative costs of gas and electricity are 0·212d. to 0·479d., showing a loss by electricity of 0·267d. But the ½ gallon of water referred to represents only 10% of the quantity of hot water required per head in the average middle class household. A fair approximation of the daily requirement of each member of the house is five gallons, and this water, heated to 180° F., for the purpose of washing up, baths and toilet, will cost 4d. where a storage tank is employed. The electric storage tank normally operates at an efficiency of 95%, whereas the latest type of gas geyser can only utilise 58% of the B.Th.U.'s delivered to it, without the same convenience. (A by-pass flame for the latter device consumes 200 c. ft. per month, and is therefore not often employed.) Electricity, therefore, costs only 2d. per day per head more than gas for all hot-water purposes. In comparison, an open coal grate and saddle-back boiler costs 6d. to heat 20 gallons to 190° F. with coal at 48s. per ton. Taken over the day, then, electricity is not such an expensive medium for heating water as is frequently assumed, particularly having regard to the cleanliness and convenience enjoyed. Certain gas companies even advertise a maintenance service whereby they clean and regulate burners weekly at 2d. each, thereby proving the necessity of such cleaning.

Turning to the matter of grilling we find that an electric grill of 1 500 W loading will perfectly cook 2 lb. of steak or 1½ lb. of chops in 12 minutes at a cost of 0·3d. A gas grill of 40 c. ft. per hour capacity costs 0·36d. for the same operation. Here is a saving, though small, in favour of electricity, but it must be borne in mind that the grill is the most obnoxious part of a gas cooker. At the same time the fat or dripping obtained in the latter case bears no comparison with that in the former. Actually the dripping obtained from electric grills in a restaurant is worth 3d. per lb., whilst that from similar gas grills is not marketable.

Turning to the subject of ovens we find much in favour of electricity. Foremost comes the question of meat shrinkage. It has been found empirically that meat cooked in an electric oven looses by shrinkage 5% to 10% of its original weight; by using a side oven and coal fire 15% to 18% is lost, and by employing a gas oven for the same operation the loss increases to 25%. In the case of the average family where a 5 lb. joint of beef at, say, 1s. 4d. per lb. is perhaps the usual roast, the cash value of the loss is as follows:

7½d. by electricity.
1s. 1¾d. by coal.
1s. 7d. by gas.

The extra loss by gas roasting over electricity is, therefore, 11½d., or, roughly, 2¼d. per lb.

It has frequently been said by competitors of the electrical industry that this saving in the case of electricity is merely water, and that it is of no value. But a joint to be properly cooked should be raised in a given time to a certain temperature, and at that temperature the same water content will be exhausted whatever the source of heat. It is foolish to contend that the sealing of the joint or the coagulation of the juices on its surface is a sufficient barrier to the passage of steam under pressure. The real test is in the consumption of the meat, and here we have an irrefutable superiority in favour of the electric method.

Now, to cook a 5 lb. joint by electricity the oven must be preheated for 20 minutes, consuming 600 W, and the meat must be cooked for 1½ hours, consuming a further 400 W, making a total of one unit.

With gas ten minutes is required for preheating in an up-to-date cooker with a burner capacity of 35 c. ft. per hour. This operation consumes 6 c. ft. Cooking continues for 1½ hours with a further consumption of 30 c. ft., making a total of 36 c. ft. for the operation. So that the relative cost for fuel is 1d. for electricity and 1·6d. for gas, a saving of 0·6d. in favour of electricity. Add to this the previously mentioned saving of 11½d. in shrinkage, and we have the surprising but quite accurate figure of 1s. total. Supposing the oven to be used only twice a week for roasting, there is an ample financial margin with which to meet the loss in the case of water heating.

Setting apart the acknowledged advantages of electric cooking from the point of view of hygiene, there is a real saving to the housewife on the score of cost. Figures of this nature should be widely circulated to refute the regrettable popular impression that electric cookers are more expensive to use.

TABLE I.

	First Boil: Plate Cold, Water Cold.					Second Boil: Plate Hot, Water Cold.			
	Loading.	Time.	Efficiency.	Consumption.	Cost.	Time.	Efficiency.	Consumption.	Cost.
		m. s.	Per cent.		d.	m. s.	Per cent.		d.
Enclosed Boiling Plate ..	2 000 W	7 40	44·2	253 W	0·253	4 50	72·5	161 W	0·161
Gas Ring	20 c. ft. per hour N.T.P.	7 5	37·2	2·36 c. ft.	0·106	7 5	37·2	2·36 c. ft.	0·106
" Superspeed " Open Plate..	2 000 W	6 10	58	205 W	0·205	4 15	84	142 W	0·142

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ROUND THE JOBS.

The 2½ per Cent. Allowance—New Form of Sub-Contract Agreement—Payments on Account—Consulting Engineers—Lead-Covered Wiring Systems—Necessity for Conscientious Workmanship.

By "CONTRACTOR."

THE electrical contractor, entering into a sub-contract with a builder or main contractor on a job, is very much the under-dog in many respects.

In the first place, the electrical contractor is probably asked to tender by the architect; having tendered on what he considers, and may even have stated, to be a net price, his tender is accepted, and, in return, he gets a "Form of Contract" to sign—a form which was probably not in his mind when he drew his tender and in which he finds that, among other things, he is expected to allow 2½% to the main contractor, this percentage to be ostensibly to cover the use of ladders and scaffolding, whereas, in fact, it is nothing more than a sort of *pourboire* to the main contractor for having been good enough to follow the architect's instructions in placing the sub-contract with the electrical contractor in question.

Tenders Lost on Small Margins.

The correct procedure for the electrical contractor to follow, of course, when he finds himself faced with this condition, is to repudiate it; to point out that his tender was on a net basis, and to refuse point-blank to allow this 2½%. As, however, this course of action may land him into all sorts of discussions and disputes with the main contractor, with whom he wants to keep on good terms, he is apt to find himself taking the easier course of allowing this 2½%, and bearing in mind the name of the particular main contractor, so that the next time he tenders for a job when he knows this builder will be the main contractor he will protect himself against this 2½% deduction. Even in this, however, he runs a risk, for next time one or more of his competitors may not have so protected themselves against the 2½%, and many tenders are lost on a smaller margin than this.

Arising out of this it is interesting to see that a move has at last been made in the direction of procuring a more equable form of sub-contract agreement as between sub-contractor and contractor. A special committee of specialist associations has evolved a form of sub-contract which appears to me to be all that can be desired. Although it protects the sub-contractor on important points, such as that already touched on, it does not go to the other extreme and make conditions to which the main contractor could possibly take exception. It does specifically contract out of any obligation on the part of the sub-contractor to allow a percentage to the main contractor for any reason whatsoever.

Again, in the matter of payment on account, it is explicit and reasonable. For it states that the main contractor shall in every case give seven days' notice to the sub-contractor of his intention to apply through the architect for a payment on account, thus enabling the sub-contractor to make his application to the main contractor, so that this may be incorporated in the "General Certificate" for payment. As things stand at present it is much too common for the sub-contractor to make application to the main contractor for a payment on account only to be told by the latter that he will have to wait some time, as he, the main contractor, has just made application for payment on account, and has not incorporated any sum for the sub-contractor, not having heard from him that such a sum was due.

It remains only to ensure that this new form of sub-contract agreement is insisted on wherever possible by the electrical contractor. Of course, it will be difficult, and, at the start, there is no doubt that many electrical contractors will be bullied into taking the main contractor's form of agreement. The only way to emphasise to the main contractors the existence and the importance of this new form is for electrical contractors to be careful, in all instances where they are submitting a tender, to include a note, somewhere on the tender, to the effect that the tender is made subject to the conditions of the form of sub-contract agreement approved and issued by the Joint Committee of Specialist Associations. Then, when their tender is accepted, they must, as far as possible, stand firm on the sub-contract being drawn according to this form of agreement.

Many contractors I know are disappointed if a consulting engineer is called in to superintend the electrical work on a contract. Perhaps it is that they feel that their pride is injured by the inference that they themselves are not competent as engineers to look after the job. Perhaps it is that they feel that here is the addition of one more to the ranks of those who are out to get their pound of flesh.

I am sure that this is a very silly attitude to adopt from both these points of view. In the first place, the calling in of the consulting engineer does not reflect in any way upon the skill or the competence of the electrical contractor any more than the calling in of an architect reflects upon the skill of the builder. In the second place, although a consulting engineer is employed by the customer, his client, and must therefore keep the interests of his client at heart, it is fallacious to assume that the consulting engineer is, if I may use the phrase, on the side of his client over all technical points. As a matter of fact, in practice it is very often the reverse, and we find the consulting engineer getting the contractor's proposals adopted by the customer, where the latter would have been suspicious if the proposal had come direct from the contractor.

Again, in the matter of payments extra to the contract, the consulting engineer, though he naturally disallows extravagant charges, will usually succeed in getting a reasonable charge allowed where the contractor, if left to his own devices, might very probably fail. Again, from the point of view of the customer—and we must remember that the customer, who is holding the purse-strings, is entitled to some consideration—it is very valuable to have two opinions. The consulting engineer draws his specification. The contractor, perhaps, has a suggestion or two to make in modification of that specification and, if such suggestions are good, the consulting engineer will not turn a deaf ear to them. Finally, and this perhaps is the most important factor from the point of view of the electrical contractor, the latter conducts his negotiations and takes his instructions from someone who is fully acquainted with his work, and with whom he can talk technicalities and from whom he may expect lucid instructions. The writer believes that a contract carried out under a consulting engineer results in a better job and a better profit.

Of late there has been some correspondence on the subject of the safety of lead-covered wiring systems, a correspondence which culminated in a letter from the secretary of the Institution of Electrical Engineers pointing out that lead-covered systems have received the sanction and approval of the Institution, provided that they are carried out according to certain regulations. Now this is very important, because lead-covered wiring systems, from their apparent simplicity of erection, are more liable, in my opinion, to failure than any other system. Every amateur who wires his own house does it with lead-covered cables. What could be simpler than clipping up to the walls this easily-handled material? Many contractors, I believe, consider that a lead-covered job does not demand their most skilled electricians. The result is failure in all cases where the I.E.E. rules are not strictly followed.

Continuity of Sheath.

When erecting a screwed-barrel job, for instance, metallic and electrical continuity of the tube is practically assured, but when erecting a lead-covered job the continuity of the sheath, a matter of the utmost importance to the safety of the installation, is often neglected. Lead-covered wiring systems can only be considered satisfactory when they are erected by highly-skilled labour and with very conscientious workmanship. Anyone who wishes to read some sane views from a practical engineer on the subject of lead-covered wiring systems could not do better than refer to the recently-published book by D. S. Munro, entitled "The Practice of Electrical Wiring."

The Northern Ireland Ministry of Labour is holding an industrial lighting exhibition in the Employment Exchange, Corporation Street, Belfast. The exhibition, which opened on January 14th, and will conclude on February 1st, seeks to demonstrate that good lighting saves time, increases output, avoids eye-strain, promotes safety, facilitates supervision, and ensures a more contented staff. The exhibits deal with methods of attaining maximum lighting efficiency.

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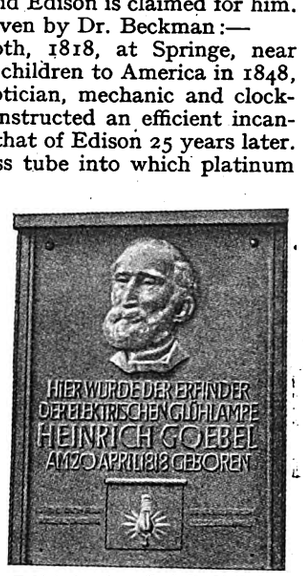
INVENTION OF THE ELECTRIC LAMP.

Claims of H. Goebel to Priority.

A BRUSSELS correspondent, M. Lionel Calisch, calls our attention to the claims of Heinrich Goebel to be regarded as the real inventor of the electric incandescent lamp. He sends a cutting from the Austrian "Radio Amateur" for December, 1929, comprising an article by Dr. H. Beckman, in which Goebel's work is briefly described and a priority of a quarter of a century over Swan and Edison is claimed for him.

The following particulars are given by Dr. Beckman:—

Goebel was born on April 20th, 1818, at Springe, near Hanover; went with his wife and children to America in 1848, and set up in business as an optician, mechanic and clockmaker. In the year 1854 he constructed an efficient incandescent lamp, closely resembling that of Edison 25 years later. Goebel's lamp consisted of a glass tube into which platinum wire was smelted to conduct the current into the interior of the glass cylinder. To this platinum wire was attached a filament consisting of a bamboo thread (as in Edison's lamp), which was brought to a glow by the electric current. A good vacuum was necessary, and this Goebel had already learnt to secure, while he lived at Springe, in connection with the making of barometers. He smelted to the lamp a glass tube about a metre in length, filled the tube with mercury and plunged it into a bowl containing mercury. When placed upright the flow of the mercury checked the atmospheric pressure, thus securing the vacuum in the lamp. Between 1855 and 1860 Goebel regularly exhibited his lamp in the evenings in the squares and streets of New York. The time was not ripe, however, for the sale and use of the lamp because a satisfactory supply of current was not available. Goebel died in 1893 in New York, and the Elektrotechnische Gesellschaft, Hanover, has erected a tablet to his memory, describing him as the inventor of the electric glow lamp, on the house in which he was born. The inscription reads:—"Hier wurde der erfinder der elektrischen glühlampe Heinrich Goebel am 20 April 1818 geboren."



Tablet placed on Goebel's birthplace in Hanover.

Our Brussels correspondent suggests that we should conduct an investigation of the claims of Goebel and "let us know the *real* inventor of the incandescent lamp." But, interesting as the subject undoubtedly is, we regret that we have neither the time nor the facilities for such an inquiry, nor would the result be decisive in any case. Probably a further search would reveal others on whose behalf claims could be maintained, for most inventions are the fruit of a long series of experiment by numerous investigators. There is no doubt that Swan and Edison are entitled to the credit of producing commercially successful lamps, though, as in the case of Adams and Le Verrier, the joint discoverers of the planet Neptune, their respective countrymen may never see eye to eye in regard to their respective merits. If Goebel preceded them, he was, like many another pioneer, unlucky in being ahead of his time, but in the interests of truth his name should not be forgotten among the "prophets of the dawn."

LITERATURE ON WATER POLLUTION.

The Department of Scientific and Industrial Research has issued "Summary of Current Literature on Water Pollution Research," No. 1, Vol. III, containing abstracts Nos. 1 to 119. These abstracts are made from the monthly summaries on the subject which have been issued by the Department since October, 1927, and further abstracts will be included in future issues of the Summaries. In addition to information which is of great value from the public health point of view, the abstracts contain much interesting matter relating to the treatment of water for boilers, the abstraction of water from reservoirs for electrical undertakings, etc. The price of the Summary is 1s. 3d. net, and it is published by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, Edinburgh, Manchester, Cardiff and Belfast.

TELEPHONES AND RADIO.

World Position—Great Scope for Growth.

WRITING in the January number of the "Telegraph and Telephone Journal," Mr. W. H. Gunston estimates the number of telephones in use at the end of 1929 throughout the world at not less than 34 250 000—probably the true figures are considerably larger. At the end of 1927 there were 30 904 000, and twelve months later the number had risen by 1 740 000 to 32 644 000.

Distribution by continents at December 31, 1928, was as follows:—

Europe	9 185 000
Asia	1 205 000
Africa	205 000
North America	20 885 500
South America	491 500
Australasia and Oceania ..	672 000
Total	32 644 000

The European increase of 644 000 (7·5 per cent.) in 1928 was much the largest yet recorded. North America showed a larger numerical gain (906 000), but the percentage of growth (4·5) was lower than in Europe. From 1921–28 inclusive the number of telephones in Europe has increased by about 4 000 000 (77 per cent.) as compared with 6 500 000 (46 per cent.) in North America.

With one telephone to every 56 inhabitants, Europe falls far behind North America; but if the backward countries of eastern and southern Europe are excluded, the ratio for the north and west at the end of 1928 was 1 to 25 (Great Britain 1 to 25·8). In 1928 the position of the leading European countries in regard to rate of growth (with the percentage in parentheses) was:—

Austria (27); Russia (15); Belgium (15); France (9·3); Switzerland (9·2); Poland (9); Spain (8); Great Britain (7·6); Italy (7·5); Holland and Czechoslovakia (7); Germany (5); Sweden (4).

In Asia there are 840 inhabitants to each telephone, and in Africa 704. Japan (exclusive of Chosen, Formosa, Quantung and Saghalien), with 834 686, is far ahead of all other Asiatic countries, China with 130 000 (estimate) and India with 53 689 following at a remote distance, in spite of their much larger populations. The Dutch East Indies, with 49 398 telephones, were little behind India, although having only about a sixth of the population.

North America shows great disparity between the 6·6 and 7·2 inhabitants per telephone of the United States and Canada and the 221 of Mexico and 270 of Central America. In South America the ratio ranges from 41 in Argentina and 61 in Uruguay to 349 in Colombia and 427 in Peru.

The United States can boast of 157 cities with upwards of 10 000 telephones each, against Germany's 34, Great Britain's 18, and Canada's 15. New York alone had 1 702 889 at the end of 1928—not many short of the total number installed in Great Britain (1 759 686).

Comparing Great Britain with other principal countries of the Empire inhabited almost entirely by European races, we find the position to be:—

Country	No of inhabitants per telephone.
Great Britain	25·8
Irish Free State	110·0
Canada	7·2
Australia	12·8
New Zealand	9·6

Canada and Australia are ahead of the European country with the lowest ratio (Denmark, 10·8), and considerably ahead of Sweden (12·6) and Norway (15·3), being beaten only by the United States (6·6).

20 000 000 Radio Listeners.

Although broadcasting is only seven years old, as compared with the half-century or so in which the telephone has been at work, a recent estimate gave the number of radio receiving sets in use in the world as about 20 000 000, of which nearly half were in the United States and one-eighth in Great Britain. If in seven years the number of radio receivers in use can attain to four-sevenths of the number of telephones, in spite of the long start obtained by the latter, it would be rash to attempt to set limits to the growth of the radio manufacturing industry in the years to come.

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BOOK-KEEPING FOR ELECTRICAL CONTRACTORS—III.

Cash and Stock Accounts—Day Book and Ledger—Analysing Credit Sales—Invoices and Returns.

By S. HOWARD WITHEY, F.C.I.

THE sales of the electrical contractor will consist of both cash sales and credit sales—that is to say, while certain instruments, batteries, generators, accessories, etc., will be supplied to customers in the shop for immediate cash, other electrical goods such as dynamos, cable, wire, belting, fans, etc., will be supplied subject to payment some time in the future. Both these kinds of sales will fall under the same general heading or headings in the periodical final accounts, but the method adopted for recording the original transactions in the subsidiary books will differ.

In applying the principles of double-entry, no difficulty will be experienced if it is borne in mind that money or value entering or coming into an account must be recorded on the left-hand or debit side of that account, and that money or value leaving or going out of an account should be entered on the right-hand or credit side of that account. As each cash sale will have the effect of increasing the contractor's cash or bank balance and of decreasing the stock, it follows that all such transactions will have to be shown on the debit or receipts side of his cash book, or cash account, and also on the credit side of the goods or stock account.

It will not be necessary, however, to make two entries in the books every time goods or articles are sold on a cash basis. Indeed, to do so would rapidly fill the cash book with a mass of comparatively small amounts each of which would have to be transferred or posted to the sales account. By keeping a cash sales or takings book each transaction may be entered and the daily totals recorded on the debit side of the cash book in a separate column provided for the purpose, or, as an alternative, the cash register records may be added up each day and the total entered in the cash book, providing sums paid in by credit customers are not included in these daily totals. At the end of each month the total of the cash sales columns should be posted to the credit side of a general sales account kept in the impersonal ledger, together with the date—viz., the last day of the particular month, and the words "By Sundries per Cash Book."

In those cases where the contractor wishes to ascertain the amount of gross profit made under each heading, it will be necessary to analyse the takings for posting purposes. For example, he may desire to know the total sales of electric bells, lamps, lighting sets and insulators, in order to determine whether or not one or more of these branches should be developed or suppressed. To ascertain these separate totals it would be essential to classify the cash sales records, and to enter in the cash book the amount of cash taken each day under those headings, the separate items being posted to the credit side of separate goods accounts bearing those names.

When electrical goods or articles of any description are sold on credit, the contractor's book debts will be increased and his stock decreased, consequently, in order to give effect to such transactions the personal accounts of the different customers should be debited with the amounts involved, and the goods or stock account credited. In practice, this is effected by recording each credit sale in a day book or sales book, and by transferring the selling price to the debit side of an account opened in the customer's name in the contractor's sales ledger. Each day book item should show the date of the sale, or the date on which the goods were actually despatched; the customer's name and postal address; and the number, quality, class and price of each different kind or brand. In addition to this information, the method of delivery could be stated, also any special terms or conditions which may have been agreed to. If no classification of the credit sales is deemed necessary or desirable, the monthly totals of the day book should be transferred to the credit side of the general sales account, with the date and the words "By Sundries per Day Book," the folio of the ledger being inserted underneath each day book total, and the folio of the day book against each ledger entry.

To be able to analyse the credit sales under two or more headings, it will be advisable to use a form of day book which has been ruled by the printers with a sufficient number of additional cash columns so that each amount recorded in the book can be extended under its most appropriate heading.

Two specimen rulings are shown, the first being suitable for ascertaining the total sales of motors and switches, and the second for determining the sales of wire, lamps, transformers, and fuses.

As soon as the details connected with a particular sales

DAY BOOK (Form A)

Date.	Invoice No.	Customer's Name and Address.	Particulars.	Ledger Folio.	Total.	Motors.	Switches.	Sundries.

DAY BOOK (Form B)

Date.	Invoice No.	Name and Particulars.	Details.	Ledger Folio.	Total of Invoice.	Wire.	Lamps.	Transformers.	Fuses.	Sundries.	Remarks.

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transaction have been entered up and carefully checked over, an invoice should be made out and forwarded to the buyer. In this connection, while some electrical contractors prefer to type their invoices and to file carbon copies as a part of the slip system, others keep a press-copy invoice book, copies of all invoices being retained in this book. Unless authentic copies of the invoices are kept, it will be difficult, and in some cases quite impossible, to verify the accuracy of the original entries.

The number of goods and articles returned by customers will vary considerably in individual cases according to the volume of the contractor's turnover and the particular class of electrical products sold. Where the returns consist in the main of such things as wrong capacity circuit breakers, unsuitable terminals, or unsuitable grades of enamel, etc., and are not likely to be very numerous, they should be recorded at the end of the contractor's day book, where a number of pages can be reserved for the purpose. Each entry should give the date on which the goods, materials or stores were actually returned; the name of the sender; the quantity, number or weight of the returns; and the original selling price or allowance agreed to. If no analysis of the sales has been made, it will not be necessary to classify the returns inwards under their respective headings, and each item will be posted direct to the credit side of the particular personal account in the sales ledger, with the date, the words "By Returns" or "By Credit," and the folio, the monthly totals of the returns section of the day book being transferred to the debit side of the general sales account. But if the sales have been analysed under two or more headings, the returns should also be analysed under the same headings, but instead of posting the monthly totals of each classification column to the debit side of its respective sales account, they should be deducted from the corresponding monthly totals of the sales before the latter are transferred to the credit side of the sales accounts. Where the number of returns inwards is really considerable, and a sub-division of the office work is called for, it will be better to keep a separate returns inwards book or sales credit book, and the same applies to allowances made by the contractor in lieu of actual returns, these allowances being booked in exactly the same way, and corresponding with the details stated on the credit notes forwarded to the customers.

The copies of the credit notes retained by the contractor should not be attached to the respective invoices, but should be placed on a separate file and numbered in consecutive order with the entries made. At the close of each month's work, these forms can be wrapped up in a neat bundle and endorsed, leaving the file available for documents relating to the current month.

The next instalment of this series will show the correct method of keeping and balancing the electrical contractor's cash book.

(To be continued.)

CORRESPONDENCE.

Vacuum Cleaners for Hire.

[To the Editor.]

Sir,—Many housewives will shortly be turning their attention to the subject of spring cleaning, and, not unnaturally, the means of acquiring a vacuum cleaner either by purchase or hire will form one of the preliminary details which have to be considered.

Since many housewives are not able to purchase a cleaner outright, on account of the many claims upon the domestic exchequer, and since also many are still prejudiced against hire purchase methods, the advertiser of a vacuum cleaner daily hire service is looked upon as a friend in need.

Unfortunately for the domestic electrical appliances trade, the machines hired on such daily service are not up to the standard which the public has been educated to expect, with the result that an altogether erroneous opinion of cleaners is acquired. This is likely to become too general to be healthy.

It is within the writer's experience that many shopkeepers acquire second-hand electric vacuum cleaners solely for the purpose of the daily hire service. These machines in many instances have been thrown upon the second-hand market through old age or have shown some defect through mishandling.

These hire services, therefore, are doing irreparable harm to manufacturers, because, after such machines have been in use for some hours, a breakdown usually occurs and the particular machine or its trademark is then definitely condemned. Further, when such an unfortunate user discusses with her friends the mysteries of household cleaning she will not forget to air her views on vacuum cleaners in general, and XYZ's in particular, with the result that possible converts become positive detractors. They in their turn will also talk and the proverbial snowball will receive added speed.

As a remedy, might I suggest that electrical vacuum cleaner manufacturers approach such shopkeepers with a view to effecting the exchange of old machines for new ones, at the same time pointing out the infinite harm which such poor service can do to their own and the manufacturer's trade.

The position strikes me as being serious, and one which requires immediate action. With the large number of canvassers employed by vacuum cleaner makers, the names of offending shopkeepers could be quickly ascertained, particularly as the reputation of all cleaners is at stake, irrespective of type, make or nationality.—I am, etc.,

"Adsum."

London.
January 14th.

Generator Interference with Wireless.

[To the Editor.]

Sir,—Replying to "Q.'s" query: If he has one pole earthed a bank of condensers of about 10 m.f.d. directly across the brushes should do all that is required. The condensers should be connected as close to the brushgear as possible. If both poles are insulated from earth he should use two banks of 10 m.f.d. in series with a centre tapping to earth as sketch.—I am, etc.,

C. Culmer Hodges,
A.M.I.E.E., A.M.I.Mech.E.

Dawlish,
January 10th.

BOOK REVIEWS.

Motorships of the World. Edited by A. C. Hardy. (London: Sampson Low, Marston). Pp. iv+132. 12s. 6d. net.

This register of the motor ships of the world is approximately complete up to July of last year. It contains a classified record of motor vessels in alphabetical order of names with particulars of owners, dimensions, main and auxiliary engines. A route map of the world's principal motor shipping routes and a short article on "Motorshipping and the Economics of Water Transport" are other features.

Übertragungstechnik. By Rudolf Winzheimer. (Munich and Berlin: R. Oldenbourg.) Pp. vii+233. 12 marks.

Within the last decade the transmission of speech and music with and without wires has assumed considerable technical as well as commercial and political importance. It is with the acoustical and electrical interrelations of speech transmission that the present book deals. There is definite need for a treatment of this subject, and, as Director of Telegraphs in the German Post Office at Munich, the author's work merits attention. The book opens with a short dissertation on the growth of broadcasting, with its combination of landline and ether transmission. Next comes a physical treatment of the acoustic problems of sound reproduction and the various electrical circuits and devices developed to deal with them. A mathematical analysis of linear, non-linear, phase and back-coupling distortion is given very lucidly. The reader here requires a working knowledge of the operational or complex algebraic methods of solving alternating-current circuits. Chapter II deals with general transmission theory over metallic lines in an orthodox manner familiar to those acquainted with telephone technology. The conditions for distortionless transmission are developed. The author provides three excellent chapters on amplifiers and repeaters, and their arrangement and testing equipment. Chapter VI details the modified metallic line network linking up a number of broadcasting stations, and Chapter VII a short account of telephone cables. The book concludes with a chapter on the chief arrangements of sending and receiving equipment for radio telephony, with special reference to its interlinkage with landlines, as in the London–New York, Berlin–Buenos Aires and Holland–Dutch East Indies telephonic systems.

S. Parker Smith.

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NEWS IN BRIEF.

Electrical Development in the Hedjaz—"Watts in a Home"—The New Telephone Instruments—Electrical and Engineering Wages—Morecambe's Showrooms.

THE Western Union Telegraph Co., announces that the company's fast cable between New York and Bay Roberts, Newfoundland, which was interrupted by the earthquake in November, has been reopened for traffic.

Mr. C. C. Catten delivered a lecture, entitled "Electric Light and Eyesight Preservation," to the Electrical Association for Women (South Wales and Monmouthshire Branch) at the Engineers' Institute, Cardiff, on January 7th.

The City Electrical Engineer of Hull suggests that the public buildings of the city should have a permanent installation of floodlighting to be used on appropriate occasions. The City Architect is to report as to the installation and maintenance of suitable floodlighting of the Guildhall.

The Senate of the University of London invites applications for the University Chair of Electrical Engineering.

Burton-on-Trent Transport Committee recommends the purchase of automatic traffic signals and warning signs, at an estimated cost of £606.

Eastbourne Electricity Committee is to ask the Housing Committee to allow for heating points in all future houses erected by the Committee.

Hull Hospital Committee has agreed upon a revised scheme for an electrical installation at Tilworth Grange at a cost of £610, and tenders are to be invited.

Morecambe Electricity Committee has obtained premises in Queen Street for electricity showrooms. Tenders for the fitting and decorating are to be obtained.

A new out-patients' block is to be erected at Burnley Hospital to accommodate a new electrical department and a new X-ray department, at an expenditure of £20 000.

Wakefield Education Committee has decided to re-wire and provide new lamps at the technical college and school of art and crafts at a cost of £360, plus cost of lamps.

Mr. W. Maurice, lecturing on "The Development of Miners' Electric Lamps" at the School of Mines, Treforest, said it was agreed that enhanced lighting in mines resulted in from 10% to 15% increase in output and a reduction of 2% in the amount of rubbish sent out.

It is reported that the Hedjaz Government is now studying schemes for the installation of an electrical plant midway between Jeddah and Mecca to supply both cities with electricity, to construct an electric tramway, and to provide harbour works at Jeddah and lighthouses and beacons along the Arabian coast.

The Bradford police box system came into official operation on January 8th. The 101 boxes, each with its own red signal lamp and telephone, will enable the police authorities to dispense with twelve district police stations. Every box is connected directly with headquarters at the Town Hall, and the signal lamps are to attract the attention of constables on their beats.

Following the recent decision of Carnarvon T.C. to take over the electricity undertaking from the National Electric Construction Co., the Council has decided to advertise for a manager at a salary of £350, rising to £450, and to retain the services of Mr. Price White as consulting engineer during the period of changing over—estimated at two years—at a fee of £250 per annum.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of January 17th, 1880, stated that Mr. Edison had set himself to construct a portable electric lamp (comprising a constant battery for supplying the current) which would be "no larger than an ordinary moderator lamp."*

Illumination of the coal hoists belonging to the Alexandra Dock Company at Newport was projected.

A correspondent suggested that the Hughes induction balance might be used for the detection of metals in the earth.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of January 20th, 1905, a description was given of the Fisher Street sub-station of the Metropolitan Electric Supply Company which, with a capacity of 3 000 kW from six 500 kW generators was said to be "the largest sub-station with rotary machinery running in this country."*

A forthcoming paper to be read at the I.E.E. by Mr. C. L. Addenbrooke, was on "The Value of Overhead Mains for Electric Distribution in the United Kingdom."

* * *

FIFTEEN years ago it was recorded in THE ELECTRICIAN *of January 15th, 1915, that the Hughes induction balance had been utilised in the location of bullets and shell fragments in wounded soldiers.*

The decision to electrify 1 880 miles of the Swiss State Railways was announced.

* * *

TEN years ago, in the issue of January 16th, 1920, THE ELECTRICIAN *criticised the lack of propaganda on behalf of electricity in connection with the attention that was then being given to housing problems.*

The Electrical Engineer has reported further to Barking Electricity Committee upon the scheme for the hire purchase of electric cookers. Consideration has been deferred as further information is to be obtained by the Treasurer.

Amongst the Royal Institution Lectures before Easter next will be one on February 6th by Dr. R. L. Smith-Rose on "Radio Direction Finding by Transmission and Reception" and a series on March 8th, 15th, 22nd, and 29th, by Sir Ernest Rutherford on "Atomic Nuclei and their Structure."

Glasgow Electricity Committee has considered a report by the Manager on a claim by the Electrical Power Engineers' Association for recognition of extra services and responsibility in connection with change of frequency work. The Central Electricity Board is to be consulted with regard to the claim.

The Electrical Association for Women play "'Watts' in a Home," will be performed at the Rudolf Steiner Hall, Park Road, London, N.W., on Tuesday, February 11th, at 8 p.m.

An offer by the Lancashire Electric Power Co. to instal and maintain an electric cooking stove free of charge at Chorley Grammar School and Technical Institute has been accepted.

The new type of telephone instrument, in which the receiver and transmitter are combined, will shortly be available for subscribers connected with automatic and the larger manual telephone exchanges.

At a meeting on January 22nd the executive committees of the engineering trade unions will discuss a proposal that the employers should be asked to establish national standard wages for plain time-rate workers.

The Chief Constable of Eastbourne has submitted a plan to the Watch Committee for placing illuminated signs marking the ends of the parking places. If such signs are fixed, drivers using such parking places will be permitted to extinguish their lights.

The Electrical Trades Union is pressing for an increase of the wages of men in the electrical contracting industry in London from 1s. 10½d. to 2s. an hour. The claim is mainly in respect of men employed on electrical contracts in building work, and does not affect the electricity supply industry, in regard to which the wages agreement was recently extended until the end of this year.

A "Financial Times" correspondent in Warsaw reports that negotiations with W. A. Harriman for the electrification of an important area in Poland are still continuing. The "Gródek" company, owning one of the greatest hydro-electric plants in Pomerania, has received offers from three foreign groups who wish to undertake the electrification of the western part of Poland. Belgian interests have subscribed to a new issue of capital of an electro-technical company in Warsaw.

A claim by the Association of Wireless and Cable Telegraphists for a revision of the wages and conditions of marine wireless operators was discussed at a conference with the Engineering and Allied Employers London and District Association (representing the wireless companies) in London, last week. Objection is taken by the operators to the method of fixing pay according to the tonnage of the ship. The conference was adjourned to a date to be fixed to enable the employers to consider the position.

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PERSONAL.

SIR Alexander and Lady Roger have returned to England after three months' tour of India, Ceylon and Egypt.

Mr. Cyril Edward Lloyd has joined the board of Associated Electrical Industries, Ltd.

Barking Electricity Committee recommends the appointment of Mr. A. B. Catling as assistant engineer.

It is announced that Mr. C. W. G. Little, chief engineer to the British Electrical Federation is about to retire.

Mr. E. Marsden, electrical engineer to the Newmill Urban Council, has been appointed borough electrical engineer at Louth.

Miss Jean Cowan, daughter of Sir Henry Cowan, chairman of Measurement Ltd., whose engagement is announced to Mr. J. R. Barnes, the Lancashire amateur cricketer. Miss Cowan played cricket for her house while at Roedean School.

Personal estate of the value of £50 240 was left by the late Mr. Wm. Falconer King, electrical engineer, of Hunter's Quay, Argyll.

Mr. S. A. Pollock, chief of the G.P.O. research station at Dollis Hill, has resigned in order to take up a commercial appointment.

Coventry Electricity Committee recommends the appointment of Mr. W. J. Marston, assistant electrical engineer, as electrical engineer.

Southwark (London) B.C. Appointments Committee recommends the promotion of Mr. J. Holcroft to the position of station superintendent.

The Council of the Institution of Electrical Engineers has elected Sir Richard Tetley Glazebrook, F.R.S., to be an Honorary Member of the Institution.

Dover Electricity Committee recommends that the salary of Mr. R. W. Boorn, shift charge engineer, be increased in accordance with the schedule of the National Joint Board.

Mr. J. W. Robinson has resigned the position of President of the London branch of the Association of Mining Electrical Engineers, and Captain A. C. Sparkes has been elected in his stead.

Mr. A. M. Manighetti has been appointed continental technical representative for the Sterling Varnish Co., Ltd., of Trafford Park, Manchester, and is leaving England on January 20th.

Mr. C. L. Fisher, director of Hydro-Electric Securities Corporation, has been elected to the boards of the Standard Gas and Electric Co., and the Standard Power and Light Corporation.

Mr. G. G. L. Preece, until recently manager in the Manchester district for Bruce Peebles and Co., Ltd., of Edinburgh, has now been appointed to the position of sales manager for England and Wales.

Ald. A. Cook, a member of Fulham (London) Electricity and Lighting Committee, has been re-elected as one of the members on the employers' side of the District Joint Board, Electricity Supply Industry, Area No. 10.

Mr. Joseph Y. Shaw, for 31 years rolling stock superintendent to the Manx Electric Railway Co., has retired, and has been presented by the directors with a cheque and by the staff with an engraved gold hunter watch.

The marriage of Mr. George Frederick Farnfield, electrical engineer, of the Victoria Works, Victoria Road, Bexhill-on-Sea, and Mrs. L. V. Edwards, was solemnised at the Parish Church, Charing, near Ashford, Kent, on December 29th.

Mr. James Speight, who joined the Ormskirk Electric Supply Co. on its formation some 17 years ago and was latterly the engineer and manager, has retired. The undertaking was recently taken over by the Lancashire Electric Light and Gas Co.

The marriage of Miss Catherin Beatrice Birkett, third daughter of Mr. Robert Birkett, who was for 23 years borough electrical engineer at Southend-on-Sea, and Mr. Eric Rugg was solemnised at the Church of St. John the Baptist, Southend on-Sea, on January 4th.

Wolverhampton Corporation has agreed to fix the salary of the transport manager, Mr. C. O. Silvers, at £1 000 per annum, rising by annual increments of £50 to a maximum of £1 250. His present salary is £1 075. The salary fixed for the position of electrical engineer (now vacant) is £1 000, rising by increments of £50 to £1 200.

After 50 years' service with the Anglo and Western Union Cable Companies, Mr. T. O'Donoghue, who has been superintendent at the Western Union Cable Co.'s station at Penzance for the past ten years, retired on December 31st. At the annual dinner of the staff Mr. O'Donoghue was presented by Mr. J. V. Bentley, on behalf of the staff, with a piece of plate suitably inscribed.

Burnley Transport Committee has considered applications for the position of manager through the retirement of Mr. Henry Mozley, and has reduced the list to thirteen. These include Messrs. Charles E. Crossley, Chesterfield; Frank H. Crossley, Ashton-under-Lyne; Alfred S. Handsford Bristol; A. A. Jackson, Nottingham; E. H. Mason, Manchester; Sydney Mitchell, Newcastle; R. H. Nuttall, Luton; Cyril P. Paige, Wakefield; Arthur E. Scorey, Southampton; H. P. Sharpe, Rotherham; Charles H. Stafford, Reading; Charles Symon, Aberdeen; J. A. Wild, Lincoln.

Obituary.

ALD. T. RUSHTON, on January 9th, chairman of Leeds Tramways Committee.

MR. FREDERIC HUMPHREY BILLOWS, for many years superintendent of the Indo-European Telegraph Co.

DR. DE BOISSIERE, radiologist at several hospitals in France. He died at Havre, of radio-dermatitis caused by his work in applying X-rays.

MR. J. ALLWORK, aged 81 years. He was for many years a director of A. and C. Bridgland, Ltd., electrical and general engineers, of 33, London Road, East Grinstead.

MR. HAROLD ERNEST MEDHURST, aged 30 years. Mr. Medhurst was for some years engaged as an electrical engineer at the Rochester power house of the Kent Electric Co., Ltd.

MR. CHARLES GODFREY JAMESON, on Christmas Day. He was engineer and manager for the British Aluminium Co. at Kinlochleven. He was largely responsible for the Fort William hydro-electric scheme and died on the day originally planned for admitting the water to the Ben Nevis tunnel.

MR. H. ALABASTER.

WE regret to have to record the death of Mr. Henry Alabaster, a director of the Electrical Review, Ltd., who passed away at Sanderstead, Surrey, on Monday, after a brief illness (bronchitis). Mr. Alabaster, who was in his 84th year, was born in London in August, 1846. Early in 1874 he became interested in the "Telegraphic Journal and Electrical Review," which was started on November 15th, 1872, thus beginning a long lifetime's association with the electrical industry, to the development of which he made a substantial contribution. This connection was continuous until the end. His Jubilee was celebrated in February, 1924, by a dinner at which a presentation was made to him and Mrs. Alabaster by his co-directors, staff and employés. Mr. Alabaster was for many years in partnership with the late Mr. T. E. Gatehouse and with Mr. H. R. Kempe in the firm of H. Alabaster, Gatehouse and Co. and, on the formation of the business into a limited company (The Electrical Review, Ltd.) in 1919, he became chairman and managing director. He held this office until the autumn of last year, when he resigned owing to advancing years, continuing as a director until his death.

During a connection with the electrical profession and industry lasting for 56 years, Mr. Alabaster was interested in most of the movements affecting them. He became an Associate of the I.E.E. in 1887, and was one of the founders with Mr. T. E. Gatehouse and Mr. A. Izard of the Electro-Harmonic Society, which on its twenty-first anniversary presented these three gentlemen with souvenirs. For some years, Mr. Alabaster was joint-auditor with the late Mr. Sidney Sharp of the I.E.E. accounts. He was one of the founders and joint-secretary with Mr. A. M. Sillar of the Electrical Engineers' Ball, and was also an early member of the Dynamicables. Mr. Alabaster will be remembered as a generous subscriber to the Electrical Trades' Benevolent Institution and to various printing trade and other charities. In 1901 he presided at the meeting of electrical contractors held at Anderton's Hotel, at which the Electrical Contractors' Association was formed.

The funeral was held at Brookwood Cemetery yesterday, and a recent photograph of Mr. Alabaster is reproduced on page 79.

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DR. FERRANTI.

TO Dr. Sebastian Ziani de Ferranti, who died on Monday at Zurich at the age of 65, is due, perhaps more than to any other, the credit of establishing the electricity supply industry as we understand it to-day. He was born in Liverpool, and from an early age manifested the liveliest interest in electrical science, and while at college at Ramsgate in 1877 designed, amongst other electrical apparatus, an arc lamp not unlike the Brush "clutch" lamp. At the age of 14 he commenced the construction of his first dynamo. His first practical working start was made when he obtained employment with Siemens Bros. and Co., at Woolwich, during the period when the Mackay Bennett submarine cables were being made. At the age of 17 he was deputed to erect and supervise the running of a temporary lighting plant at Wolverhampton when experience with such plant was in an experimental stage. About the same time he made a series of experiments with electric furnaces for Sir William Seimens. Ferranti's first patent was the zig-zag armature, and a company was formed in 1882 to exploit the invention, with Ferranti as engineer to the company at the age of 18. It was later discovered that Sir Wm. Thomson (afterwards Lord Kelvin) had invented a similar machine, and arrangements were made for manufacturing the "Thomson-Ferranti" alternator. The power developed by these machines was found to be enormously greater than anything previously obtained, and in 1883 Ferranti established the firm of S. Z. de Ferranti and Co., Ltd.

Grosvenor Gallery.

In the same year Messrs. Gaulard and Gibbs introduced into this country the Gaulard and Gibbs transformer system of distribution, and it was decided to light the Grosvenor Gallery by this system. Later came requests from neighbouring tradesmen for a supply of current, and these led to negotiations with Ferranti for extensions of plant, and in 1886 he was appointed engineer to the Grosvenor Gallery Co. A year later two 700 H.P. Ferranti alternators were put down and 36 000 lamps soon connected, generating plant being housed in basements of buildings adjacent to the Gallery. The difficulties of finding accommodation led Ferranti to select for his station a site at Deptford, and here was erected 10 000 H.P. plant with a 10 000 V distribution system. Building operations were commenced in 1888, and the capacity of the plant in the station was ultimately increased to 65 000 H.P.

Early workers in the electrical industry will remember the discussions (often heated, but always guarded in their condemnation, appreciation, or otherwise, of Ferranti's scheme) which centred round what was then described as the "Deptford experiment." The Electric Lighting Act of 1888 led to the abandonment of part of the original Deptford scheme, but not before the success of 10 000 V transmission was proved. At that time Ferranti was faced with a variety of problems in the solution of which there was no previous experience to guide him. He saw that for economical transmission he would have to employ a high pressure, and he chose 10 000 V. This for one thing involved him in the task of building a transformer that would step up the 2 300 V of his generators to 10 000 V. The difficulties under which he had to carry out the design were made worse by the fact that there were no instruments in existence which could measure so high a pressure, and he had to fall back on the makeshift of joining a hundred 100 V lamps in series, the transformer being judged to be giving the required 10 000 V when these lamps glowed with normal brightness.

A Cable Problem.

Another problem was to get cables that would carry the high-pressure current, and he was obliged to design and make these for himself. He employed concentric tubes of copper separated by brown paper impregnated with ozokerite wax, and as they were in lengths of 20 ft. over 7 000 joints were required in the 28 miles laid. The cables happened to be contrary to the Board of Trade regulations, but they proved quite satisfactory, and some of them were still in use 35 years after they had been put in place.

Dr. Ferranti was a past President of the Institution of Electrical Engineers and was awarded the Faraday medal in 1924. He was elected a Fellow of the Royal Society in 1927, and the University of Manchester gave him the honorary degree of D.Sc. in 1911. He was President of the British Electrical Development Association.

A photograph of Dr. Ferranti is reproduced on page 79 of this issue.

OVERSEAS TRADE.

Twelve Months' Exports Exceed Imports by over £11 000 000.

SHIPMENTS of electrical apparatus and machinery from the United Kingdom during December last amounted to £1 711 880, an improvement on December, 1928, of £276 442, and for the twelve months ended December, 1929, £19 534 706; an advance on the same months of 1928, of £1 213 311. Similar imports during last month amounted to £911 543, or £293 678 more than during December, 1928. For the twelve months of 1929 electrical imports were valued at £8 399 929, an increase on the 1928 return of £1 957 862.

Electrical exports during December exceeded imports by £600 337, while for the twelve months the excess was £11 134 777.

Export items, which showed improvement when compared with last year's return for the month of December include motors other than railway and tramway motors, increase £56 249; wires, other then rubber insulated, not being telegraph or telephone, increase £67 418; telegraph and telephone wires other than submarine, increase £41 626; submarine telegraph and telephone cables, increase £33 203.

On the import side items which contributed to the increased value during the month included electrical machinery, which by comparison with the same month of 1928, increased by £41 082; telegraph and telephone instruments by £9 461; electric glow lamps by £64 103; and electrical instruments by £118 332.

We give below figures for December, 1929, and for the year:

	Month of December		Twelve Months	
	1928	1929	1928	1929
	£	£	£	£
IMPORTS.				
Electrical Machinery	150 373	191 455	1 731 430	1 893 930
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	22 654	20 661	195 428	247 000
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables)	52 011	71 442	600 357	667 328
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	3 698	1 440	71 071	43 055
Submarine Telegraph and Telephone Cables	5 950	—	5 950	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	104 321	113 782	726 856	1 628 641
Carbons, Electric	9 863	11 283	128 339	151 081
Electric Lamps and Parts thereof—				
Electric Glow Lamps	22 695	86 798	424 877	495 423
Arc Lamps and Electric Searchlights	398	292	6 493	7 177
Parts thereof (except Carbon Rods)	2 120	1 228	30 741	16 040
Batteries and Accumulators (including parts)	80 248	75 985	742 835	862 249
Electrical instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	24 232	142 564	279 866	508 398
Switchboards, other than Telegraph and Telephone	154	242	1 742	2 214
Electrical Goods and Apparatus, all other Sorts	139 148	194 371	1 496 082	1 877 393
Total of Electrical Goods and Apparatus	617 865	911 543	6 442 067	8 399 929
EXPORTS.				
Electrical Machinery—				
Railway and Tramway Motors	16 986	16 836	475 191	292 476
Other Motors and Generators	186 377	242 626	2 432 652	2 300 058
All Other Sorts	309 411	278 455	3 784 417	3 764 882
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	117 126	109 044	1 403 186	1 628 905
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	104 323	171 741	1 464 828	1 761 671
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	56 591	98 217	855 418	1 118 179
Submarine Telegraph and Telephone Cables	51 137	84 340	630 301	447 137
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	213 073	267 854	2 623 620	2 842 424
Carbons, Electric	411	505	13 726	11 378
Electric Lamps and Parts—				
Electric Glow Lamps	47 382	56 709	532 582	662 530
Arc Lamps and Electric Searchlights	1 475	725	13 396	13 318
Parts thereof (except Carbon Rods)	658	1 425	7 645	12 080
Batteries and Accumulators (including parts	85 904	74 045	1 091 015	1 004 627
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	22 100	28 281	378 351	386 596
Switchboards, other than Telegraph and Telephone	5 717	4 574	72 857	64 100
Electrical Goods and Apparatus, all other Sorts	216 767	276 503	2 542 210	3 224 345
Total of Electrical Goods and Apparatus	1 435 438	1 711 880	18 321 395	19 534 706

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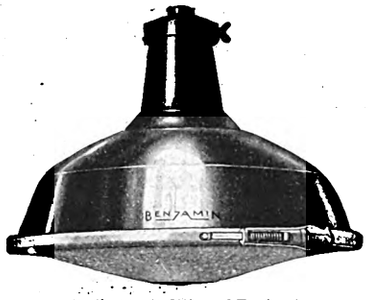
DOMESTIC ELECTRICAL APPLIANCES.

New Apparatus and Equipment of Interest to the Electrical Contractor—Shop Window and other Fittings.

DEALERS in radio accessories may be interested in the Ferranti electro-dynamic loud speaker, of which particulars have been supplied us by the makers, FERRANTI, LTD., of Hollinwood, Lancashire. The design of this speaker, it is stated, enables full advantage to be taken of the amplifying properties of the Ferranti A.F. 5 transformer. The speaker consists essentially of a light right-angle cone suspended in such a way as to allow a large amplitude of vibration, and fitted with a low-resistance coil which moves in the circular gap of an electro-magnet. Means are adopted permanently to centre the coil in the gap, so preventing the possibility of distortion through the coil moving laterally and touching the magnet. The intensity of the magnetic field is claimed to be considerably higher than is usual with most other types of electro-dynamic speakers. Under working conditions the pressure across the field winding is 230 V and the average flux density in the gap is 10 500 lines per sq. cm. In appearance the a.c. and d.c. speaker chassis are similar. Incorporated in the a.c. chassis are a mains transformer and a rectifying valve, with smoothing condensers, to provide the field winding current.



The "Visor" fitting of Benjamin Electric, Ltd.

The Ferranti electro-dynamic speaker employs a low impedance coil, which is light in weight and permits the use of a very small magnet gap. It must, therefore, be operated from an output transformer of fairly high ratio. The average impedance of the coil is, in fact, 20 ohms, and when used with a single output valve having an impedance of the order of 2 400 Ω the output transformer should have a ratio of 15/1, the OPM 3 being suitable. If two such valves are used in push-pull, a ratio of approximately 22·5/1 will be correct, and the OPM 3 c push-pull output transformer is recommended. The total energy consumption of the two types of speaker is as follows:—A.C. type SA1 . . 35 W. D.C. type SD1 . . 25 W. If the speaker is used in conjunction with the Ferranti all-mains receiver, model 31, no additional output transformer is necessary.

Increased attention is being given to the use of "artificial daylight" units, the latest of which to come to our notice is the "Benjamin Visor" produced by THE BENJAMIN ELECTRIC, LTD., of Brantwood Works, Tottenham, London, N.17. This unit falls into the class of those not claimed to give entirely true correction, but it is stated to give a close enough approximation to daylight to enable close and prolonged work to be carried out comfortably and with no fear of visual fatigue. It can be used for general lighting in coal-screening plants, laboratories, printing shops and textile factories—and in other places where, although accurate colour matching may not be essential, colour discrimination is important. The "Visor" artificial daylight unit is made in three sizes, for use with standard gas-filled lamps from 60 to 200 W. It consists of a Benjamin one-piece R.L.M. reflector with "Crysteel" enamelled finish, special blue-tinted glass front and a spring clip band with locking lever. The spring clip ensures positive tension on the band of the cover. and forms a dust-tight joint. A detachable top flange allows the whole unit to be removed from the flange and lampholder, to ensure ease of wiring.

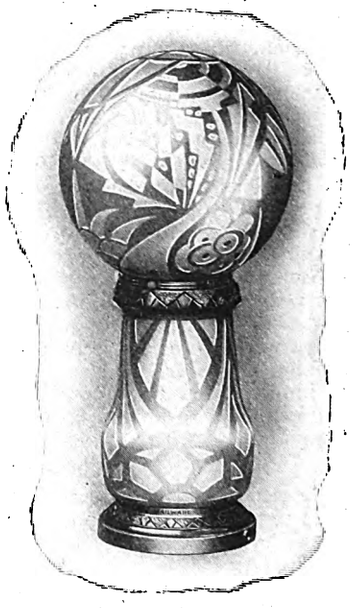
The new "H.B. No. 10" drink mixer is easily operated, durable and attractive to look at. It is marketed by S. G. LEACH AND CO., LTD., of 26, Artillery Lane, London, E.1. The user has merely to grasp the cup with one hand, slide it into position along the guiding column and the motor starts. The high speed of the motor, together with the "scientific agitator," ensures—it is claimed—the complete and rapid mixing of the drink, be it cocktail or malted milk. The upright of the mixer is normally finished in white porcelain enamel; it can, however, be supplied to order in jet black, jade green or ivory for a small extra charge. The enclosed type universal motor operates on 105 to 120, or on 200 to 250 V. The sliding contact switch is concealed in the upright. The agitator is silver plated. Accessories include the nickel silver cup, six feet of flex, adaptor, and a wooden box for packing.

The H.B. mixer No. 2 differs from the newer model in being somewhat more heavily built and also in being suitable for use with ordinary drink containers. Another useful H.B. product comprises an electric drink heater, which has a cup and a heating portion as separate units. The element is totally enclosed, the outside metal shell being nickel-plated, buffed and polished. The heater can be operated from any lampholder on 105 to 120 V, or 200 to 250 V, a.c. or d.c.

PHILIPS LAMPS, LTD., Philips House, Charing Cross Road, London, W.C.2, have given details of their latest output of lamps for projection work, cinemas, theatres, flood-lighting, etc. The Philips vertical tube type projection lamps, class A.1 (burning position: cap down), are rated from 100 to 1 000 W, and have a life of 100 hours. The standard voltages are 15, 30, 50; 100, 110 and 115; and 200-260. The vertical round type, class A.2 (burning position: cap down), have a maximum wattage of 1 500 and voltages from 100 to 115 and 200 to 260; the life is again 100 hours. Class A.3 comprises "end on" round bulbs with a life of 300 hours, rated for 100, 250 and 500 W. Epidiascope lamps—which, together with class A.2 can be supplied with silver mirrors at an extra charge—floodlighting lamps and standard projector lamps, class F, for 4, 6, and 12 V are also offered.

For attracting the attention of the public to shop window displays and at the same time eliminating the chance of the onlookers' eyes becoming tired, Messrs. Phillips are now recommending the "Philiray" reflector, which is made from crystal glass, highly polished on the inside and having numerous facets. On the outside of the reflector are two coats of silver protected by several applications of copper, which—it is stated—is electrically deposited by a new process. Finally the external surfaces receive two coats of aluminium. The design of the facets above referred to gives in effect an immense number of minute mirrors, ensuring a good reflection of light and an unusually arresting appearance. The firm gives a five-year guarantee against peeling, checking and tarnishing.

Those who are familiar with the advantage of "Supastone" glass will doubtless be pleased to learn that THE WHOLESALE FITTINGS CO., LTD., of 23, 25, 27 and 37, Commercial Street, London, E.1, have, as the result of numerous experiments, successfully developed artificial daylight units which utilise Supastone glass. The three-ply lighting glass of this name absorbs very little light, and the new "Da-Ray" units are claimed to produce a daylight effect with the minimum of absorption. "Da-Ray" units are stated to "produce a brilliant natural diffused daylight effect without glare" with an efficiency of 93%. Photometric tests are said to show an almost uniform distribution of light. The units are supplied in three sizes, with 8 in., 12 in., and 14 in. diameter glassware, the gasfilled lamps recommended being respectively up to 100, 200 and 300 W. The unit, an example of which is shown in our illustration, is dustproof and has polished surfaces which are simple to clean. The firm offers to supply a sample "Da-Ray" to any trader for a seven days' test.


A new design of fitting offered by Hailwood and Ackroyd, Ltd.

The GENERAL ELECTRIC CO., LTD., has now gone a step farther in the manufacture of electric irons by the introduction of a feature which provides a decorative touch. "Magnet" irons are now being manufactured with the domes finished in

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blue, green or red enamel, the sole and handle support being in nickel plate. The G.E.C. have lately built and equipped at their works in Birmingham a new section for carrying out enamelling work in large quantities, more especially to cope with the vitreous enamelled parts of cookers and electric fires; the vitreous enamel finish of the coloured iron is thus able to be of a high standard. The finish is claimed to be impervious to changes of temperature; it will not show any tendency to chip or peel, nor will that unsightly discoloration be possible which usually takes place when a nickel-plated iron is carelessly used and overheated. They are made only in the 5 lb. size and packed in a neat black and gold box, with three yards of black circular flex and bakelite BC adaptor.

For many of the applications of the "Osram" photo-cell the new Osram photo-set should prove of considerable service. The unit comprises a one-valve amplifier, a standard Osram photo-cell and a 50-milliamp. relay. It has been designed and produced by the General Electric Co., Ltd. No external batteries are required to work the photo-set, resistances being so arranged that the supply mains, a.c., or d.c., provide both filament current and the positive anode potential to the amplifying valve. The values of the resistances are adjusted to allow the correct filament current to pass. The voltage between the anode of the valve and the filament is about 150. When no light falls on the photo-cell, a current flows in the anode circuit of the valve. As soon as light falls on the cathode of the photo-cell, the grid of the valve assumes a negative charge, and the anode current of the valve is stopped. This change of current through the operating coil of the relay closes a secondary contact, and lights up the indicating lamp. The change in current through the relay-operating coil is about 10 milliamps. The secondary contacts will carry about 50 milliamps.

Larger currents can be dealt with by a further relay circuit, in place of the indicating lamp. If the photo-cell current is as great as 0·1 microamp. the response will be very rapid when light falls on the cell. As the grid takes a short time to assume its original potential, the response is not so rapid when the light is turned off.

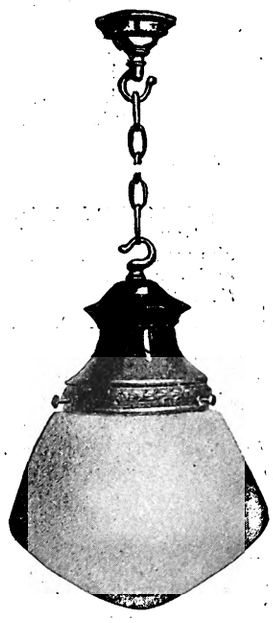
L. G. HAWKINS AND CO., LTD., 30-35, Drury Lane, Kingsway, London, W.C.2, have sent us particulars of "Peter the Heater" model No. 3. When the intense frosts of last year played havoc with unprotected motor cars, over 1 800 of "Peter the Heater," model 2, were put into commission, and with this encouragement the larger model 3 has been produced. The new model has the various popular points of the No. 2, and in addition, provides a portable inspection lamp with hinged wire guard protection. The light can be directed with considerable accuracy by a well-designed reflector, and the hook-shaped carrying handle (which is also used for hanging the heater under the bonnet of the car) is conveniently placed—while the top of the heater is recessed to provide a good refuge for such things as screws.

Moulded Accessories.

Until recent years, many electrical accessories were made of metal—not always because metal was a suitable material, but sometimes merely because a custom had developed. Apart from being a conductor, metal has the added disadvantages of being subject to corrosion from the polluted air of towns and the brine-saturated air of coastal districts, thus calling for continual cleaning. A substitute for metal which is claimed to provide most of its advantages and few of its drawbacks is "Jacelite" moulding, manufactured by J. A. CRABTREE AND CO., LTD., of Lincoln Works, Walsall. The firm produces lampholders in "Jacelite" moulding of three colours, and recommends them for all domestic locations where all-metal lampholders have formerly been used. They are offered as an improvement—in design as well as in material—over the metal type, but as they are not provided with protective skirts they do not comply with Home Office regulations for factory use. "Home Office" types are, however, also manufactured in various models, as in 2 454 for cab-tyre and workshop flex and 2 574 for ordinary flex. The high degree of safety of these skirted lampholders makes them desirable for some domestic locations.

A new enclosed lighting unit, known as the "Eralite" fitting, employing special glassware designed to give an illumination approximating to that of natural diffused daylight, has been put on the market by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., of 38-39, Upper Thames Street, London, E.C.4. The glassware used in this fitting has been designed to correct the light from the lamp, and the approximation to natural light is claimed to be of a high degree. By the use of "Eralite" units colours are seen virtually in their natural tones, and the general light effect is pleasing in character and lacking the coldness usually associated with filtered light. The fitting comprises a heavy gauge, spun, ventilated canopy with cast ornamental work, solid brass ceiling plate and Cash's chain.

An electric washer, known as the "Efesca Easy" washer has recently been introduced by FALK, STADELMANN AND CO., LTD., of 83-93, Farringdon Road, London, E.C.1. The washing is done by means of vacuum cups which are attached to tubes and work up and down at the rate of 60 times per minute. These vacuum cups, on striking and rising from the surface of the water, produce air pressure; every time the cups reach the bottom of the stroke they change position (twenty times per minute) so that every portion of the washing comes under their action. On the up stroke suction is created, and the clothes at the bottom of the tub are drawn upwards; thus each article is moved, and thoroughly washed—not only surface dirt, but also the dirt that is embedded in the meshes being quickly removed. The delicate operation of the cups makes it possible for the most flimsy lace or the most expensive fabric to be washed thoroughly, without fear of damage. The chamber adjoining the washing container is used for drying. It is composed of an inner perforated tank, with an up-to-date centrifugal dryer. The dryer can be packed with clothes, which, it is stated, will be "damp dried" ready for ironing or airing in three minutes. This operation is claimed to be more efficient than mangling, while buttons cannot be crushed or broken, and no creases will be formed in the washing. It ensures even drying, and all the water whirled out of the clothes is returned to the washing tub. The machine can be emptied either from the exhaust vent provided or from the draining board, as required, a pump being fitted for this purpose. A heating arrangement is fitted under the washing container to maintain the water at the correct heat during the various washing operations.



The new "Da-Ray" unit referred to on the previous page.

Another series of new fires which may be mentioned among the large number introduced for the winter season are those put on the market by ELECTRIC HEATING AND HARDWARE, LTD., of Crown Works, Berkley Street, Birmingham. In the ascending order of price these fires are known as the "Westminster," "Carlton," and "Beaufort." The Westminster is obtainable in silver nickel, antique brass and oxidised copper, or oxidised silver; like the other models, it has two elements, one is on the main, the other controlled by a special kick switch. The Carlton and Beaufort, which both belong to the firm's "Glowincoal" class of fire, have kick switch control for each or their two elements, smoke and flame effect, and all porcelain insulation. These three fires have parabolic reflectors of chromium, and are stated to be remarkable for the long heat beams emanating from such reflectors. The resulting high radiant efficiency is claimed to effect a saving in consumption of 25 to 33⅓%. Owing to this high efficiency the maximum loading has been reduced from 3 to 2½ kW. All elements are of the plug-in type.

A floor-polisher known as the "Hobby" is now being manufactured by THE WASHING-UP MACHINE CO., LTD., of 34, Fulham Road, South Kensington, London, S.W.3. It has a ¼ H.P. motor, driving three sets of brushes set triangularly—a worm on the motor shaft engages with helical gears on the three brush spindles. All the gearing is in an oil bath. The machine is provided with rollers, and during polishing these are put out of use by means of a lever operating a cam movement, which lowers the base of the polisher relative to the rollers. A cake of hard polishing substance is held down on the upper periphery of the brushes, so that polish is applied gradually and evenly all over the floor as the machine is systematically moved over the area. A very convenient type of switch is fitted, and our representative found the machine unexpectedly light and easy to manipulate.

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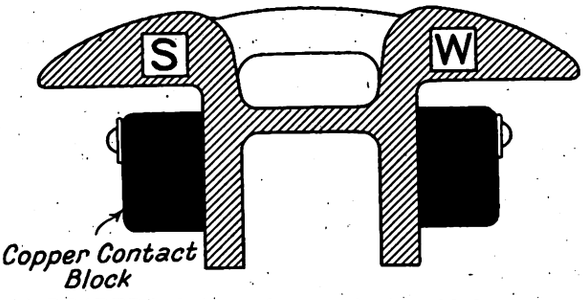
BUSINESS ITEMS.

IT is reported that orders received by the GENERAL ELECTRIC CO., of New York in 1929 amounted to $445 000 000, against $348 000 000 for 1928.

The HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, London, E.15, recently entertained a party of officers of H.M.S. "Vernon" and explained to them at the works the various processes of "Hart" battery manufacture.



A READER is desirous of communicating with the manufacturers of the fusebridge, of which this drawing is an actual size resemblance. We are unable to trace the makers ourselves, and if any reader can assist us will he please communicate with the Editor?

CROMPTON PARKINSON, LTD., Bush House, Aldwych, London, W.C., ask us to point out that if any readers have one of this company's desk diaries in their possession and have not yet received a 1930 refill, application should be made to the address above.

We are informed by the "Typerlite" Co., 86, Cannon Street, London, E.C.4, that their "Typerlite" units for use with all kinds of office machines have been adopted by the Midland Bank. One-piece "Typerlites" for lighting office machinery have also been adopted at the head office of Barclays Bank Ltd.

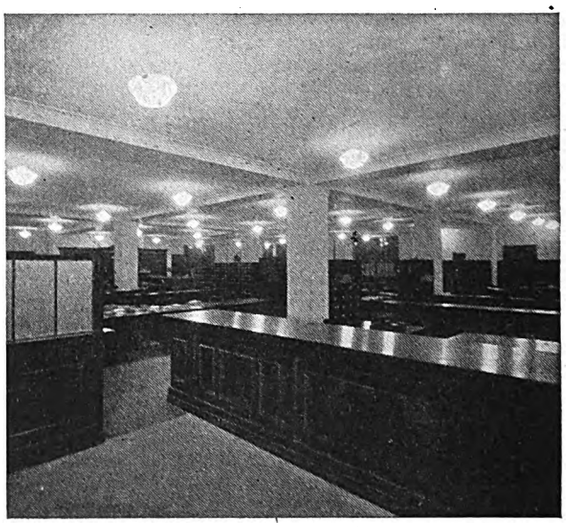
The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C., is identifying itself wholeheartedly with the Radio Week Campaign. The windows of the head office in Kingsway, and at the twenty three branch establishments throughout the country, have attractive displays staged of a representative range of the wireless products of the company. In addition, the company enlisted the aid of all those who handle these products, and many dealers are featuring G.E.C. goods only.

An electrical exhibition was held in the Y.M.C.A. Institute, Motherwell, during the annual Carnival from December 27th until January 4th, the difficult task of staging the display being achieved by Mr. W. D. Brassington, the burgh electrical engineer, and his staff. Among the attractions was a "Sun-Ray" apparatus and ozoniser by QUAIN SUNLIGHT LAMPS, LTD., and an instructive E.L.M.A. display of model room, shop and workshop interiors, showing correct and incorrect lighting. Miss E. Pettigrew, of the CREDENDA CONDUITS CO., LTD., demonstrated electric cooking; the J. P. TUBULAR HEATING CO., LTD., gave a display of its well-known tubular heater, a festooned specimen of flexible type claiming that "it ties 'knots' in other forms of heating." The GENERAL ELECTRIC CO., SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., the EDISON SWAN ELECTRIC CO., LTD., METRO-VICK SUPPLIES, L. G. HAWKINS AND CO., LTD., and SANTON, LTD., were among others represented; a selection of E.D.A. posters, effectively framed in panels, was another exhibit.

A number of electrical exhibits were shown in the scientific section of the annual Conversazione of the Birmingham and Midland Institute which was held from January 7th to 10th. The GENERAL ELECTRIC CO., LTD., Witton, had on view two models representing two different types of sub-station layouts as supplied to the Central Electricity Board in connection with the Central England Scheme. One model, of the H.D.B. type, represented a high steel structure carrying bus-bars in duplicate, with oil circuit breakers on the ground. The other type, "L.N.E.," showed a lower form of construction, having isolators on concrete stools and oil circuit breakers on the ground, this latter type being used for the small or less important stations. High power electric aerodrome lights and illuminated wind indicators were exhibited by CHANCE BROS. AND CO., LTD., Smethwick. Mr. W. WILSON, of the General Electric Co., had three simple exhibits illustrating in a graphical manner the production of mechanical power in three types of electric motor. Professor J. B. KRAMER, also of the General Electric Co., gave demonstrations with television apparatus.

A number of "Wembley" lanterns have recently been installed by the Bloemfontein Municipality for street lighting, and the untouched photograph reproduced on p. 76 shows a night view of President Brand Street, which is illuminated by means of these units equipped with 500 W white bowl-sprayed Osram gasfilled lamps mounted at a height of 22 ft. with 120 ft. spacing. The civic authorities of Bloemfontein are extremely proud of the installation, and photographs of the lighting have been featured in the Orange River Colony newspapers alongside a photograph of the Thames Embankment lighting in London, to show that a really up-to-date system of street lighting has been adopted. In all some 110 lanterns, complete with brackets for pole mounting, have been supplied by the BRITISH GENERAL ELECTRIC CO., LTD., of Johannesburg. The Bowling Greens and the "Wanderers'" sports ground at Bloemfontein have also had a lighting system installed, Geco reflectors, equipped with 1 000 W lamps, being employed for this purpose. A number of tennis courts are also lighted, the installation including specially designed elliptical reflectors.

Elaborate preparations are in hand to ensure that the speeches at the opening ceremony of the Five Power Naval Conference, which takes place in the Royal Gallery of the House of Lords on January 21st, shall be perfectly audible to all present. No fewer than seventeen microphones will be installed, pride of place being taken by the special gold and silver cased instrument reserved by the MARCONIPHONE CO., LTD., for the exclusive use of the King. This is to rest on a pedestal before the Throne, and has been entirely refurbished for the event. Round the table at which the twenty-eight delegates are seated will be fourteen Marconi-Reisz microphones, of the type used for broadcasting, and two more are allotted to the interpreters. As each speaker rises a "look-out" man posted in an alcove will signal by telephone to the engineers in charge of the apparatus in the ante-room, and the correct microphone will be switched into circuit. Thus every word will be picked up by the apparatus with a minimum of background, and the danger of "howl back," due to the proximity of the loud speakers, is practically eliminated. An eleven-valve power amplifier will deliver its output to seven loud speakers of a special type suspended vertically from the roof. These employ rubber diaphragms driven by a moving coil, and are disposed to give an adequate distribution of speech over the entire seating area.



A SECTION of the new offices of the Commercial Union Assurance Co., Ltd., 22, Cornhill, where Siemens "Silvaray" fittings and gasfilled lamps are employed. Over 300 such fittings have been installed in the offices on the upper floors, the whole of the electrical installation work being carried out by Electrical Installations, Ltd., under the supervision and to the plans and specifications of Albion T. Snell and Partners, the consulting engineers for all internal engineering services.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BLACKPOOL CORPORATION.—Supply of six 6 600 V, 50 cycle, three-phase, sub-station switchboards. Particulars and specification from Mr. Charles Furness, borough electrical engineer, Electricity Offices, Shannon Street, Blackpool .

LLANDUDNO HOTEL.—Re-wiring of bell system of a large hotel at Llandudno. Specification, etc., from Messrs. J. H Jones and Fogg, Tatlow and Co., 69, Mostyn Street, Llandudno; deposit £1.

Lighting Installations.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 17th.—One year's supply of cables, electricity meters, cable terminal and other boxes, switches, wires, lamps and sundries. Specification, etc., from the Town Clerk, Municipal Buildings, Upper Street, London, N.1.

BRADFORD CORPORATION, January 18th.—Electrical installation at Thornton district baths. Specification, etc., from the City Architect.

CHELTENHAM CORPORATION, January 18th.—Supply of electric light fittings, etc., for one year. Tender forms from Mr. J. S. Pickering, borough engineer. Municipal Offices, Cheltenham.

ISLE OF MAN GOVERNMENT PROPERTY TRUSTEES, January 18th.—Electrical installation in Gronk Ruagh Hospital, Ramsey. Specifications from the Government Office, Douglas; deposit £1 1s.

MANCHESTER WATERWORKS COMMITTEE, January 18th.—Supply and erection at Haweswater, Westmorland, of three 275 H.P. oil engines, direct coupled to three 200 kW d.c. generators, etc. Specifications, etc., from the Engineer, Waterworks Offices, Town Hall, Manchester; deposit £2 2s.

WEST RIDING COUNTY COUNCIL, January 18th.—Electric light installation in the mixed department of Riveton Park Council School. Specifications from Mr. A. Rayner, 151, Cross Hill, Ecclesfield.

CENTRAL ELECTRICITY BOARD, January 20th.—Supply and erection of 3·3 kV, 6·6 kV, and 11 kV switchgear, for connecting the Board's supply to undertakers' busbars. Specification (N.W.E.—G.S.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

BELFAST GUARDIANS, January 21st.—Electric lighting installation in connection with alterations and additions to nurses' home at Belfast Infirmary. Specification can be seen and form of tender obtained on application to Mr. R. H. Wilson, clerk to the Guardians.

METROPOLITAN WATER BOARD, January 21st.—Supply and erection of four steam turbines, with pumps, and two electric generators, for Surbiton pumping station. Specification, etc., from the Chief Engineer (Room 173), 173, Rosebery Avenue, London, E.C.1; deposit £3 3s.

WORKSOP RURAL DISTRICT COUNCIL. January 21st.—Electric wiring of 26 houses now being erected at North Carlton, near Worksop. Forms of tender and specifications from the Surveyor, Council Offices, Highfield House, Carlton Road, Worksop.

BATH CORPORATION, January 22nd.—Supply of 60 000 lb. boiler, 7 000 kW turbo-alternator and e.h.t., h.t. and l.t. cables required during 12 months. Specifications, etc., from Mr. J. W. Spark, city electrical engineer, 7, Dorchester Street, Bath; deposit £2 2s.

HULL CORPORATION, January 22nd.—Supply and fixing of two 9 in, centrifugal pumps, with a.c. motors, switchgear, piping, etc. Forms of tender and other particulars from Mr. T. Thomas, city engineer, Guildhall, Hull; deposit £1.

HULL CORPORATION, January 22nd.—Electric wiring and fitting of first portion of Eastfield Road School. Specification, etc., from the City Architect.

GRIMSBY CORPORATION, January 23rd.—Manufacture, supply and erection of 10 000 kW three-phase turbo-alternator, with condensing plant. Specification, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby; deposit £2 2s.

LIVERPOOL CORPORATION, January 23rd.—Twelve months' supply of C.L.I. wrought-iron standards, brackets, etc., and No. C.L. 2 c.i. lamp columns, and malleable c.i. pitching irons, etc. Tender forms from the City Lighting Engineer, 17, Highfield Street, Liverpool. State name and number of schedule for which form is desired.

LIVERPOOL CORPORATION, January 23rd.—Twelve months' supply of materials to the electric supply department, including cables, compounds and tapes (Form E.S.1), insulated cables (E.S.2), meters (E.S.3), incandescent lamps (E.S.5), a.c. motors and starting gear (E.S.7), electric cookers and kettles (E.S.11), etc. Tender forms from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

LIVERPOOL CORPORATION, January 24th.—Supply of 10 300 copper bands, 35 in. by 65 in. long. Forms of tender from the City Engineer, Municipal Buildings, Dale Street, Liverpool.

MANCHESTER CORPORATION, January 24th.—Supply of sheet steel neutral earthing cubicles, etc., for power transformers, Cumberland Street sub-station. Specification (No. 261) and form of tender from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ECCLES CORPORATION, January 25th.—Supply of 250 kVA three-phase, oil-cooled transformer, 6 600/400 V, 50 cycles. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft, Lancs; deposit £1 1s.

NORWICH CORPORATION, January 28th.—Supply and erection of refrigerating plant at the Isolation Hospital. Specification, etc., from Mr. J. S. Bullough, city engineer, Guildhall, Norwich.

CLUTTON RURAL DISTRICT COUNCIL, January 29th.—Electric light installations in 55 houses. Specifications, etc., from the engineer, Mr. J. Wayne-Morgan, 6, Church Road, Whitchurch, Cardiff.

COWDENBEATH CORPORATION, January 29th.—Electrical work in connection with erection of 32 houses at Randolph Street, Cowdenbeath. Specifications, etc., from Mr. C. A. Alexander, burgh surveyor, Town House, Cowdenbeath; deposit £2 2s.

WORSLEY URBAN DISTRICT COUNCIL, January 29th.—Twelve months' supply of electric lamps, etc. Forms of tender from the surveyor, Mr. J. Howard, Town Hall, Walkden.

ARMAGH COUNTY EDUCATION COMMITTEE, February 1st.—Electric lighting installation at Armagh New Public Elementary School. Plan and specification can be seen at the office of Mr. J. St. J. Phillips, 16, Donegall Square South, Belfast, or at the Education Offices, Armagh. Tender forms will be supplied.

CENTRAL ELECTRICITY BOARD, February 1st.—Supply and erection of 33 000 V overhead transmission lines in South-East England. Specification (No. S.E.E.—S.L. 3) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross London, W.C.2; deposit £2 2s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, February 11th.—Twelve months' supply of cables for street mains and services (tender form E.S.1); lamps (E.S.2), meters (E.S.3), creosoted cable protection boards (E.S.4); plywood meter boards and insulators (E.S.5); ironclad service cutouts (E.S.6); street lighting standards and electric fittings (E.S.7); and creosoted wood service tee boxes (E.S.8). Forms of tender from the Electrical Engineer, 37, High Street, Cheadle, Cheshire.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

WAITEMATA (N.Z.) ELECTRIC POWER BOARD, January 18th.—Supply of three-phase 11 000 V 50 cycle transformers. (Reference B.X. 6 027.)

INDIA STORE DEPARTMENT, January 21st.—Supply of 43 205 battery cells, etc. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER GENERAL'S DEPARTMENT, MELBOURNE, January 21st.—Supply of dry cells (schedule C. 550). (Reference B.X. 6041.)

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 21st.—Four electric motor driven ventilating fans. (Reference A.K. 8 857.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 21st.—Spare parts for automatic telephones. (Reference B.X. 5 917.)

LATVIAN POSTS AND TELEGRAPHS, January 22nd.—Supply of telephone cable. (Reference B.X. 6 054.)

SOUTH INDIAN RAILWAY CO., January 24th.—Supply of cables and accessories, in connection with Madras improvements. Specifications and forms of tender (£1, not returnable) from the Company's offices, 91, Petty France, Westminster, S.W.1.

PRESIDENT Brand Street, Bloemfontein, illuminated by Wembley lanterns and Osram lamps. *(See note on page 74.)*

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 4th.—Friction disc saw, with electric motor, for cutting steel joists and rails (tender No. P.W. 3/46). (Reference A.X. 8 998.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, February 13th.—Supply of electric tube butt welding set. (Reference B.X. 6 005.)

LOUIS TRICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of distribution system (poles, conductors, transformers, meters, sub-station equipment, etc.). (Reference B.X. 6 003.)

CHILEAN STATE RAILWAYS, February 19th.—Supply of apparatus and material for a signalling service between Maipu and Cartagena stations and between San Fernando and Talca stations. (Reference A.X. 9 008.)

JOHANNESBURG MUNICIPALITY, February 20th.—Supply of switchgear (contract 322). (Reference B.X. 6 044.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of switchboard plugs (schedule C. 548). (Reference B.X. 5 998.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttleton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

POSTMASTER-GENERAL'S DEPARTMENT, March 24th.—Supply of dial parts (schedule C. 555). (Reference B.X. 6 047.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats Waitaki power scheme, section 8. (Reference B.X. 6 048.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

Tenders Accepted.

OLDHAM CORPORATION.—Union Cable Co., Ltd., supply of cable.

WAKEFIELD CORPORATION.—J. E. Fowler, electric wiring of 18 stalls at Pitching Market, £28 6s. 6d.

MAIDENHEAD T.C.—Edgar Fitton and Co., Manchester, heating apparatus, diphtheria ward, £371 9s.

EALING CORPORATION.—H. C. Poole and Son, electric wiring, Health Centre, Islip's Manor, Northolt, £100.

WEST HAM CORPORATION.—Murex, Ltd., supply of 63 tons of British standard tramway rails. (Recommended).

TENTERDEN CORPORATION.—C. Milsted and Son, electric light installation in houses at Shrubcote and Danemere.

H.M. OFFICE OF WORKS, ETC.—T. Clarke and Co., Ltd., electric light, rewiring of infirmary block of Chelsea Royal Hospital.

EASTBOURNE CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., erection of overhead lines to Friston and East Dean, £2 537 9s. 8d. (Recommended.)

STEPNEY (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., exhaust fan, £30; Metropolitan-Vickers Electrical Co., Ltd., electric motor, £85. (Both recommended.)

GENERAL POST OFFICE.—Telephone exchange equipment: Richmond (Surrey), Automatic Telephone Manufacturing Co., Ltd. Telephonic repeater equipment, General Electric Co., Ltd.

BRADFORD CORPORATION.—Aiton and Co., Ltd., steam piping for turbine, Hopkinsons, Ltd., main steam valves for turbine, J. Carter, electric lighting at Bolling secondary school, £1 038 7s. (All recommended).

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—Bromford Tube Co., lamp columns, £6 10s. 5d. each; Holophane, Ltd., lanterns, £2 6s. 6d. each; Acme Lighting and Engineering Co., time switches, £3 1s. 6d. each. (All recommended).

REIGATE CORPORATION.—Callender's Cable and Construction Co., Ltd., cable extensions in Carlton Road, Redhill; T. S. Marriage and Co., Ltd., wiring small houses under hire-purchase scheme, 13s. 5d. per point; with extra 8s. 6d. for a two-way switch on any point.

LONDON COUNTY COUNCIL.—Burdette and Co., Ltd., preliminary electrical work in connection with adaptation of St. Magnus for a new secondary school at Forest Hill, £141. Also tendered: A. Hawkins and Co., £155; Coleby and Co., £162; A. Dean and Co., Ltd., £174; Smethurst and Co. (London), Ltd., £195.

HACKNEY (LONDON) BOROUGH COUNCIL.—Plant in connection with the 30 000 kW extension at Millfields Road generating station: Simon-Carves, Ltd., boiler house, boiler house plant and accessories, including coaling gear, £222 039 (recommended); also tendered:—John Thompson Water Tube Boilers, Ltd., £223 495; Stirling Boiler Co., Ltd., £238 756; Mitchell Conveyor and Transport Co., Ltd., £250 795; Underfeed Stoker Co., Ltd., £254 501; Babcock and Wilcox, Ltd., £255 051. C. A. Parsons and Co., Ltd., 30 000 kW turbo-alternator, feed water heaters, and Hick-Hargreaves condensing plant and auxiliaries, £105 484 (recommended); also tendered:—A. E. G. Electric Co., Ltd., £84 516; Brush Electrical Engineering Co., Ltd., £102 750; Richardsons Westgarth and Co., Ltd., £105 600; English Electric Co., Ltd.; £106 001; British Thomson-Houston Co., Ltd., £106 350; Fraser and Chalmers Engineering Works, Ltd., £107 543; Metropolitan-Vickers Electrical Co., Ltd., £108 387; alternative tenders: C. A. Parsons and Co., Ltd., £99 993; English Electric Co., Ltd., £101 501; Herbert Morris, Ltd., overhead travelling crane, £3 040; also tendered:—Vaughan Crane Co., £3 115; Ransomes and Rapier, Ltd., £3 595; Babcock and Wilcox, Ltd., £3 928 5s.; Stothert and Pitt, Ltd., £4 170. A. Reyrolle and Co., Ltd., switchgear, £77 900; also tendered:—General Electric Co., Ltd., £77 224; English Electric Co., Ltd., £78 576 14s.; Ferguson Pailin, Ltd., £80 541; Park Royal Engineering Co., Ltd., £81 908 10s.; British Thomson-Houston Co., Ltd., £83 314; Metropolitan-Vickers Electrical Co., Ltd., £84 911.

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WORK IN PROSPECT.

BATH.—Extensions to cost between £20 000 and £30 000, for Sir Isaac Pitman and Sons, Ltd. Particulars, Messrs. Hayward and Wooster.

BROMLEY (KENT).—Extensions, Maternity Hospital. Particulars, Mr. P. A. Coad, architect.

CROYDON.—Three new schools and extensions. Particulars, Mr. John M. Newnham.

DARTFORD.—Houses (14). Particulars, the Surveyor.

EASTBOURNE.—Houses (28). Particulars, the Borough Surveyor.

GARSTON.—School (412 places). Particulars, Mr. A. E. Prescott, County Architect, Hatfield.

LLANDRINDOD WELLS.—Extensions to intermediate school. Particulars, Mr. J. Mostyn, Director of Education.

MAIDENHEAD.—New block, Isolation Hospital. Particulars, the Borough Surveyor.

NEWCASTLE-ON-TYNE.—New warehouse. Particulars, Messrs. Cachett and Burns Dick, architects, Pilgrim House.

NOTTINGHAM.—Shops and offices. Particulars, Messrs. Calvert and Jesson, Low Pavement, Nottingham.

PERSHORE.—Senior school (400 places). Particulars, Mr. A. W. Priestley, Shire Hall, Worcester.

READING.—Housing scheme (237). Particulars, the Borough Surveyor.

RICCALL.—School. Particulars, the clerk, Mr. J. R. Procter, Beverley.

ROMFORD.—Intermediate school. Particulars, Mr. J. Stuart, Chelmsford.

ROTHWELL.—Conservative club. Particulars, Col. John Brown, Northampton.

RUGBY.—Block of offices. Particulars, Mr. W. T. Loveday.

RYE LANE.—Business premises. Particulars, Messrs. North Robin and Wilsdon, architects.

SCARBOROUGH.—New wing, stone pavilion, etc., Queen Margaret's School, to cost £42 000. Particulars, Mr. T. J. Rushton, 2, New Square, Lincoln's Inn, London, W.C.2.

RELIGHTING SAFETY LAMPS.

New Relighting Order Requiring Preliminary Examination of Lamps.

THE Secretary for Mines has made and published an Order in pursuance of Sections 33 and 35 of the Coal Mines Act, 1911, and of the Coal Mines General Regulations (Safety Lamps), 1927, authorising and prescribing conditions for the use of flame safety lamps fitted with self-contained relighting devices. The Order, which is entitled "The Safety Lamps (Relighting) Order of 1929," extends the operation of the Safety Lamps (Relighting) Order of 1927 from January 1st until further order, and is in the same terms as the existing Order, except that the opportunity has been taken to make clearer the intention of paragraph 3 in regard to the examination of the lamp to be made before relighting it underground. The intention of this requirement is to prohibit the relighting, without previous examination by the light of an electric safety lamp of approved type, of a lamp which has been extinguished by a fall or blow, and may have suffered damage in this or some other way. A foot-note has also been added explaining that "an electric safety lamp of approved type," for the purposes of paragraph 3, includes electric torches approved for the use of officials or for special purposes.

RESTRICTION OF RUBBER SUPPLIES.

IT is reported that the Dutch rubber producers, who are meeting at Amsterdam to consider methods of improving the position of the rubber industry, have decided to attempt to restrict production by 10% to 20%. A committee will visit Java to propose the restriction of tapping, and the deposit by European and native producers of 20 fl. per ton and 2 c. per kg. respectively, which will be forfeited if the proposed restriction obligations are not fulfilled. Rubber has fallen to about 7d. per lb.—the lowest figure in the last seven years—and this, with the rise in London stocks during the past year, is regarded as an indication that production is in excess of demand. In London and Liverpool the stocks amount to 78 630 tons, compared with 22 691 tons a year ago, and stocks throughout the world are estimated at 210 000 tons. On the other hand, consumption increased last year by about 130 000 tons, and the total consumption, including reclaimed rubber, was over 1 000 000 tons—a record figure. The Dutch producers desire to consult with British producers and other foreign interests on the situation.

RURAL ELECTRIFICATION.

Australian Opportunities for Manufacturers of Electro-Farming Equipment.

THE State Electricity Commission of Victoria announces that steps are being taken by the Commission to develop more aggressively the farm load, and as a result of initial activities numerous inquiries are being received in connection with electrically-operated farm equipment. It is apparent that the Commission must be in a position to furnish full information to its consumers on the prices, energy consumption and the source of supply of all types of farm electric devices, and particularly incubators and brooders; egg cleaning apparatus; milking plants; separators; dairy water heaters; water systems; milk coolers; refrigerators; pasteurisers; portable single phase, 460 V, fractional H.P. motors,, 230 V, integral reduction gear, variable speed single phase motors; lawn-mowers; greenhouse heating equipment. Also all classes of farm machinery, such as chaff-cutters, feed crushers, etc., in which electric motor drive is integral to the plant.

The Commission, therefore, invites such firms as manufacture any of the above equipment to communicate with 22, William Street, Melbourne, stating particularly (*a*) the name and address of their representative in Australia, if any; (*b*) if not represented, the terms on which they will ship sample equipment; (*c*) the price, weight, cubic measurement packed and whether wholly manufactured in Great Britain; (*d*) the output, wattage and energy consumption of appliances, together with as complete descriptive and illustrated matter as will enable the Commissioners or their clients to order, if necessary.

It may be mentioned that a large electrical exhibition will be held in Melbourne in September next, and the Commission would like to be in a position to introduce some of the latest farm electric appliances on that occasion.

TRADE PUBLICATIONS.

THE REVO ELECTRIC CO., LTD., Great Queen Street, London, W.C.2, has issued a new folder relative to loud speakers.

W. BEARDSALL AND CO., LTD., 5, Victoria Bridge, Manchester, have sent us copies of two new lists relative to lighting-fittings.

The current stock list of electrical accessories has been received from BAXTER AND CAUNTER, LTD., 219, Tottenham Court Road, London, W.1.

List 410 entitled "Conduit and Conduit Fittings" has been published by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38, Upper Thames Street, London, E.C.4.

The "Mignon" electric hand drill is the subject of a new folder by the ELECTRICAL EQUIPMENT AND CARBON CO., LTD., 100/111, New Oxford Street, London, E.C.1.

"Electro-Vapour Radiators" is the title given to a new coloured folder by the manufacturers, BENHAM AND SONS, LTD., 64/66, Wigmore Street, London, W.1.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., has published list Nos. 6638 and 6643, describing the type P 225 power amplifier and "Brookman's" rejector respectively.

We have received from FRY'S (LONDON), LTD., 24/26, Water Lane, London, E.C.4, a copy of the company's new catalogue dealing with tools. The new issue covers equipment for the engineering and carpentery trades and is profusely illustrated.

An interesting publication just issued by BRITISH INSULATED CABLES, LTD., Preston, Lancs., is a brochure entitled "The Central Scotland Electricity Scheme." This publication tells the story of the Scottish grid in words and pictures, the latter being large plates of outstanding excellence. The first illustration shows the marking out of the tower sites, and is followed by other pictures showing overhead line construction from this stage until a final landscape plate shows part of the country with the lines erected. In all there are twenty-five full-page illustrations with two pages of "cinema" snapshots showing steps in tower erection.

BENN BROTHERS' JUBILEE.

The Jubilee Dinner of Benn Brothers, Ltd., will take place at the Wharncliffe Rooms, Great Central Hotel, Marylebone, London, N.W., on Saturday, February 1st, at 6.15 p.m. The Rt. Hon. J. H. Thomas, M.P., Lord Privy Seal, will be a guest of honour at the dinner, and dancing will follow.

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ELECTRICITY SUPPLY.

Proposed New Plant at Bath—Scunthorpe Assisted Wiring—Inauguration of Clitheroe Undertaking—Power Development on the St. Lawrence—Home System Charges at Preston—Glasgow's Change of Frequency.

WIMBLEDON Corporation is to apply for permission to extend the plant at the generating station.

Bath Electricity Committee recommends the City Council to apply for a loan of £24 960 for the installation of a 7 000 kW turbo-alternator.

An application has been made by Scunthorpe and Frodingham U.D.C. for a loan of £1 568 for the assisted wiring of an additional 200 houses. Under the scheme 340 houses have been wired, leaving 60 to complete the number sanctioned by the Commissioners.

Worcestershire County Highways Committee has received from the Shropshire, Worcestershire and Staffordshire Electric Power Co. an application for consent to erect overhead distribution lines along the Bewdley-Kidderminster Road, in order to supply street lighting in Wribbenhall. The Committee has consented to the erection of necessary short sections of overhead line.

Dagenham U.D.C. has accepted the offer of the County of London Electric Supply Co., Ltd., to lay mains and services and supply wiring and lighting fittings in connection with the new housing estate, at 18s. 8d. per point per house for a total of 107 houses. Tenants who desire to adopt the domestic two-part tariff system are to be supplied at the rate of 1s. per week, plus 1d. per kWh.

The Minister of Transport, on January 9th, informed a deputation from the Council for the Preservation of Rural England that the national grid was to go ahead. He did not see any difficulty in arranging a certain measure of consultation in the central body of the Council with regard to main transmission lines. Apart from the big structures of the grid, the rural transmission lines were not conspicuous.

The Chief Engineer of the Aldershot Command has informed Aldershot Corporation that it is proposed to extend the Command electricity station, and has asked whether the Council desires to increase its bulk demand above the present 1 200 kVA maximum. The Council has decided to ask that provision be made for a maximum of 1 500 kVA until the expiration of the present contract in September, 1931.

The inauguration of Clitheroe's electricity extension to the West Riding villages of Waddington, West Bradford and Grindleton will take place to-morrow (January 18th). The Mayor, members of the corporation and a number of visitors will be present at the opening ceremony, and there will be a cinema novelty at the picture house, demonstrating the many purposes to which electricity can be applied in country places.

Godalming T.C. is in negotiation with the Aldershot Gas, Water, and District Lighting Co. with reference to the transfer to the company of the local undertaking of the Urban Electric Supply Co. The Mayor announced recently that a sub-committee was negotiating with the Aldershot Co., and it was hoped that terms would be submitted enabling the Council to consent to the transfer. Guildford R.D.C. is not to oppose the transfer.

Modifications have been made in Fleetwood Council's electrical development scheme for the provision and laying of mains and supply of current to the south-westerly portion of the district. A modified scheme, involving an estimated expenditure of £15 000, has been adopted, subject to the Unemployment Grants Committee's sanction to the alterations and to 33⅓ per cent. of the requisite labour being obtainable from the distressed areas.

Derby T.C. has applied for a loan of £77 398 for electricity purposes and for the withdrawal of a previous application for a loan of £50 000 for mains, transformers and motors. Application has also been made to the Unemployment Grants Committee for grants towards the cost of laying pipes in streets where electricity mains are not at present provided, £3 100; and changing over supply in outlying districts where d.c. mains are in operation, £21 000.

Dungannon U.D.C. has received a letter from Electrical Supplies, Ltd., stating that the company considers the Council's resolution in favour of obtaining an option to purchase, should the firm be granted an Order by the Electricity Commissioners, unreasonable. A letter from the Dungannon Gas Co. states that if granted the Order it would be prepared to grant the Council an option to purchase. It has been decided not to support the Gas Co.'s application.

A concession has been granted for the supply of electricity within a radius of 14 miles of Jerusalem. The Power Securities Corporation, which has acquired the rights from the Greek pre-War concessionnaire, is to hold the concession for 44 years.

The conference between the Canadian Federal Government and the Ontario and Quebec Provincial Governments in regard to the water power of the St. Lawrence and other rivers, is to take place on January 20th. It is understood that the engineers of the Hydro-Electric Commission of Ontario and the technical experts of the Federal Government, who originally favoured different plans for power development on the St. Lawrence, have now arrived at a compromise in regard to the matter.

Mr. E. Kilburn Scott, who planned and supervised the installation of new electrical plant at the Royal Merchant Seamen's Orphanage, Bear Wood, near Wokingham, informs us that the plant has now been running for over a year, and the total cost of electricity generated works out at 0·084d. per kWh, or about 1d. including interest on capital and depreciation. The plant includes a 60 H.P. Fielding and Platt semi-Diesel engine driving a 30 kW dynamo, and a booster to charge the storage cells.

Wakefield Electricity Committee has decided to charge a flat rate of 2d. per kWh for shop window lighting and advertising displays, with a minimum of 21s. per 100 W lamp per annum.—The Committee is considering a draft scheme for assisted wiring of premises.—The percentage charges under the rateable value tariff for electricity are to be up to £20 rateable value, 17½%; above £20 and up to £60, 15%; above £60, 12½%.—Terms for the supply of electricity in bulk to British Ropes, Ltd., have been arranged.

It was alleged by Coun. H. E. Rhodes, chairman of the Electricity Committee, at a recent meeting of Preston Corporation, that certain people took undue advantage of the home system charges. In future, he said, it would be a condition that there should be a minimum consumption of 1 kWh per day per kilowatt installed. Some consumers were using less current than before they adopted the system. After hours lighting in shops would be reduced to 2½d. per kWh.—The Chairman said there had been complaints that unauthorised persons had been opening sealed electric slot-meters and robbing them.

A conference was held at Leicester recently between representatives of the Central Electricity Board, the County Council and other public bodies, with regard to the scheme for carrying electricity from Birmingham to places in the Midlands, including Leicester, Loughborough, Nottingham and Burton. The overhead cables would be carried by steel lattice-work towers. It is understood that objection was made by Leicester on the ground that it would interfere with the scheme for a municipal aerodrome at Braunstone. No agreement was reached at the conference, and it is probable that another will be held shortly.

The York City Electrical Engineer reports that it has become necessary to consider the advisability of commencing to change the centre portion of the town to alternating current, that he has prepared a scheme to effect this change-over, and that the cost is estimated at £36 395. The report has been adopted by the Electricity Committee.—The Committee has made an agreement with Osbaldwick Parish Council to supply and erect four brackets and nineteen posts for street lighting at a cost of £187, and to supply the necessary current and lamps and attendance during six months in each year, the lighting to be from dusk to dawn, at two guineas per lamp per annum.

Mr. Herbert Bell, manager of the Glasgow electricity department, reports with regard to the change of frequency in the north-west district of the city, that a complete survey has been made and that the approximate cost of the change over, based on the assumption that an extra supply at Port Dundas by the Central Electricity Board is available at the date previously arranged, will amount to £248 000, made up of generation, £35 000; inter-connection, £5 000; distribution, £131 000; adaptation of consumers' equipment £65 000, and management, £12 000. The Electricity Committee has instructed the manager to submit the scheme to the Central Electricity Board.

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COMPANY NEWS.

Quiet Market in Electrical Securities—New Electrical Plant for Burma Mines—Calcutta Electric Supply Corporation and Foreign Shareholders—Reports, &c.

DURING the past week there has again been little activity in the electrical stock and share market, and changes in quotations, so far as the securities quoted in our list are concerned, have been slight, except in a few notable cases such as those of the County of London Electric Supply Co.'s ordinary shares, which have jumped from 42s. 6d. to 46s. 3d., Hydro-Electric Securities, which after a rise from 38½ last week have again improved from 40 to 43⅜, the Victoria Falls Electric Power Co.'s ordinary, which have risen from 57s. 6d. to 61s. 3d., and the Calcutta Electric Supply Corporation's ordinary shares, which have this week put on half-a-crown.

Calcutta Electric Supply preference have not yet regained the 1s. 3d. dropped a week ago, and they still stand at 20s. Rises have to be recorded this week in International Holdings from 5⅛ to 5⅝, Lancashire Electric Light and Power ordinary from 27s. to 27s. 6d., London Electric Supply ordinary from 26s. to 26s. 6d., Midland Counties Electric Supply ordinary from 27s. to 28s., South Metropolitan Electric Light and Power first preference from 25s. to 25s. 7½d. In the traction section advances have taken place in British Electric Traction preferred ordinary from 121½ to 122½ and 6% preference stock from 123½ to 125½, London Electric Railway 4% preference from 71½ to 72 and 4% debentures from 76½ to 77; Metropolitan Railway ordinary from 62½ to 64 and 3½% preference stock from 61 to 62; and Underground Electric Railways ordinary from 21s. to 22s.

Amongst the manufacturing companies the following increases have occurred:—British Insulated Cables ordinary, 1s. 3d.; W. T. Henley's ordinary, 1s. 3d.; and Telegraph Construction ordinary, 1½. Anglo-American Telegraph 6% preferred, Cables and Wireless "A" ordinary and Great Northern Telegraph shares each put on one point, while Marconi International Marine appreciated to the extent of 2s. 6d. British Electric Transformer 7% preference remain at 10s. as last week, having failed to regain the 3s. 1½d. dropped compared with the week before. Electric Construction first mortgage debentures are down by two points, to 69½, and Siemen's preferred by 1s. 3d. to 31s. 3d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6½	" " " C. Cum. Pref. ..	21/-	21/-	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	57/6	57/6	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	48/1½	45/7½	56/-	32/6
5	" " " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95⅝	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	36/3	35/-	41/6	26/6
8	" " " 8% Pref.	27/6*	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	46/3	42/6	68/6	25/9
6	" " " 6% C.P.	22/-	22/-	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-*	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6*	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	89	89	92	80½
—	Hydro Electric Securities ..	43⅜	40	87	20
—	International Holdings	5⅛	5⅛	35⅛	6⅛
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/6	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/6	27/6	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/-	27/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	26/6	26/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	99	104	95
10	Melbourne Electric Ord. Stk. ..	171	171	180	150
1/9½	Metro. Elec. Sup. Ord.	37/6	36/9	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	27/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	11⅛	9⅛
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(e)	St. James & P.M. Ord. (£1) ..	25/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	25/6	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92	92	98⅛	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	61 3	57/6	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	80½	80½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	88½*	89½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	121½	152	117
7·67	" " " 6% Pf. Stk.	125½	123½	133	103¾
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/6
5	" " " 5% Cum. Pf.	13/9*	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½*	79½	85½	78
4	" " " 4% Deb. ..	77*	77	83	77½
5	City & S. London, Cons. Ord. ..	67	67	64	56
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	72	71½	77	68
4	" " " " 4% Deb. ..	77	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	50½	50½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	64	62½	81	34½
3½	" " " 3½% Pf. Stk. ..	62	61	76	60½
3½	" " " 3½% Deb. ..	67½*	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72½	72	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	111½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	80½	82½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	22/-	21/-	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57*	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	27/6	27/-	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	76/3	86/3	36/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	22/9	22/9	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6*	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	83½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	21/-
4	" " 1st Mt. Deb. ..	69½*	71½	75	68
20	Enfield Cable Works Ord.	97/6	97/6	82/-	60/-
7½	" " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	5/-	5/-	15/9	5/-
—	" " 6% C.P.	7/6	7/6	18/9	7/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb. ..	69½	69½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	18/9	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	46/3	46/3	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	120/-	118/9	120/-	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	33/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9*	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord.	25/-	25/-	36/6	24/9
10	" " " Cum. Pref.	31/3*	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	24½	23	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	225	225	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	61½	61½	63½	56½
6	" " " 6% Prefd. Stk...	102½	101½	105½	91
1½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	76½	75½	—	—
—	"B" Ord. Stk.	37⅛	37⅛	—	—
—	5½% Cum. Pref. Stk. ..	98½	98½	—	—
3½	Eastern 3½% Pref. Stk.	61½*	62½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	76	76	80	74½
22	Great Northern Telegraph (£10)	30½	29½	43½	26
—	International Teleph. & Teleg. ..	$75	$75	161½	48½
15	Marconi Int. Mar.	47/6	45/-	90/-	16/6
4½	New York Telep. 4½% Mt. Bds...	97½	97½	101	96
12	Oriental Telephone Ord.	58/9	58/9	65/-	42/-
—	Radio Corporation of America ..	43	43⅛	115⅝	18½
4½	United R. Plate Teleph. 4½% Deb.	87½*	88½	89½	82
4	Western Tel. 4% Deb. Stk. ..	77	77*	82	76

(a) 19½d. per share. (b) 1s. 9·3d. per share. (c) 2s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share, (f) Plus 4d. bonus. *Ex dividend (g) 2s. 2⅝d. per share.

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Directors' Reports, etc.

SINGAPORE TRACTION CO., LTD.—Intm. div. of 7%, less tax, on 7% cum pref. shs. is announced.

LLANELLY AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Transfer books of 6% cum. pref. shs. will be closed from Jan. 17 to 31, inclusive.

TRACTION AND GENERAL INVESTMENT TRUST.—Fin. div. of 11% is recommended on ord. stk., makg. 17%, less tax, for year, agst. 16% for previous year.

PERAK RIVER HYDRO ELECTRIC POWER CO., LTD.—Transfer books of 7% participatg. deb. stk. at 9, Clements Lane, Lombard Street, London, E.C.4, will be closed from Jan 18 to 31 inclusive.

KOLSTER RADIO CO.—It is reported from New York that a request has been made for the appointment of a receiver for the company. It has been alleged by a shhldr. that the company is losing money.

TATA POWER CO.—Net pfts. for year ended June 30, Rs. 2 71 521, after placing Rs. 6 00 000 to depreciatn. Div. at the rate of 7½% p.a. on pref. for three months ended June 30, 1927. Rs. 1 57 575; fwd., Rs. 1 19 024.

MEXICAN LIGHT AND POWER CO., LTD.—Coupon No. 54 due Feb. 1 on 5% 1st mtge. gold bonds will be paid on and after that date at the Bank of Montreal, 47, Threadneedle Street, London, E.C.2. Coupons to be left three clear days.

AMERICAN TELEPHONE AND TELEGRAPH CO.—A syndicate headed by J. P. Morgan and Co. made, on Monday, an offer of $150 000 000 of 35-year 5% debs. in the American Telephone and Telegraph Co. The proceeds will be used to finance the company's expansion programme.

ASSOCIATED GAS AND ELECTRIC CO.—Regular qrtrly. div. of 50 cents on class "A" stk., will be payable Feb. 1, in class "A" stk. at rate of 1/40th of one sh. of class "A" stk. for each sh. held Dec. 31, 1929. In additn. an extra div. of 40 cents p. sh. is payable in 2/125ths of a sh. of class "A" stock.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—It has been decided to pay blce. divs. of £1 10s.% on ord. con. stk. and on pfd. stk., both less tax. A first and fin. div. of £1 10s. % will also be paid on dfd. stk, less tax. These paymts. will again bring distribution to £3 15s.% on Ord. and £6% on pfd. stk., the paymt. on dfd. same as last year.

CREED TELEGRAPHEN APPARATE G.M.B.H.—Messrs. Creed and Co., of Croydon, announce the formatn. of a company in Germany associated with the International Telephone and Telegraph System, to be known as Creed Telegraphen Apparate G.m.b.H. The new company has been formed to manufacture and exploit the sale of Creed printing telegraph apparatus in Germany.

AMERICAN COMMONWEALTH POWER CORPORATION.—The Corporation and subsidiaries rpt. gross earngs. of $24 721 431 for year to Nov. 30, increase $6 942 917. Net earngs. $10 879 146, agst. $6 919 291. Blce. for divs. and reserves of parent corporation $4 285 141, increase $2 503 786. Blce. for reserves, Federal taxes and surplus, after divs. on 1st and 2nd. pref. stks. of parent had been paid, $3 666 459 agst. $1 150 383.

SIMMS MOTOR UNITS, LTD.—The directors have sent a letter to shhldrs. statg. that the business during the past year has been quite satisfactory, and continues so, steady progress being made. In view of the recent quotatns. of the company's shs. on the London Stock Exchange, the directors feel that this informatn. will prove useful to shhldrs. The directors' rpt. and accts. for the financial period ended Dec. 31 will be issued at usual time—about the end of April.

BERLIN CITY ELECTRIC CO.—Redemption of part of the $15 000 000 (£3 000 000) issue of 30-year 6½% sinkg. fund debs. made last Feb. by Dillon Read and Co., on behalf of the Berlin City Electric Co. ("Bewag"), is announced by the bankers. The designated debentures, totalling $87 000 (£17 400) principal amt. of the issue, will be payable at 100% with int. on Feb. 1, 1930, at the office of Dillon Read and Co., in New York, at the offices of Guinness, Mahon and Co., in London, or at certn. offices in Amsterdam, Zurich, Basle, and Stockholm.

COMMONWEALTH AND SOUTHERN CORPORATION.—The Commonwealth and Southern Corporation is about to reorganise and acquire the businesses of the Allied Power and Light Corporation, the Commonwealth Power Corporation, the Pennsylvania-Ohio Electric Co., and the South Eastern Power and Light Co. The Allied Power and Light Corporation, which was formed last May, consolidated the Hodenpyl Hardy and Co., Stevens and Wood and other interests; and the Commonwealth Power Corporation controls the Consumers Power Co., Central Illinois Light, Illinois Power, Southern Indiana Gas and Electric, Ohio Edison, Illinois Electric Power, Tennessee Electric, etc. The South Eastern Power and Light, which was incorporated in Maine, in September, 1924, sold its various artificial gas properties to Central Public Service Corporation last March.

Company Meetings.

BURMA CORPORATION, LTD.—Mr. P. E. Marmion, presiding at a meeting in Rangoon on December 20th, said during the period under review they had taken the necessary steps to ensure that their undertaking shall always remain under British control. This had to be done to comply with the terms of their lease. No impediment had been put in the way of anyone, of whatever nationality, who wished to buy or to hold shares in the corporation. In addition to the extensions and alterations to their milling plant they had effected various improvements to their smelter and refinery and added to their hydro-electric station at Mansam Falls. The units generated in 1924 were 25 millions, against nearly 44 millions for the year under review, an increase of 76%. Arrangements had been made to replace some of the existing units with new plant in order to make available at Namtu still more electrical energy. Their efforts at making the best possible use of the volume of water at their disposal had met with singular success. It was truly a case of stretching the water to its maximum limit.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—A general meeting of members of the Corporation was held on January 10th to consider a resolution to alter the articles of association. The chairman, Lord Meston, said the resolution could be divided into two parts, the first dealing with alterations necessary to bring the articles of association into line with the provisions of the new Companies Act, and the second dealing with alterations to secure the maintenance of British control of the company. The first set of alterations was carried without discussion. The chairman, proposing the adoption of the alterations regarding the maintenance of British control, said their effect was, briefly, that the holding of shares in the company by persons who were not British subjects should be limited to 20% of the total number of issued shares, and that the directors of the company should be British subjects. A misapprehension appeared to exist to the effect that the proposals indicated hostility to the investment of American capital in India. So far as that company was concerned there was no such hostility, and never had been any. Another bogy was the idea that the proposal was aimed against Indian shareholders. That suggestion was misleading. British Indian shareholders were subjects of the Crown, and as such were not foreigners; they were in no way affected by the restriction. Nothing would be done to prejudice foreigners who were already holders of their shares. Their holdings would be put on their foreign register, but nothing else would happen. In the case of an ordinary commercial concern the control to be exercised by virtue of holding a majority of the shares was purely a matter of supply and demand. With a public utility company the position was different. Besides the present owners and any propsective future owners, there was a third interested party, namely—the public authority which brought the utility company into existence by granting it a concession. Last year the company had received an intimation from the Bengal Government that they regarded it as essential that control of the company should remain in British or Indian hands and that should transfer of that control be contemplated the Local Government would have to consider in consultation with the local authorities affected by the licences and with the Government of India, the question either of compulsory purchase at the time stipulated in the licences, or of imposing a condition in the licences requiring financial control to be held by British or Indian interests. Since then they had applied for a licence for a small subsidiary area and the Government had made it plain that they were going to await the company's action before any new licence was granted. Mr. T. J. Carlyle Gifford said that he represented over 80 000 ordinary shares held by investment trust companies and their view was that the example which the directors, and through them, the Government of Bengal, was setting was most injurious to the financial interest of London and Great Britain. On being put to the meeting, the proposals were supported by 33 votes against 14, and, as this did not give a three-fourths majority, a poll was demanded. On several shareholders withdrawing their opposition, the Chairman said although the official opposition was withdrawn, a poll had been demanded, and under the law this must proceed. The result is to be declared to-day (January 17th).

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NEW COMPANIES.

MOBILECTRIC, LTD.—Cap., £150. Electrical and mechanical engineers, etc. A director: F. J. Matson, 18, Queens Place, Otley, Yorks.

WATKIN HEATING CO., LTD.—Cap., £6 000. Electric, and general engineers, electricians, etc. Reg. office: 60, Westborough Road, Westcliff-on-Sea.

WILLIAM WELLS, LTD.—Cap., £2 000. Electrical radio and automobile engineers, etc. Reg. office: 168a, Marlborough Road, Holloway, London, N.19.

TOM B. WILKINSON, LTD.—Cap., £100. Electricians, electrical engineers and contractors, dealers in wireless sets, etc. Reg. Office: Arnside, Westmorland.

DOMESTIC AND COMMERCIAL ELECTRICITY (HULL), LTD.—Cap., £100. Electrical and radio engineers and contractors. etc. Reg. Office: Mill House Yard, Southcoates Lane, Hull.

FERRUM, LTD.—Cap., £100. To carry on the business of iron and steel founders, electrical and hydraulic engineers, etc. Solicitors: Stones, Morris and Stone, 41, Moorgate, London, E.C.2.

WHITWORTH ELECTRICAL REPAIRS, LTD.—Cap., £1 000. Engineers, manufacturers of electrical, wireless, fittings and accessories, etc. Reg. Office: 184, Grays Inn Road, London, W.C.1.

ELECTRIC-GAS CAMSHAFTS, LTD.—Cap., £10 000. To acquire inventions relating to camshafts or the process of electro-gas welding, etc. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, London, W.C.2.

ANDERSON ENGINE CO. (FOREIGN), LTD.—Cap., £500. Engineers, machinists, manufacturers of and dealers in locomotives and engines. whether worked by steam, gas, oil, electricity or other power, etc, Reg. office: 199, Piccadilly, London, W.1.

PERFECTION LOUD SPEAKER WIRELESS CO., LTD.—Cap., £1 100. To acquire business of manufacturer of and dealer in wireless apparatus carried on by M. E. Elliott, at Gosford Road, Beccles. Reg. office: 22, Birchin Lane, London, E.C.2.

NASSAK MANUFACTURING CO., LTD.—Cap.,. £100. To acquire from S. W. Nassauer interests and benefits of trade mark "Nassak" and to carry on business as wireless factors and manufacturers, etc. Solicitor: C. L. L. Foakes,.221, Bishopsgate, London, E.C.2.

MAGENERATOR, LTD.—Cap., £525. Manufacturers, repairers, importers and exporters of and dealers in magnetos, dynamos, self startors and other electrical equipment for mechanically propelled vehicles, etc. Reg. office: 24, White Lion Street, Bishopsgate, London, E.C.

W. A. HYMAS AND CO., LTD.—Cap., £1 500. To acquire business of scientific electrical engineer carried on by W. A. Hymas at 303, Westmount Road, Eltham, and to carry on same and business of manufacturers of and dealers in scientific instruments and accessories, including wireless goods, etc. Solicitor: Francis W. Beech, Eltham.

WM. E. CULKIN AND CO., LTD.—Cap., £1 000. Electrical and mechanical engineers, suppliers of electricity, proprietors and managers of telegraph, telephone and signalling works, manufacturers of generators, motors, dynamos, lamps, accumulators, radiators, vacuum cleaners, wireless receivers, etc. Reg. office: Neville Street, Leeds.

TELEPHONE RENTALS, LTD.—Cap., £600 000. To acquire from Telephone Manufacturing Co., Ltd., that part of its undertaking which consists of the issued share capital of those of its subsidiary companies mentioned in an agreement with F. C. T. Lane, the liquidator, and the Telephone Manufacturing Company (1929), Ltd., to carry on business of making, selling, installing, etc., private or other telephones and telegraphs, makers and sellers of electrical apparatus, etc. Reg. Office: Hollingsworth Works, Martell Road, West Dulwich, London, S.E.21. (Public Co.)

METAL AND CHEMICAL PRICES.

		TUESDAY, January 14th. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£76 15 0	£1 5 0	—
Electro Wirebars	,,	£83 15 0	—	—
H.C. Wires, basis	per lb.	11 7/16d.	1/16d.	—
Sheet	,,	11 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2 1/16d.	1/16d.	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10 1/16d.	—	—
Wire ,,	,,	10 1/16d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	—
Foreign or Colonial	,,	£21 12 6	5s.	—
Tin—				—
Ingot	per ton	£175 0 0		2s 6d.
Wire, basis	per lb.	2s. 4 1/4d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 7 6	—	2s. 6d.
Mercury	per bottle	£23 5 0	—	—

Sulphur—Flowers, Ton £12 0 0; Roll, ,, £10 10 0. *Copper Sulphate* .. Ton £25 to £25 10 0. *Boric Acid* (Crystals) ,, £30 0 0.

Sulphuric Acid (168°) Ton £6 15 0. *Sodium Chlorate*—Per lb., 2 1/2d. *Sodium Bichromate*—Per lb., 3 1/2d.

Rubber—Para fine, 8 1/4d.; plantation, 1st latex, 7 1/2d.

. The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CAMPBELL, James, 1a, Robert Street, Henry Street, W.C., electrical specialist. £29 2s. 10d. October 22nd.

DAW AND SONS, 142, Broadway, Handsworth, wireless dealers. £13 3s. 6d. November 23rd.

FORD'S (J. M.) GARAGE, Market Place, Alnwick, wireless dealers. £13 15s. 8d. November 11th.

NORBITON ELECTRICAL AND WIRELESS SUPPLIES, 190, London Road, Kingston-on-Thames. £26 1s. 6d. November 14th.

SEAGER AND BURCH, Claughton Buildings, Claughton Road, Colwyn Bay, radio engineers. £14 19s. 7d. November 4th.

SOLOMON, J., AND SONS, 18, Clarence Road, Gorleston-on-Sea, electrical dealers. £45 5s. 2d. December 6th.

WALLIS Alex. J., Church Hill, Little Common, near Bexhill, radio engineer. £16 9s. 3d. November 11th.

WARDSWORTH, L. AND V., 335, Bury Old Road, Heaton Park, Manchester, wireless dealers. £16 11s. 5d. November 19th.

Receiverships.

FELLOWS MANUFACTURING CO., LTD.—P. A. Bristow, C.A., of 68½, Upper Thames Street, E.C.4, was appointed receiver and manager on January 6th, 1930, under powers contained in debentures dated November 15th, 1929.

RISSIK, FRASER AND CO., LTD., formerly RISSIK, FRASER, SPINKS AND CO., LTD. H. A. Brown, accountant, of Trafalgar House, Waterloo Place, Pall Mall, S.W., was appointed receiver and manager on December 24th, 1929, under powers contained in mortgage dated December 8th, 1928.

London Gazette, etc.

Company Winding-up Voluntarily.

ALDERLEY AND WILMSLOW ELECTRIC SUPPLY, LTD.—By special resolution, January 3rd. H. Fraser appointed as liquidator.

Bankruptcy Information.

CROOK, James, 5, Crosby Street, Atherton, Lancashire, trading as W. AND J. CROOK, wireless engineer. Receiving order, January 6th. Debtor's petition. First meeting, January 22nd, 11.45 a.m., and public examination, March 11th, 10.45 a.m,. Court House, Maudsley Street, Bolton.

DURANT, Thomas William Baron, Coib Lane, Chapeltown, near Sheffield, electrical and motor engineer. Receiving order, January 10th. Debtor's petition.

HOEY, Frank Walter Charles, of 51, Montgomery Road, Chiswick, wireless and electrical dealer, lately 29, Sicilian Avenue, London, W.C. Receiving order, January 7th. Debtor's petition. First meeting, January 20th, 11.30 a.m., and public examination, February 28th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

JAUNDRILL, Alexander, 21, Duke Street, St. Helens, Lancashire, trading as ALEC JAUNDRILL, radio and gramophone dealer. First meeting, January 17th, 11 a.m., Official Receivers, Government Buildings, Victoria Street, Liverpool. Public examination, February 4th, 10 a.m., Court House, Government Buildings, Victoria Street, Liverpool.

QUINTRELL, William Henry, Higher East Street, St. Columb Major, Cornwall, electrical and mechanical engineer. Receiving order, January 10th. Debtor's petition.

Notices of Dividends.

BLAIR, Edward Winnington, electrical engineer and contractor, lately 6, Queen's Parade, Brent Street, Hendon, Middlesex, trading as BLAIR AND SON. First and final dividend, 7s. 2d. per £, payable January 21st. Official Receiver, 29, Russell Square, London, W.C.1.

CLARKE, Harry Bell, 2, Devonshire Road, Carrington, Nottingham, electrical engineer. First and final dividend, 3 11/16d. per £, payable, January 22nd, Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham.

TURTON, John William, Market Place, Banbury, Oxford, electrical engineer. First and final dividend, 5s. 4¾d. per £, payable, January 20th, Official Receiver's Office, 37, Cornmarket Street, Oxford.

Notice of Intended Dividend.

DEAN, Joseph, electrician, lately 4, Gogerddan Place, Aberystwyth. Last day for receiving proofs, January 28th. Trustee, H. W. Thomas, 4, Queen Street, Carmarthen.

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Order Made on Application for Discharge.

LANGLOIS, Herbert Augustus, electrical engineer, trading in co-partnership with Daniel Timothy Donovan, under style of THE LONDON ELECTRICAL COMPANY, at 119, St. Mary Street, formerly 124, Queen Street, Cardiff. Discharged December 3rd, consenting to Judgment for £150 and £1 10s. costs of Judgment, payable £50 forthwith and £100 on or before June 3rd, 1931, to the Official Receiver.

Partnerships Dissolved.

BLACKBURNE AND PARKER (Roger Giles Marrick BLACKBURNE and Walter Mansel PARKER), radio engineers, 20, Southsea Road, Kingston-on-Thames, and 46B, Victoria Road, Surbiton, by mutual consent as from December 1st, 1929. Debts received and paid by R. G. M. Blackburne, who continues the business.

BRISTOW AND CO. (Leonard BRISTOW and Edwin BRISTOW), electrical engineers and lampshade manufacturers, 40, Sloane Street, 5, Maddox Street, 63, Buckingham Gate, 9, Pollen Street, 21, Astwood Mews, by mutual consent as from September 30th, 1929.

MOUNTAIN, WOOD AND MACLEAN (Kenneth Arthur MOUNTAIN, William Wellesley WOOD and Archibald Barr MCLEAN), electrical and mechanical engineers, Sun Buildings, Newcastle-upon-Tyne, and at Birmingham., by mutual consent as from December 31st, 1929, A. B. MacLean, retiring from the business. Debts received and paid by K. A. Mountain and W. W. Wood, who will continue the practice under the former style of W. C. Mountain, Son and Wood.

Bankruptcy Proceedings.

BATES, VICTOR HAROLD, trading as THE LINTON RADIO SERVICE, High Street, Linton, Cambridgeshire, wireless engineer. The adjourned public examination herein was held recently at the Guildhall, Cambridge. According to the statement of affairs there were liabilities amounting to £204, against assets of £56, thus leaving a deficiency of £148. Debtor stated that he was formerly employed by his father in his boot business. In September, 1924, the debtor commenced business on his own account as a wireless engineer and boot repairer at Harlow with a capital of £55 in cash. The business was mainly wireless, but the greater amount of the profit came from boot repairing. In March, 1928, the debtor's mother died, and his father induced him to sell his business at Harlow and open a business in conjunction with him at Linton. Debtor stated that he agreed to do this on the understanding that his father would hand the Linton business over to him, but this he had failed to do. Debtor sold the business at Harlow for £140, and all the liabilities had been discharged except one. The debtor's father opened the shop at Linton and the debtor erected a workshop at the back at a cost of about £30. The debtor stated that his father's boot business and his own wireless trade were entirely separate. He attributed his failure to changing from Harlow to Linton, expenditure on buildings and plant at Linton, and insufficient profit. Debtor first became aware of his position about six months ago, since when he contracted a few debts, thinking that he would be able to realise sufficient on the sale of the premises and the business. The examination was adjourned for closing.

FELLOWS MANUFACTURING CO., LTD.—The statutory first meeting of the creditors and shareholders of the above were held recently at Bankruptcy Buildings, Carey Street, W.C.

The Official Receiver stated that the company was registered as a public company on July 25th, 1927, with a nominal capital of £175 000, to acquire Fellows Magneto Company under a scheme of reconstruction and to carry on business as manufacturers of wireless apparatus, motor electricians and ignition specialists.

According to the balance-sheet for the first seventeen months of the company's existence, the trading resulted in a gross profit of £109 343, nearly one-half of which was expended on advertising, and a net profit of £15 700. The result of the subsequent trading had not yet been ascertained, but it was clear that heavy losses had been sustained.

A draft statement of affairs had been lodged showing total liabilities £107 290, of which £46 336 was unsecured, and assets £61 612, which would be absorbed in the debenture and preferential claims. The deficiency with regard to contributories was estimated at £173 926. Those figures must only be taken as approximately representing the position, as proofs of debt amounting to £53 830 had already been received, as against the £46 336 returned as the amount of the company's unsecured indebtedness, but it was perfectly clear that no dividend could possibly be paid to the unsecured creditors unless the second debentures were to be set aside, in which event there might be a small dividend. Nor could any return be made to the shareholders.

The liquidation was left in the hands of the Official Receiver.

THE LEAD MARKET.

The market this week has been quiet and according to James Forster and Co. prices have fluctuated within narrow limits. Lead producers raised their price early in the week by 2s. 6d. per ton, but failed to stimulate demand, which remains dull.

Closing prices on January 10th were £21 8s. 9d. for January, £21 10s. for February, and £21 11s. 3d. for March and April, showing practically no change on the week.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

320 121 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC).. Electrical impedance networks. (7/7/28.)
320 122 J. LUCAS, LTD., O. LUCAS, and W. H. EGGINTON. Motor-vehicle electric lamps. (7/7/28.)
299 007 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (19/10/27.)
293 776 BRITISH THOMSON-HOUSTON CO., LTD. Electric switches. (11/7/27.)
320 187 S. GOWAN and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Dashpot damping devices. (22/8/28.)
320 193 CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., and L. G. BRAZIER. Measurement of the temperature of electric cables. (29/8/28.)
320 197 GENERAL ELECTRIC CO., LTD., and H. J. ELEY. Arrangements for driving spinning-spindles of spinning-machines. (1/9/28.)
320 198 C. M. DE C. DE LA BOURDONNAIS (PRINCE DE MAHE). Sound-producers such as loud speakers. (1/9/28.)
297 734 SIEMENS-SCHUCKERTWERKE AKT.-GES. Means for supervising or controlling electrical fault indicating and protective devices. (26/9/27.)
320 206 G. WILKINSON. Thermal electric switches. (10/9/28.)
320 212 A. D. S. RICE. Radio reception. (15/9/28.)
297 826 INFRA. Electric resistance furnace for the thermal treatment of metals and other substances. (29/9/27.)
320 224 EDISON SWAN ELECTRIC CO., LTD., and W. E. HANKINS. Electric imitation fires. (3/10/28.)
320 227 T. R. CHRISTOPHER. Connectors, or terminals for making a positive metallic connection between high or low tension electric cable and terminal post. (8/10/28.)
320 235 BRANDES, LTD., and T. D. WARD-MILLER. Combined condenser and grid-leak for wireless receiving apparatus. (12/10/28.)
315 295 N. V PHILIPS' GLOEILAMPEN-FABRIEKEN. Thermionic valves or electron-discharge tubes. (11/7/28.)
299 874 WAYGOOD-OTIS, LTD. Elevator safety appliance. (4/11/27.)
299 461 SIEMENS-SCHUCKERTWERKE AKT.-GES. Quick-acting switches for heavy direct currents. (28/10/27.)
300 547 F. ROTHER. Electron-discharge devices. (14/11/27.)
320 253 S. M. RUTNAGUR. Electric traction for railways. (31/10/28.)
314 039 SOC. MARITIME NATIONALE. Device for correcting radiagoniometric indications on board a ship. (22/6/28.)
316 856 F. SZALAY. Devices for preventing the tilting movement of the bows of current-collectors. (4/8/28.)
304 228 HEWITTIC SOC. ANON. Mercury-vapour apparatus. (17/1/28.)
320 288 M. C. SPENCER. Means for operating polyphase motors from a single-phase source. (21/12/28.)
304 211 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electrical control devices responsive to light. (16/1/28.)
320 067 R. O. KAPP, and C. G. CARROTHERS. Protective arrangements for electric power lines or the like. (21/6/28.)
288 292 G. H. SCHIEFERSTEIN. Method of and means for equalising forces and inertia effects in oscillating systems. (8/4/27.)
288 521 BRITISH THOMSON-HOUSTON CO., LTD. Hard metal compositions, and methods of making the same. (6/4/27.)
320 364 H. E. DANCE. Electrical indicating, measuring, recording, or controlling apparatus. (11/4/28.)
320 388 A. E. KNOWLES. Electrolytic apparatus. (14/4/28.)
320 214 G. G. DE ANDIA-YARRARAZAVAL. Sound amplifiers for wireless loud speakers and the like. (17/4/28.)
320 352 B. THOMAS and E. THOMAS. Electric heating elements. (10/5/28.)
320 366 G. A. BETULANDER. Automatic telephone systems. (10/7/28.)
320 337 G. A. BURNHAM. Electric circuit interrupting systems and methods of controlling said electric circuits. (7/6/28.)
320 319 P. R. COURSEY and DUBILIER CONDENSER CO. (1925), LTD. Toroidal coil windings. (5/6/28.)
320 320 E. B. WEDMORE, W. B. WHITNEY and BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION. Electric circuit breakers. (8/6/28.)
320 356 C. W. COX and C. E. C. SHAWFIELD. Electric supply service boxes or fittings. (9/6/28.)
292 078 M. BERGOIN. Pneumatic devices for making and breaking electrical circuits. (11/9/27.)
320 338 W. HOLMES and FERRANTI, LTD. Electrical testing sets. (9/6/28.)
320 390 J. A. CRABTREE and B. G. HARRISON. Electric couplings. (12/6/28.)
320 322 G. SCHONSTEIN. Means for starting and stopping an electrically driven talking machine. (2/7/28.)
293 462 HAZELTINE CORPORATION. Amplifier volume control for carrier signalling. (7/7/27.)
320 370 W. S. SMITH, H. J. GARNETT, J. N. DEAN, B. J. HABGOOD and H. C. CHANNON. Electrical insulating materials. (4/7/28.)
293 694 DR. S. LOWE. Manufacturing cathodes for thermionic valves. (9/7/27.)
320 348 SIEMENS BROS. AND CO., LTD., and D. A. CHRISTIAN. Telephone systems (9/7/28.)
320 358 S. G. S. DICKER (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN). Electric discharge tubes. (9/7/28.)
320 360 SANTON, LTD., and H. C. SANDERS. Thermostatic controls. (10/7/28.)
320 380 STANDARD TELEPHONES AND CABLES, LTD., and E. P. G. WRIGHT. Automatic or semi-automatic telephone systems. (11/7/28.)
320 383 A. REYROLLE AND CO., LTD., and H. C. ATKINS. Electric protective systems. (11/7/28.)
320 384 E. BARNFATHER and CORRECTA LIGHT, LTD. Lamp-swivelling mechanism for steerable vehicles. (11/7/28.)
320 405 P. R. COURSEY and DUBILIER CONDENSER CO. (1925), LTD. Electrical condensers. (12/7/28.)
320 412 J. STONE AND CO., LTD., and E. G. ROWLEDGE. Refrigerator plant. (13/7/28.)
320 425 C. S. FRANKLIN and E. GREEN. Aerials for use in wireless telegraphy and telephony. (17/7/28.)
294 256 INTERNATIONAL GENERAL ELECTRIC CO., INC. Plugs for electrically heated apparatus. (21/7/27.)
320 440 SOC. CHIMIQUE DE LA SEINE, and V. SZIDON. Apparatus for electrolytically depositing chromium. (28/7/28.)
320 442 J. A. CRABTREE. Electric switches of the tumbler type. (30/7/28.)

Applications for Patents.

September 28th.

29 385 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Signalling systems, (31/10/28, Germany.)
29 367 A. A. THORNTON (RADIO FREQUENCY LABORATORIES, INC.) Electrical device and method of determining distances.
29 290 TELEHOR AKT.-GES. Synchronising apparatus for television, etc. (29/8/29, Germany.)
29 432 P. BAXTER. Electric motors.
29 451 J. MCCALLUM. Electric cables.
29 447 SIEMENS-SCHUCKERT AKT. GES. Electric measuring instruments. (29/9/28, Germany.)
29 470 H. SONNENFELD. Cable armouring. (28/9/28, Austria.)
29 444 WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Electrical relays. (12/12/28, U.S.)

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September 30th.

29 574 Aeonic Radio, Ltd., and P. Kader. Radio receiving sets.
29 583 Arcturus Radio Tube Co. Photo-sensitive cells. (11/1/29, U.S.)
29 584 Arcturus Radio Tube Co. Photo-sensitive cells. (16/3/29, U.S.)
29 581 Associated Electrical Industries, Ltd., H. Diggle, and J. Fowler. Electric tapping switches.
29 599 P. H. Chase. Cables. (20/10/28, U.S.)
29 537 Compagnie des Forges de la Marine et d'Homécourt and E. Granat. Electric transmission of angular positions. (6/11/28, France.)
29 621 H. W. Cron and S. D. White. Electric junction boxes, etc.
29 480 F. H. Dance. Electrolytic method of reclaiming water.
29 562 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Band filters for wireless receivers.
29 563 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Circuit arrangement for screened grid valve.
29 564 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Manufacture of apparatus comprising thermo-electric couple.
29 566 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Thermionic valve amplifiers.
29 567 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Electron discharge tubes.
29 582 Electrical Research Products, Inc. Refining copper. (8/3/29, U.S.)
29 531 A. H. Gausden. Electric motors for gramophones.
29 484 General Electric Co., Ltd., and M. J. McAinsh. Loud speakers.
29 572 C. H. Greenham. Bath for electromedical use.
29 622 R. J. T. Jefferson. Producing and distributing direct electric currents.
29 626 Marconi's Wireless Telegraph Co., Ltd. Vacuum tubes. (28/9/28, U.S.)
29 628 Marconi's Wireless Telegraph Co., Ltd. Communication systems. (29/9/28, U.S.)
29 629 Marconi's Wireless Telegraph Co., Ltd. Voltage regulators. (2/10/28, U.S.)
29 499 L. H. Pearson and W. J. Randall. Means for controlling amplification of sound by electricity.
29 620 Radiovesor Parent, Ltd. and E. F. Stephenson. Operation of electric relay.
29 482 E. H. Smith. Electric drive for wringing, etc., machines.
29 528 M. C. Spencer. Electric motors.
29 586 Telefonaktiebolaget L. M. Ericsson. Circuit arrangements for registration of electrical impulses. (4/10/28, Sweden.)
29 486 R. M. Wilmotte. Oscillographs, etc.

October 1st.

29 666 E. R. Alexander. Emergency fuse box.
29 753 P. Allman. Electric signalling devices for vehicles.
29 674 H. Ashton. Automatic earthing switch for wireless apparatus.
29 650 F. W. Berry. Electric binding post, etc.
29 708 British Thomson-Houston Co., Ltd. Electric heaters. (1/10/28, U.S.)
29 709 British Thomson-Houston Co., Ltd. Electric control systems. (1/10/28, U.S.)
29 759 E. Brontman (A. Garbarini). Electric flashing devices.
29 767 S. G. Brown. Inductance coils.
29 757 Cambridge Instrument Co., Ltd., C. C. Mason, and E. B. Moss. Electrical instruments.
29 772 R. E. H. Carpenter, F. G. G. Davey, M. Trouton, and Wireless Music, Ltd. Electromagnetic vibratory devices.
29 737 Ceag, Ltd., and R. J. Plummer. Electric torches.
29 726 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Devices comprising a thermo-couple.
29 727 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Thermoelectric couples.
29 729 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Electric discharge tubes.
29 730 S. G. S. Dicker (N. V. Philips' Gloeilampenfabricken). Thermionic amplifiers, etc.
29 649 G. F. Dutton. Prepayment devices used in telephone instruments.
29 707 Electrical Research Products, Inc. Continuously loaded conductors. (28/5/29, U.S.)
29688 Felten and Guilleaume Carlswerk A.G. Electric switches. 26/2/29, Germany.)
29 689 Felten and Guilleaume Carlswerk A.G. Multiphase circuit breakers (25/5/29, Germany.)
29 690 Felten and Guilleaume Carlswerk A.G. Thermal cut-outs. (6/9/29. Germany.)
29 756 Ferranti, Ltd., and E. D. T. Norris. Voltage regulation of transformers.
29 752 J. H. Hewitt. Adjusting device for electric condensers.
29 684 Highfield Electrical Co., Ltd., and F. W. Highfield. Automatic traffic control apparatus.
29 677 H. F. Joel. Storage batteries.
29 714 J. Maroni. Masts for electric conductors.
29 747 J. Robinson. Light-sensitive devices. (1/12/28.)
29 755 S. Ruppel. Electric switches. (2/10/28, Germany.)
29 649 Siemens Bros. and Co., Ltd. Prepayment devices used with telephone instruments.
29 765 Siemens and Halske A.G. Electrolytic recovery of tin from alkaline dyes. (28/3/29, Germany.)
29 660 P. D. Tyers. Tuning devices for wireless receiving systems, etc.

October 2nd.

29 882 J. W. Astley and British Insulated Cables, Ltd. Electric cables.
29 807 W. A. Bennett. Electric connector.
29 829 C. A. W. Boothroyd, J. L. Miller and C. A. Vandervell and Co., Ltd. Electric starting mechanism for engines.
29 783 B. W. and J. G. Brenner. Automatic selective sound reproducing machines.
29 883 Callender's Cable and Construction Co., Ltd., and P. V. Hunter. Bonding devices for cables.
29 796 Campbell and Isherwood, Ltd., and S. R. Rothwell. Electric driving gear.
29 852 G. F. Dutton. Prepayment devices for telephone instruments.
29 824 W. Engelke. Light sensitive apparatus.
29 914 B. B. Fenn. Incandescent lamps.
29 890 J. K. W. Manufacturing Co., Ltd., A. Kipling, and F. W. Yates. Electric lampholders.
29 821 Landis and Gyr Soc. Anon. Illumination systems. (8/1/29, Germany.)
29 926 G. W. Melland. House telephone systems, etc.
29 847 J. S. P. Robertson, Standard Telephones and Cables, Ltd., and L. H. Webb. Supporting structure for electrical instruments.
29 850 J. K. P. Roberts. Picture telegraphy, etc.
29 877 Siemens and Halske A.G. Signalling equipment for distant indication of switches. (3/10/28, Germany.)
29 846 Standard Telephones and Cables, Ltd., and C. G. Conolly. Cord repeaters.
29 848 Standard Telephones and Cables, Ltd. High frequency receiving systems.
29 927 Telefunken Ges. für Drahtlose Telegraphie. Electric discharge devices. (8/10/28, Germany.)
29 833 Widerstandsfabrik Panadi Ing. R. Rabe and Co. Electric network. (3/10/28, Germany.)

October 3rd.

30 039 Akt.-Ges. Brown, Boveri et Cie. High tension transformers. (31/10/28 Germany.)
30 032 F. Böhm. Direct current electrometers.
30 020 British Thomson-Houston Co., Ltd. Frequency changers. (3/10/28, U.S.)
30 021 British Thomson-Houston Co., Ltd. Condensers for refrigerating systems (4/10/28, U.S.)
30 022 British Thomson-Houston Co., Ltd. Frequency responsive apparatus. (4/10/28, U.S.)
30 051 R. H. Brown and Honeycomb Batteries, Ltd. Grids for electric cells.
29 995 P. Del Gaizo and G. Gianolio. Telephone installations. (4/10/28, Italy.)
29 999 Electrolux, Ltd. (Platens Munters Refrigerating System Aktiebolag). Evaporator elements for retrigerating apparatus.
29 967 Elektrische Löt und Schweiss Ges. Soldering apparatus. (30/8/29, Germany.)
29 968 Elektrische Löt und Schweiss Ges. Electric soldering devices. (19/3/29, Germany.)
29 983 W. Engelke. Light sensitive cells.
30 040 Felten and Guilleaume Carlswerk A.G. Thermal switches. (6/5/29, Germany.)
30 012 L. F. A. Fogarty and Zenith Electric Co. Ltd. Rheostats, etc.
29 996 General Electric Co., Ltd. Manufacture of electric incandescent lamps, etc. (25/10/28, Germany.)
29 998 W. T. Henley's Telegraph Works Co., Ltd., and P. Rosling. Electric cables.
29 936 Holmberg and Co. Ges. Electrically driven washing machines.
29 990 H. Leitner. Dynamos and motors.
30 011 C. H. Leong. Multi-filament electric lamps, etc.
30 062 Marconi's Wireless Telegraph Co., Ltd. Signalling (4/10/28, U.S.)
30 064 W. M. Rolph and C. W. Smith. Turntables for wireless receiving apparatus, etc.
30 025 E. M. Taunton. Electrical wander plugs, etc.
29 940 E. H. Taylor. Charging secondary batteries.

October 4th.

30 154 H. André. Electro-chemical current rectifiers. (5/10/28, France.)
30 177 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale, and R. Taylor. Telephone systems.
30 090 C. Barnett. Sealing means for electric wires.
30 175 H. Blacke. Machines for wrapping carbon electrodes. (2/4/29, Germany.)
30 162 British Thomson-Houston Co., Ltd. Supply circuits for radio receivers, etc. (4/10/28, U.S.)
30 165 British Thomson-Houston Co., Ltd. Oil-filled cables. (4/10/28, U.S.)
30 191 Cambridge Instrument Co., Ltd., and W. J. Stallan. Electrically driven mechanism.
30 198 F. H. Constable, P. St. J. Heaton, and Radiovisor Parent, Ltd. Temperature compensation of light sensitive bridges.
30 148 W. J. Corke. Wireless receiving apparatus, etc.
30 150 D. R. Davies. Metal-clad switchgear.
30 176 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Casings for wireless apparatus, etc.

COMING EVENTS.

Friday, January 17th.

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Domestic Hot Water." Speaker, Mr. C. H. Smith. 7.30 *p.m.*

Saturday, January 18th.

Association of Mining Electrical Engineers (South Wales Branch).—Cox's Café, Cardiff. Annual dinner.

Monday, January 20th.

Institution of Electrical Engineers (Mersey and North Wales–Liverpool Centre).—University, Liverpool. Discussion on "Low-Temperature Carbonisation of Fuel, with special reference to its combination with the production of Electricity." Introductory papers by Messrs. E. H. Smythe and E. G. Weeks. (Joint meeting with Liverpool Engineering Society.) 7 *p.m.*

Electrical Association for Women (Bristol and District Branch).—Rotary House, Colston Street. Lecture by Mr. S. Anderson on "Electric Light and Eyesight Preservation." 8 *p.m.*

Institution of Electrical Engineers (South Midland Centre).—University, Edmund Street, Birmingham. Paper by Messrs. T. W. Ross and H. G. Bell on "Recent Developments in the Protection of Three-Phase Transmission Lines and Feeders." 7 *p.m.*

Tuesday, January 21st.

Institution of Electrical Engineers (East Midland Sub-Centre).—College, Loughborough. Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch." 6.45 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, 17, Albert Square, Manchester. Paper by Messrs. B. A. G. Churcher and A. J. King on "The Analysis and Measurement of the Noise Emitted by Machinery." 7 *p.m.*

Illuminating Engineering Society.—Royal College of Music, Prince Consort Road, South Kensington. Paper by Mr. C. H. Ridge on "The Art of Stage Lighting." 7 *p.m.*

Paisley Association of Electrical Engineers.—39, High Street. Lecture by Mr. A. Gerrard, on "Some Notes on Modern Tramway Equipment." 7.30 *p.m.*

Association of Supervising Electrical Engineers.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. L. S. Atkinson on "Recent Developments in Modern Electric Lifts." 7.15 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Albert Hall, Cookridge Street, Leeds. Faraday Lecture by Captain P. P. Eckersley on "Broadcasting by Electric Waves." 7.30 *p.m.*

Institution of Electrical Engineers (South Midland Students' Section).—Birmingham University, Edmund Street. Paper by Mr. K. R. Sturley on "A.C. Potentiometers." 7.30 *p.m.*

Wednesday, January 22nd.

Electrical Development Association (North-Western Area).—4, Fountain Street, Manchester. Conference on "Sales Possibilities of Electricity in Advertising." By Mr. H. Lingard. 6.30 *p.m.*

Electrical Contractors' Association.—Savoy Hotel, Strand, London. Annual dinner. 6.30 for 7 *p.m.*

Institute of Wireless Technology.—Engineers' Club, Coventry Street, London. Paper by Mr. A. M. Houston Fergus on "Notes on the Fading of Wireless Signals." 7 *p.m.*

Institution of Automobile Engineers.—Engineers' Club, Albert Square, Manchester. Paper by Mr. H. K. Whitehouse on "Petrol-Electric Vehicle Characteristics." 7 *p.m.*

Thursday, January 23rd.

Electrical Association for Women.—46, Kensington Court, London. New Year Social. 3 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch." 6 *p.m.*

Friday, January 24th.

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington. Paper by Miss W. A. Leyshon on "Characteristic of Discharge Tubes under 'Flashing' Conditions, as Determined by the use of a Cathode Ray Oscillograph." 5 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre Students' Section).—Armstrong College, Newcastle-upon-Tyne. The Student Lecture.—"Electric Traction," by Lt.-Col. H. E. O'Brien. 7.15 *p.m.*

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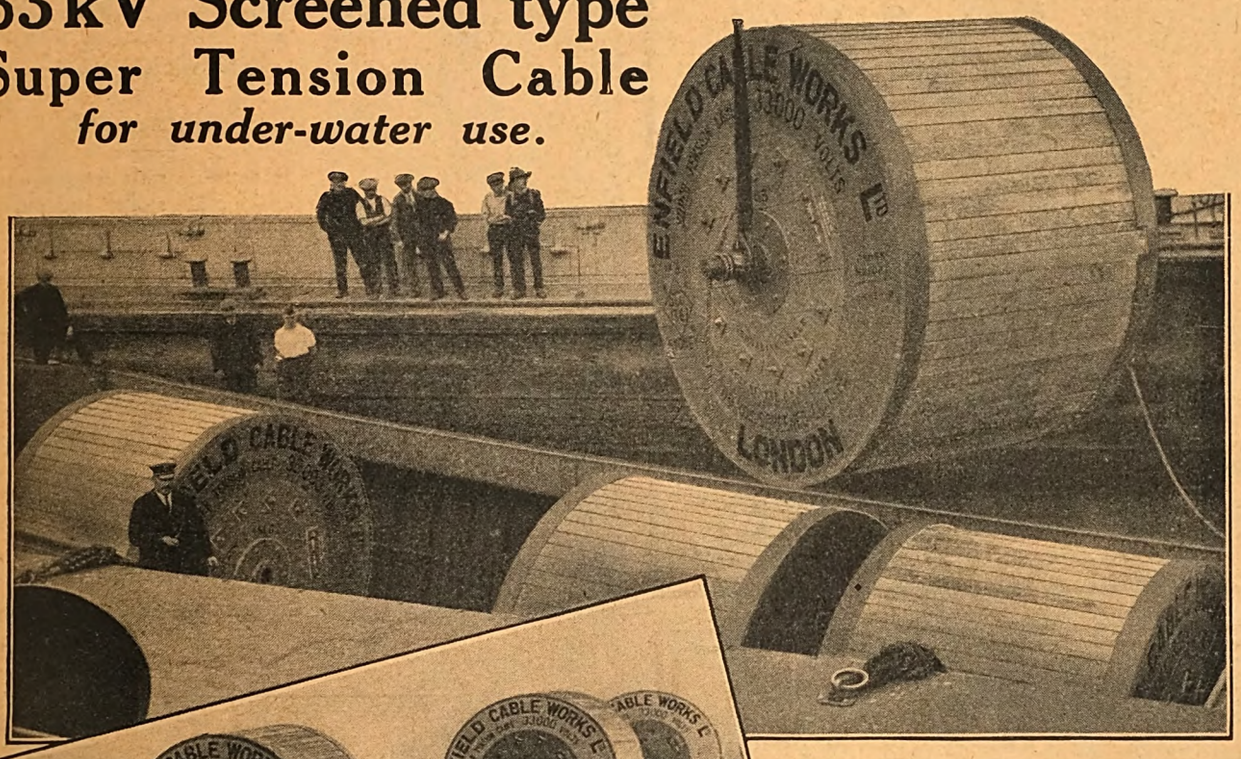
THE ELECTRICIAN

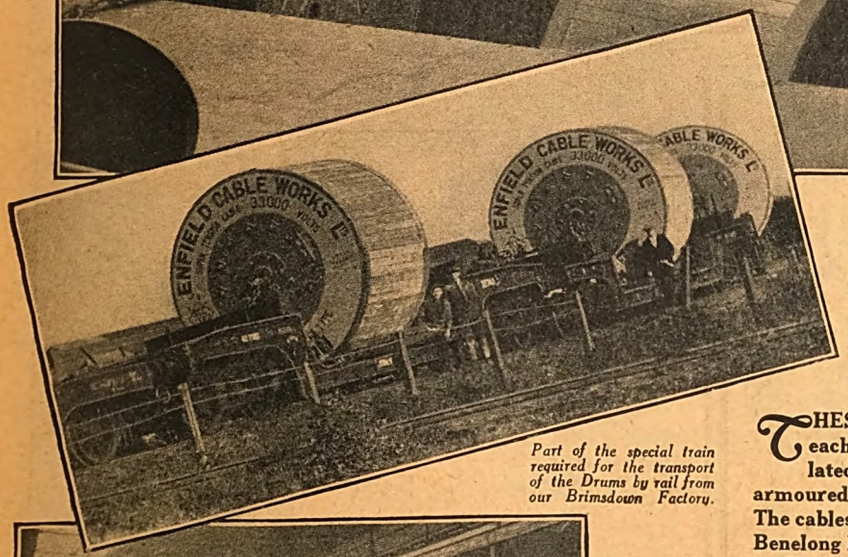
Vol. CIV.—No. 2695. Friday, January 24, 1930. [Registered at the General Post Office.] Sixpence

ANOTHER "ENFIELD" ACHIEVEMENT

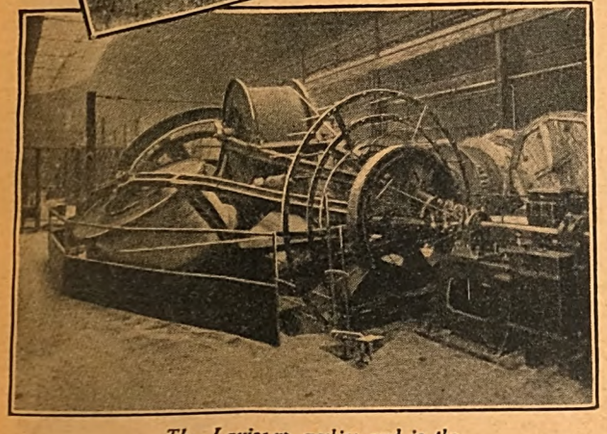
33kV Screened type
Super Tension Cable
for under-water use.



Drums being taken by barge for shipment per S.S. "Ferndale," King George V. Dock.



Part of the special train required for the transport of the Drums by rail from our Brimsdown Factory.



The Laying-up machine used in the manufacture of the cable. This machine is the largest of its kind in the United Kingdom.

THESE photographs concern a shipment of 5 Drums, each containing 700 yds. of 3 × ·25 sq. in. Paper Insulated, separately lead sheathed cables, double wire armoured and served, 33,000 Volts Super Tension Type.
The cables will be laid in parallel across Sydney Harbour from Benelong Point to Kirribilli, and are to be used as a connecting link to supply electric current by the Sydney City Council, from the Bunnerong Power Station to the North Shore.
Each Drum weighs 28 Tons 1 cwt. Gross—25 Tons Nett.
Size of Drums 11 ft. 1 in. diameter.
These are the heaviest Drums of cable made in Great Britain

THE Enfield CABLE WORKS LTD

LINCOLN HOUSE, 296-302, High Holborn, W.C.1.
Telegrams: "Enfelcama, Phone, London." Telephones: Holborn 0591 (4 lines).

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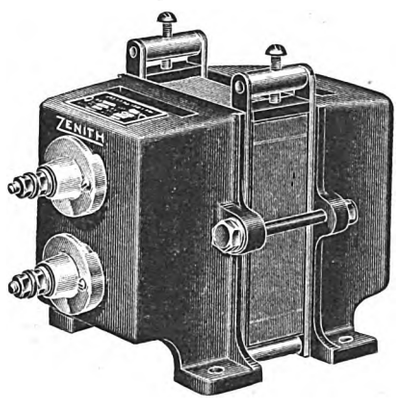
ZENITH

(REGISTERED TRADE MARK)

INDUCTANCES and CHOKE COILS for FILTER CIRCUITS



Quotations on receipt of detailed inquiry.

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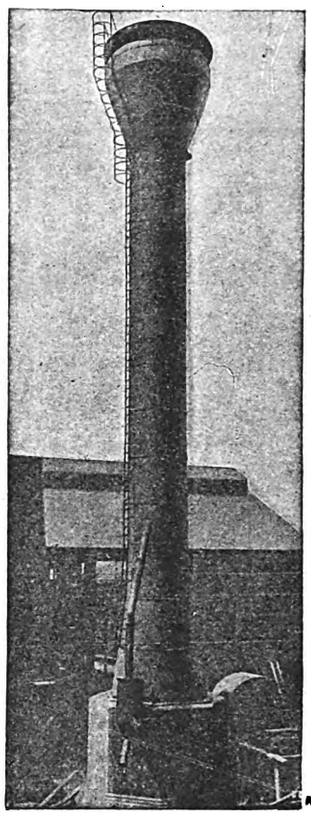

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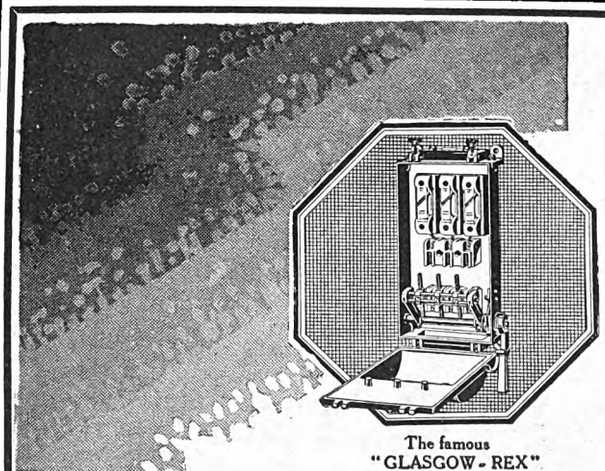

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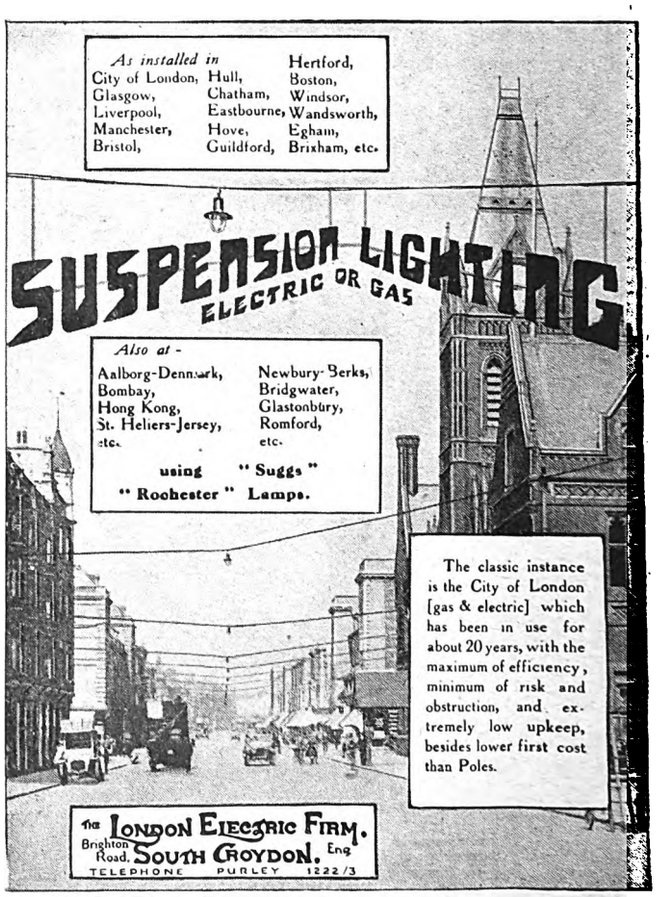

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Current Topics.

Coal Mines Bill.

THE Federation of British Industries, the British Engineers' Association and the London Chamber of Commerce are among the important bodies which have made strong representations condemning the provisions of the Coal Mines Bill which, together with the threat of higher taxation, is the darkest cloud on the industrial horizon at the present time. The gas industry is also bestirring itself, but the electrical industry is once again feeling the lack of a single federal organisation which could present its views on such an important matter. Supply undertakings and manufacturers will both feel the effect of dearer fuel and higher taxation, and it is time that their views on these matters were authoritatively voiced.

Rural Electrification.

MORE than 500 000 farms in the United States are now electrified, half of the number having been connected during the past three years. On the industrial side 75 per cent. of the power used in the United States is now electrical, compared with 66 per cent. in Germany and 48 per cent. in England. The figures have a bearing on the question that is now being asked in America: "Shall we increase our sales of current or our rates?" Most of the urban population of the United States is now supplied, and it is becoming necessary to build transmission and distribution lines into more remote and less thickly populated areas. Mr. M. S. SLOAN, president of the National Electric Light Association, takes the view that sales must be increased and that the way to stimulate domestic consumption is to reduce rates. This contention is supported by the figures of domestic consumption, which show that an increase in the annual use per consumer in the United States of 41 kWh, or 9 per cent., resulted in an increase of 90 cents, or 3 per cent., in the bill and a decrease of ·35 cent or 5½ per cent. in the charge per kWh. It is in a similar direction, as regards charges for current, coupled with a courageous policy on the part of urban undertakings in pushing out their distribution lines into rural areas and willingness to face an initial period of low returns, that the problem of rural electrification in this country will have to be tackled if the grid system is to do all that is hoped from it.

Meter Rents.

IT is a welcome announcement that the Hull Corporation expect to abolish meter rents at the close of the financial year. With small concerns—and even with large supply systems when in their infancy—meter rents are doubtless necessary, but there can be no good reason for retaining these quarterly annoyances when the annual energy supplied approaches 100 000 000 units—the consumption anticipated by Hull. Although the economist, regarding the question purely with an accountant's eyes, may see arguments in favour of the fixed and certain charges incorporated in meter rents, he fails to consider their psychological effect on consumers, who naturally prefer to feel they are receiving the precise equivalent—in energy—of every penny paid to the supply authority. Supply companies, however, frequently ignore the supreme importance of persuading their customers to use more energy. A small company in London has recently been changing the voltage of part of its system from 200 to 230. In one street the higher voltage was applied some days before the company changed the consumers' lamps—so that the latter were rendered almost worthless. Yet when a customer offered to buy back one of his 100 W lamps for experimental use in a room which had formerly contained a 60 W lamp the company would only sell it to him for the absurd figure of 2s.

Bad Salesmanship.

FAULTfinding with our methods of selling is apparently not confined to Australia, for Mr. HENNESSY COOK, speaking at the annual banquet of the British Chamber of Commerce recently, stated that every day made it

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clear that British firms were "handicapping themselves very severely by not printing catalogues in French"; furthermore, though a great deal of money was spent in advertising, the drawing power was practically nil, by virtue of the fact that such advertisements were not adapted to the French mentality. These views are not, of course, confined to the electrical industry, but they do apply to selling methods of many electrical manufacturers. The good feeling which was created between the British and French electrical industries as a result of the last Summer meeting of the I.E.E. and the excellent work which was done by that ambassador of our industry, Col. K. EDGCUMBE, should not be forgotten, and the habit of the then I.E.E. President of addressing his hosts in the language of their country should surely have been taken by manufacturers as a useful hint upon which to base their future dealings with our French neighbours.

An Omission.

WE have heard some comment on the lack of State recognition of the late Dr. de. FERRANTI'S great services to the electrical industry and to the general public. It is to be feared that merit of a non-political character is too often overlooked when honours are awarded. Dr. FERRANTI was too much engrossed in his profession to thrust himself into the limelight as deserving of public reward, and friends, who might have urged his claims, were doubtless caught napping by his unexpectedly early death. In another page we print Colonel CROMPTON'S tribute to his old friend.

Underground Carriage of Goods.

A MODIFIED scheme for a Manchester Underground Railway is to be brought before the City Council by Mr. WALKER, chairman of the Underground Railway Committee, next month. This scheme, which comprises a circular ring with one extending arm, is estimated to cost £5 000 000, compared with an estimate of £11 000 000 for a circular track with five radial arms which were included in an earlier proposal. An impression prevails locally that the railway could only be operated at a considerable loss, which would fall upon the ratepayers, and that it is questionable whether it will, to any appreciable extent, relieve the congestion of traffic in the streets. A matter which might be worth further consideration is Mr. WALKER'S suggestion that between the rush hours the railway would be available for the transport of goods. A cheaper and perhaps more effective proposition might be an underground electric railway for goods transport only, which would leave more room above ground for passenger vehicles. It seems to be generally agreed that the solution of the street traffic problem will be found in the speeding up of motor traffic and providing it with as clear a course as possible, so as to enable it to get away quickly from busy junctions and crossings. This object might be attained by inducing manufacturers and traders to use the underground railway and by restricting horse traffic and loading and unloading of goods in the principal thoroughfares to certain hours when the motor traffic slackens.

Colour for Domestic Fittings.

IN our monthly article on domestic appliances, published in our last issue, we gave details of two devices for which a choice of colours is offered. One is a drink mixer—for use in cocktail bars and soda fountains—which can be had in white, black, green or ivory. The other, an electric iron, is available in blue, green or red. Evidently the steadily strengthening movement for more decorative lighting fittings is spreading to other sections of the domestic side of the industry. This is a very good thing for all concerned, as undoubtedly numerous buyers—especially women—will be attracted by some brilliant hue into buying articles whose purchase might otherwise have been long deferred. Moreover, the ability of a domestic appliance to retain its initial colour will provide additional evidence of electricity's cleanliness. One wonders, however, what will be the next step. Will vacuum cleaners be supplied with multi-coloured bags—or will a wide choice of tints be offered, so that between carpet and cleaner there may be complete concord?

Overhead Lines and Amenities.

THERE was a very interesting discussion at the meeting of the Overhead Lines Association at the I.E.E. last week, when several members of the C.P.R.E. and C.P.R.W. were present. It was speedily made evident that there is no real barrier to collaboration between those who are actively seeking to preserve the beauties of rural England and Wales and those who are engaged in carrying out national electrification. The resolution that was unanimously passed declared that "the C.P.R.E. and the Overhead Lines Association agree to co-operate fully regarding the construction and operation of power lines and arrangements connected therewith." One valuable suggestion which emerged from the discussion (of which we hope to give a full summary in our third annual Overhead Lines Number next week) concerned the possibility of arranging for a local representative of the C.P.R.E. to accompany the electrical engineers in a preliminary inspection of the route of a proposed transmission line, with a view to securing agreement before the plans are finally drawn, and so avoiding delays such as have frequently occurred in the past. Letters which have appeared in the Press lately suggest that in certain cases landowners have been antagonised by surveyors who enter their properties to look over a proposed route without first asking permission to do so. Indifference may easily be changed into hostility by lack of ordinary courtesy.

Oxford Resolutions.

WE are glad to note that the conference which was held at University College, Oxford, on Saturday, took a broad minded view of the question, and devoted no more than a fair share of its time to electrification as a cause of disfigurement of the countryside. Certainly the new roads, roadside garages, advertisements, and unsightly buildings are far more in need of regulation. We find no cause for quarrelling with the two resolutions relating to electrification, inviting land owners and residents to approach electricity supply undertakings "with well considered suggestions as to the placing of poles in such a way as to avoid mutilation of the landscape," and suggesting that the Electricity Commissioners and the G.P.O. should be asked to take into account "the scale and contour of different parts of the countryside which they may find it necessary to punctuate with pylons and telegraph posts, with a view to the avoidance of unnecessary hurt to the beauty of the landscape." Electrical engineers are very far from being blind to the unmatched beauties of the English countryside, though the cost factor sometimes compels them to pay less attention to purely æsthetic considerations than they would wish.

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ELECTRIC BOATS FOR RIVER SERVICES.

Can Electricity Restore the Thames as a Passenger Highway?—Details of the "Paragon" Thermo-electric System—Regenerative Five-bladed Propeller—Low Fuel Costs.

By Captain WILLIAM P. DURTNALL.

ATTENTION is once again being directed to the use of the Thames through London as a passenger highway and various proposals with this end in view have been put forward. In electrical propulsion we have, I believe, the essential means of making river travel the cheapest and most rapid method of transit in London.

As far back as 1908, after I had been presented with my first gold medal at the Franco-British Exhibition, I was asked to consider a scheme for electrically driven boats for passengers at Venice. Even with the relatively reduced thermal efficiency obtained with Diesel oil engines, as prime movers, the scheme indicated enormous potentialities, but today, with the very much higher thermal efficiency, and the silence in operation

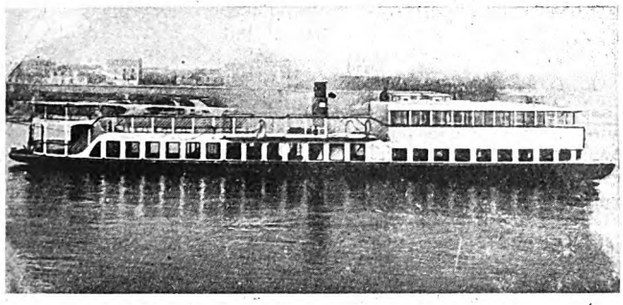

Fig. 1.—A river steamer on the Seine.

that can be obtained with the "Paragon" Super-Diesel Heat Cycle, the possibilities are superior to those of any form of steam heat. The "Paragon" engines which are proposed for use in my Thames passenger electric-boat scheme will have at least the highest thermal efficiency possible.

Another important feature in the development of the "Paragon" boats, is the new regenerative, infinitely variable speed control which is embodied and has been very successful in all my "Paragon" electric locomotives. This system is essentially a storage of energy, that is to say, the plant embodies the electrical storage accumulator. The combination of internal-combustion engines and chemical storage of electrical energy for such a variable load-factor as obtain in river passenger boat traffic, plays a most important part in the commercial aspect.

After much testing and investigation I have found that the mean load-factor of such short period propulsion may be anything from 25 to 50 per cent. of the total power capacity of the boat. A proper time-table has to be adhered to on a tidal river and, at the same time, the general traffic on the river necessitates much slowing down and pulling up, as is the case also in connection with street traffic. There is also the pulling up and stopping at the various landing stages and the time taken by the passengers in landing and embarking. The variable load factor is of course easily met in the case of steamboats, as they have great heat storage in their boilers and, in the event of too much heat energy being generated under times of light load, they simply lift their safety valves and blow it to waste in the air. In the case of the ordinary motor-boat the internal-combustion engines are simply throttled down; this means that bad compression and inferior ignition result, with smoky and noisy exhausts, often misfiring and vomiting out clouds of filthy products of incomplete combustion involving waste of fuel and high operating costs.

Constant Load.

The "Paragon" system overcomes all these bad operating features by simply using the super-Diesel heat-cycle previously mentioned, which avoids the troubles of incomplete combustion and has much higher thermal efficiency than Diesel or other heavy oil engines. At the same time the load on the engines is kept constant, which means that the lowest possible consumption of fuel is used. All these advantages are the direct result of such thermal improvements and of the fact that efficient chemical storage of electrical energy is efficiently secured by the inclusion in the system of the well tried and reliable steel alkaline electrical storage accumulator, introducing also a factor of safety by reason that operating power is always available whether the internal-combustion engines are in operation or not.

The hull design of the "Paragon" boats is of more than passing interest, and is also the result of many years of practical study and experiment with a view to obtaining a suitable public water vehicle. The lessons from the great disaster of the *Princess Alice* have been thoroughly studied during the evolution of these improved hull details. The present design for the proposed fleet of 42 sister vessels indicates that they will be single deck, double saloon type vessels, 140 ft. long, 22 ft. beam, and drawing about 30 in. of water when loaded with 300 passengers. All passengers will be carried above the water line, and the propelling machinery, the storage accumulator and the auxiliary machinery will be installed in the various water-tight compartments into which the whole hull is divided. It would be a very difficult thing to sink these vessels, and this is a factor of the highest significance from the public safety aspect, quite apart from the rapid and unique control. Thanks to modern and strong electrical welding, these hulls will be light but will also have (owing to their cellular construction) the maximum of strength. Owing to their special form, they will pass through the water with the least resistance and almost complete absence of wash.

Propelling Mechanism.

They will be twin-screw vessels and the "Paragon" propelling motors will be of special construction with a 1 hour rating of 150 shaft H.P. at 150 r.p.m., with bar windings, operating on low voltage. The large amount of regenerated energy available when checking the momentum of the vessels when pulling up at landing stages and other places is returned to the steel alkaline accumulator and this allows of a great reduction in the rated horse-power of the oil engine prime-movers. These engines will be of my latest three cylinder, two-stroke type, with separately compressed combustion air and running at 700 R.P.M.; there will be two such engines, each direct-coupled to the latest type "Paragon" Electro-Kinetic transformer, through a hand-wheel operated multi-

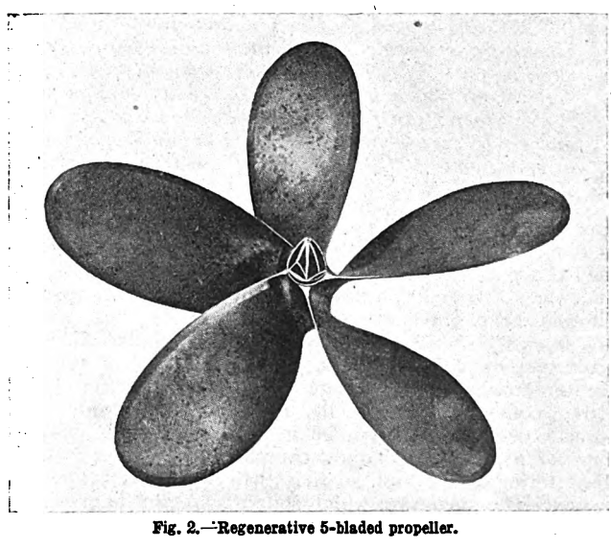

Fig. 2.—Regenerative 5-bladed propeller.

plate clutch. (This clutch is only used for starting the engines and for taking the drive from the engines to the transformers when they are in operation as the boat may be operated without the use of the engines for short manœuvring, the transformers being run continuously).

The propellers which will be used are of the "Paragon" regenerative type, and these interesting 5-blade screws are of special construction of the finest mixture hard metal. They are so arranged that they form water turbines when being dragged through the water by the way of the vessel, when stopping or slowing down at landing stages and so on, the infinitely variable voltage supplied to the propulsion motors, causing the propellers to drive the armatures as generators. The torque set up slows the blades and so the

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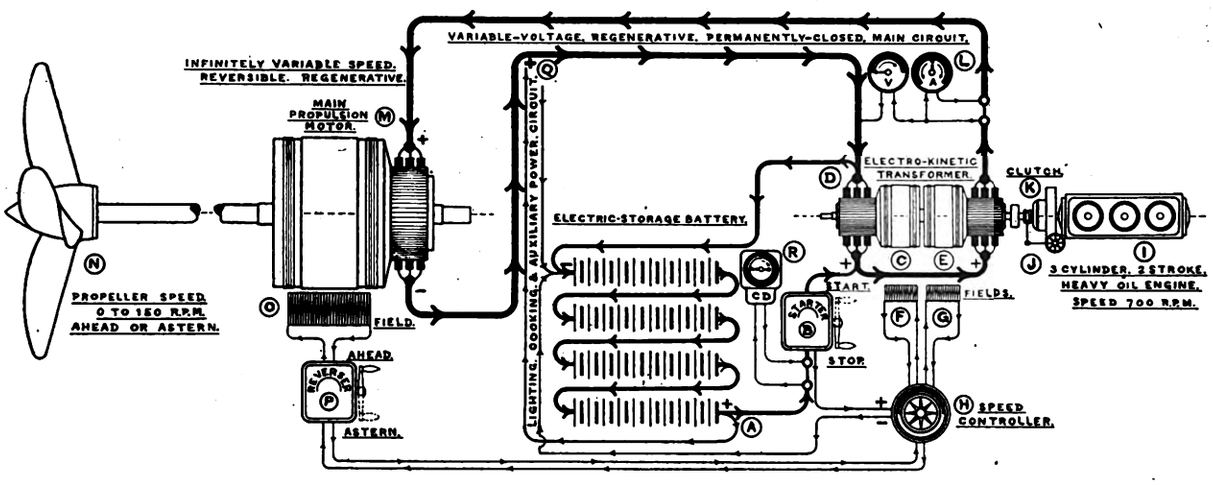
vessel is braked, even down to stand still, the pressure of the water then being in front of the propeller blades instead at the back as when propelling, and the rotation being in the same direction, so that very little live energy will be used in stopping the " Paragon " vessels. Reversing is very quickly obtained by reversing the propelling motor fields, this being carried out sparklessly and accurately by means of a potentiometer balanced resistance. Fig. 2 shows one of my experimental regenerative 5-bladed propellers, which has been the result of much expensive research work during the last twenty years. The diameter of the twin propellers will be approximately 48 in., port and starboard propellers turning in opposite directions. They will be arranged in a particular way at the stern without any brackets (decreasing resistance) and between the three rudders, giving very fine steering control.

The main circuit between the transformers and their propelling motors will be never opened, so that there will be no flashing or burning contacts. The operating is silent and effective, and embodies navigating features which are appreciated by many in charge of vessels which have to be handled in various tidal waters, in the fact that, although the prime-mover oil engine will always operate at one constant speed (or approximately so) the propellers may be driven at any particular speed which may be desired. It very often happens that the port side propeller has to be driven slightly faster than the starboard side propeller or vice versa, in order to get the best out of the boat with the slightest use of the helm and this is easily obtained in the " Paragon " infinitely variable speed system. The engines are 60 B.H.P. each, and the storage accumulator is of 900 ampere hour capacity on the five hour rating, consisting of 144 cells, made up in 4 batteries each of 36 cells permanently coupled in series of 175 V., split up in four of the many water-tight compartments and spread about the interior of the hull, so that their weight is balanced and provides the means by which sound trim can be given to the vessel. The accumulator provides the energy reservoir for both port and starboard power plants, and also for the general power supply for the auxiliary machinery, lighting, steering, pumping, cooking and heating, etc., as well as the exciting energy for both the electro-kinetic transformers and the two main propelling motors. Over the top of the crates the cells stand about 30 in. high, and in their three cell crate units they weigh 420 lb., or for the 48 crates, a total weight of 9 tons. The cell compartments will have forced ventilation discharging through a vent shaft flush with the roof of the bridge amidships, from which shaft the exhaust from the two engines will also be discharged. At both bow and stern powerful searchlights will be fixed, their beams being controlled from the navigating bridge. Both saloons will be equipped with radio receivers.

These electric boats would be in public service on an average 16 hours per day, operated by two shifts of crew, and maintaining a close headway timetable. With top speeds of about 14 miles per hour, it is estimated that the variable load during the day's work will be approximately equal to 1 600 shaft H.P. hours. A large amount of acceleration energy is in this system recuperated and returned to the accumulator for future use, and the two oil engine prime-movers will generate no less than 1 920 brake H.P. hours, so that the accumulator would come in to moorings at the end of the 16 hour day's duty, in just about the same charged condition as it went out at the beginning of the day. Should it be slightly run down, owing to heavier duty than usual, it is only a matter of leaving the engines running a little longer to bring the accumulator up to its full charge condition.

The oil engines working under this system operate at all times at full power and speed (if they are not contributing to the propulsion load they are charging the accumulator and this operation is quite automatically carried out) consequently the engines always run on the very lowest fuel consumption at all times, whether the boat is moving or not. As the late Captain Riall Sankey stated in his report on the heat cycle used in the " Paragon " Super-Diesel heavy oil engines, the thermal efficiency is higher than that of the ordinary Diesel engine. Based on my past experimental work on actual oil engines operating on my cycle I am well within the mark when I estimate that the fuel consumption per hour will be 36 lb. or, say, 68 gallons per working day, which at 4d. a gallon means a fuel cost per day of only £1 2s. 8d. This is a much lower fuel cost than that of any other similar 300-passenger river service boat in existence, far away below what is possible with any steamboat, and a long way below the cost with any ordinary Diesel motor boat.

DIAGRAM SHOWING PROPELLING MECHANISM OF THE "PARAGON" BOATS.



(A) Positive terminal of accumulator; (B) starter for electro-kinetic transformer; (C) primary armature of electro-kinetic transformer; (D) negative terminal of (C); (E) secondary armature of electro-kinetic transformer; (F) field winding for (C); (G) field winding for (E); (H) main propulsion motor speed controller; (I) three-cylinder two-stroke " Paragon " heavy oil engine; (J) hand-wheel for operating clutch; (K) multiplate clutch for coupling engine to shaft of electro-kinetic transformer; (L) positive main leading to main propelling motor; (M) positive terminal of main propelling motor; (N) screw propeller; (O) field winding of main propelling motor; (P) reversing potentiometer switch in field circuit of main motor; (Q) auxiliary light and power circuit, direct from accumulator; (R) is a charge and discharge indicating A H meter.

Lubrication costs will be very low also, all the bearings being of the S.K.F. roller type, running for long periods without attention. These will be, of course, grease lubricated, but the engines would have forced pressure oil lubrication, used over and over again after passing through a separator, and having been water cooled. During my Service career I have often noticed how silently and beautifully the plant operates in a submerged submarine, and these modern " Paragon " vessels should be the most silent, most cheaply operated and most reliable passenger carrying vessels in the world. The accumulators will last for the whole period of the official life of the vessels. Depreciation is calculated at the rate of 7½%, or a working life of 13⅓ years, which is reasonable in the particular conditions under which they will be operated.

The individual parts comprising all the propelling machinery are all of such small unit construction that any individual part of the plant may be very quickly pulled out of the vessel, and a new part installed. Few spare parts need be kept in stock and the vessels will be relatively cheap to build.

In operating the engines the starter (B) is first pulled over; current flows from (A) through starter and to and through

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windings of (C) to terminal (D) and back to the negative pole of the accumulator. The clutch (K) being out, the electro-kinetic transformer, which consists of the two armatures (C) and (E) coupled mechanically together on their one shaft, now runs as a motor, the armature voltage from (E) opposes the battery voltage, so that no voltage is across the main propelling motor armature. Starter (B) also turns on current to the three fields (F), (G) and (O). Assuming that the accumulator wants a small charge before the vessel starts to work, oil fuel is turned on to the fuel pumps of engine (I), and wheel (J) gently turned, which drops the clutch (K) in and connects the crankshaft of the engine to the revolving shaft of the electro-kinetic transformer, resulting in the engine being turned against compression; the fuel is immediately injected by the pumps, and the engine begins to fire; delivering its power to the transformer shaft it causes both (C) and (E) to act as generators; (E) opposes (C) but (C) immediately begins to deliver current from its positive terminal through starter (B) to the positive terminal of accumulator (A) through accumulator to its negative pole and then on to terminal (D) of armature winding (C). As soon as the charge and discharge ampere-hour meter (R) indicates that the accumulator is fully charged the vessel is ready to start.

It will be observed that the two sister armatures (C) and (E) are mounted on one shaft, and are indeed mechanically and electrically coupled together, with the armature of the main motor in the closed armature series circuit. The operation is very similar to that which takes place when two sister machines are put under a Hopkinson test but, in this case, we have the armature of the main motor in circuit as well, as we only require a very low voltage, but a very heavy current, at starting the main motor; this is secured with great economy of both electrical and mechanical energy. The hand-wheel of the speed controller (H) is now gently turned to the right, this drops a small amount of shunt resistance in the field (G), the armature (E) immediately tries to rise in speed and a heavy torque is set up through the armature shaft between (C) and (E); there is a slight change in speed and a heavy current is set up in the permanently closed main circuit running from positive terminal of armature (C) across to the positive terminal of armature (E) from there on to the positive terminal of main motor at (M) across same to and from its negative terminal, back to terminal (D) of armature (C). This current sets up the necessary torque on the main motor and propeller shaft and the motor runs at a low speed, say in the "Ahead" direction. It may be assumed that the power required is 20 H.P. in the main motor closed circuit (for simplicity generator losses are left out in this description), the engine being 60 B.H.P., and previously giving this power to charge the accumulator. The propeller is now running and using, say, 20 H.P., the rest is going to the accumulator. As the wheel of the speed controller (H) is further turned to the right, the field (G) is still further weakened until it is at zero, the whole of the power of the engine is now taken up by the armature (C) which delivers the full engine generated current to the main circuit at, say, 175 V, the main propelling motor runs up to, say, 75 r.p.m., the 175 V accumulator being across the terminals of the armature. The vessel is now moving at about half speed and requiring only about one quarter of the electrical power which it needs at top speed. It can be assumed that the speed controller is about half way round.

Economy of Energy.

To obtain full speed on the main propelling motor, the speed controller wheel is turned gently to the extreme point of its travel to the right; this movement brings in the excitation on the field (G) again but the excitation is in the opposite direction, so that the armature (E) now acts as a generator and boosts up the voltage from armature (C) until the voltage delivered to the armature of the main propelling motor is, say, 350 V and the speed of the propeller is 150 r.p.m. The power now required in the main propelling circuit is, say, 150 H.P., and of this 60 H.P. comes from the oil engine and the balance from the accumulator. The armature (C) now delivers power to the shaft mechanically coupling the two armatures of the electro-kinetic transformer together; it draws current for so doing from the accumulator across its terminals. The full voltage of 350 which is delivered to the main motor terminals is composed of 175 from the accumulator plus 175 from the armature (E) of the transformer, which is electrically coupled in series with the main motor and the accumulator.

No main resistances are used, and the whole system works with very great economy of energy, whether this energy be supplied at low vessel speed entirely by the oil engine, or by the accumulator for short runs. The whole propulsion can, of course, be obtained from the accumulator without the use of the engine. It is indeed an accumulator system of operation, the functions of the oil engine being simply to apply power to the shaft between the two armatures (C) and (E) for charging purposes, or to assist in providing the total power for full speed.

BOOK REVIEWS.

Questions and Solutions in Magnetism and Electricity. By W. J. WHITE. 3rd. Ed. (London: Sir Isaac Pitman and Sons.) Pp. vii+178. 5s. net.

This book supplies the answers to the questions set by the Board of Education and the City and Guilds examinations, in Grade I, from 1907 to 1913 and 1919 to 1929 inclusive. The questions have been thoroughly dealt with and in some cases too fully for the needs of the examiner. This, however, is an advantage rather than a disadvantage to the student, who will, no doubt, recognise the author's reason for doing this.

Generally speaking, it should be invaluable to students in this Grade, not only for the information given, but also as a model for the way in which questions should be answered.

Private Branch Automatic Exchanges. By R. T. A. DENNISON. (London: Sir Isaac Pitman and Sons.) Pp. ix+291. 12s. 6d. net.

Although there are numerous books on the market dealing with the subject of automatic telephony, none of them have dealt very extensively with the subject of Private Branch Exchanges. The volume under review is entirely devoted to this type of telephone exchange and contains descriptions of the four main types used by the British Post Office.

The first system described is the Relay Automatic, in which, of course, the whole of the selective operations are performed by groups of relays, no other mechanical apparatus being employed for the purpose. This system has been very clearly and thoroughly dealt with, and the functions of each group of relays detailed.

The next type is that of the Standard Telephones and Cables, viz., the rotary system. This chapter contains a description of the various pieces of apparatus employed and also a summary of their operation.

Following this are two types of Private Branch Exchanges which are, in each case, based upon the Standard Strowger system of automatic switching.

In all cases the circuit's operations have been traced step by step. Practically throughout the book the inset diagrams have been placed with sufficient regard to the need for continuous reference between them and the text. The book is undoubtedly one of the most up-to-date on the subject, and as both a reference book for engineers and a text-book for students should have a wide sphere of usefulness.

Radiotechnik. VI: DIE ELEKTRISCHEN WELLEN. By Dr. F. KIEBITZ. (Berlin and Leipzig: W. de Gruyter and Co.) Pp. 125. 1.50 marks.

This small book is the sixth volume of a series on radio technology issued in the "Sammlung Göschen," and deals with Hertzian waves—in particular the waves of radio-telegraphic value. The author, as Professor at the University of Berlin and as Director of the Radio Department of the German Post Office, is eminently qualified to present a book well balanced between the theoretical and the practical. He has written an admirable monograph with a philosophical method of treatment. A good foundation of modern electrotechnics is demanded in the class of reader to which the book is addressed, namely, engineers, teachers and students, or amateurs who require a wider understanding of the underlying principles of radio transmission and reception. Dimensional considerations of units are followed by a treatment of the electric and magnetic fields of antennæ on a Maxwellian basis. The results and interpretation of the experiments of Hertz lead to a consideration of damped oscillatory circuits, aerial characteristics, wave propagation, and the functions of the earth and of the atmosphere in wave transmission. A number of fundamental formulæ are presented, always with practical calculation in mind. Examples are taken mostly from the sphere of broadcasting, but a chapter on directional antennæ is included. The book can be recommended as a good example of what a monograph should be.

S. PARKER SMITH.

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ITALY'S SUBMARINE CABLE SYSTEM.*

North and South Atlantic Routes—Design of Cables—Relays and Regenerators—Use of Baudot Distributor—Synchronisation Possibilities.

By A. L. OSTI.

THE "Italcable's" (Italian Cable Company) system of transoceanic communications comprises two entirely separate lines: one to North America and the other to South America. The Northern line consists of one cable (in two sections, Anzio a Malaga and Malaga–Horta) over 2 324 nautical miles (about 4 308 km.) in length, joining up with the Western Union and Commercial Cable Companies' cables and forming, in fact, one system with them. This explains the generous assistance given by the Western Union to the "Italcable" in its initial organisation, by supplying data, suggestions and the necessary technical assistance.(1)

South American Routes.

The other line, to South America, over 7 294 nautical miles long (13 548 km.) may be considered as composed of eight sections of cable in series with each other, forming a direct connection between Italy and Spain on this side and Brazil and Argentina on the other side of the Atlantic. This line is, therefore, independent of any other system. The characteristics of all the "Italcable's" installations must, in view of their future employment, necessarily fall into two standard types: the American or North Atlantic type, on which they were to be grafted, and that of the British world system typified by the Eastern Group with which they had to compete. The former is characterised by a bundle of parallel cables, one acting as a reserve to the other, working in identical conditions between the same terminals, ready to deal with very considerable peak traffic loads in a brief working period, and permitting a constant and very convenient rotation of the apparatus on the working circuits. The British system consists of a long series of cables and stations adapted to working continuously either between terminal or intermediate stations.

The "Italcable" was obliged to conform to these different conditions in the first instance with the intention of evolving later on, when more experience had been gained, an essentially typical and characteristic system of cables and installations of its own. The assistance of the oldest firm specialising in cable projects then in existence and at the height of its prosperity, Messrs. Clark, Forde and Taylor,(2) consulting engineers to nearly all the cable companies of the world and to many government administrations, enabled the "Italcable" to gather the necessary information for carrying out the first installations.

Until a few years ago it was the prevailing practice in technical circles to design cables suitable for the traffic to be dealt with by computing the transmission solely on the basis of the geometrical data of the cable core. Messrs. Clark, Forde and Taylor pointed out at once the necessity for taking into account the terminal conditions of the various sections.(3) This firm was, in fact, headed by Mr. Heurtley who, by the introduction of his magnifier, the extension of double sea earths (4) and the special precautions taken in balancing them,(5) had been successful in obtaining two successive increases of speed each giving from 20% to 40% gain over the figures computed by means of the old scholastic standard of the characteristic constants. (KR.) (6)

Further, as regards the South American cable, a rapid increase of traffic had to be anticipated in consequence of the creation of an independent system of communications for the Latin peoples; the necessity for maintaining such communication at full efficiency even when the insulation condition of the cable over a line of such length might be defective had to be considered. Fortunately the ability of the Government Administration's engineers who presided then (and still preside) over the making of the contracts between the company and the Italian Government, made it possible to present the problems in the light of the new standards. The expectations based on the latest improvements to the apparatus and installations proved to be well founded and the most perfect system of the Kelvin type of cable was evolved.

At any rate the geometrical characteristics computed by using the formulæ adopted by Clark, Forde and Taylor, taking into account the type of stranding selected for the copper conductor, the quality of the gutta percha, the destination of the cable, the depth and temperature at which it would be laid, proved entirely in accordance with the practice of the three firms who competed for the manufacture of the Italian company's cables, offering as they did a sufficient margin of tolerance between the specified limits and the conditions obtained. The said firms, however, did not take advantage of these tolerances and the resistance and capacity values they supplied were considerably below those considered, so that the characteristic constants obtained were perceptibly lower than those specified by the company and the Italian Government. The sheathing types were also somewhat liberally computed so as to give the line the greatest possible stability. The sheathing wires in particular were proportioned by Messrs. Clark, Forde and Taylor to the nature and depth of the bottom with a generosity quite unusual with the short cables to which we Italians had been accustomed, a generosity also made possible by the greater power and perfection of the paying-out and picking up machinery of our days. Iron wires of No. 1 B. SWG (0·300 in.) are used to a depth of 100 fathoms; at 500 fathoms wire of No. 6 BSWG (0·200 in.) and cable weights of over 4½ tons per nautical mile are still to be found, and only beyond 1 100 or 1 200 fathoms depth is the actual deep sea type met with: a light cable with steel wires of No. 13 (0·095 in.) and about two tons per nautical mile.

As to the degree of perfection attained by the paying out machines, it will be sufficient to point out that whereas hitherto average slacks ranging between 10% and 12% were usually provided for this percentage has been reduced to a mean of 7%, thanks to the use of taut wire measuring gear, automatic brakes and other well-designed controlling arrangements.

That these standards constitute the theoretical and experimental basis of a genuine engineering technique is proved by the fact that projects prepared simultaneously and independently by the "Italcable's" engineers and by the consulting engineers in England in connection with the recently laid Anzio-Barcelona and Malaga cables evinced such a striking similarity of results that the lengths of the route differed by less than 1% of the total length of the line, namely, by less than 8 miles over a length of 1 100 nautical miles. On the other hand, the allotment of the types was governed by views so nearly identical that the difference in the cost of manufacture as estimated by the "Italcable" in their project and the actual outlay hardly reached 1 per thousand.

Use of Sonic Depth Finders.

The precautionary measures which attended the selection of the route in the first scheme, which culminated in the sounding expeditions of the "Città di Milano," the "Telconia" and the "Faraday," were adhered to in the laying of the more recent cables with the result that the installation of the sonic depth finder on the occasion of the laying of the new Pacific cables on behalf of the four Governments forming the Pacific Cable Board, found its counterpart in the up-to-date equipment of the "Città di Milano."(7)

Thus, whilst laying operations of the short Mediterranean cables were conducted with absolute technical accuracy, it will be possible in the near future to carry out further and very interesting checks on the Werner Siemens' theory and the

* Based on an account published by the "Rassegna delle Poste dei Telegrafi e Telefoni."

(1) For the same reasons the Western Union collaborated with the Deutsch Atlantische Telegraphengesellschaft with regard to the working of the 1926 Emden-Horta cable connecting North America to Germany. See A. Curtis: "Valve Amplifiers for Submarine Cables," in THE ELECTRICIAN of November 16th, 1927; further, "L'Exploitation du Nouveau Cable Germano-Américain," "Revue des Télégraphes et Téléphones et de la T.S.F.", of December 1927.

(2) This firm closed down in March, 1928. In addition to the assistance given the "Italcable" and the Western Union in connection with the laying of their earlier loaded cables, Messrs. Clark, Forde and Taylor played a very active part as consulting engineers in the manufacture and laying of the Pacific loaded cables for the Pacific Cable Board, and of the Emden-Horta cable on behalf of the Deutsch Atlantische Telegraphen Gesellschaft.

(3) Cf. Milnor: "Submarine Cable Telegraphy," in "J.A.I. of E.E.", February, 1922.

(4) E. S. Heurtley. British Patents 17555, A.D. 1909; 13337, A.D. 1910; 129140, A.D. 1919.

(5) Cf. E. S. Heurtley: British Patent 193957, A.D. 1923.

(6) Cf. K. W. Wagner: "La Télégraphie Sousmarine Rapide." "Annales PP.TT." 1925, page 772.
Hughes: "Recent Development in Cable Construction." "Journal I.E.E.," London, January 1928.

(7) Cf. Engineering, 1927, Vol. CXXVII, page 52.

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formulæ developed by him and used for 54 years for the determination of the depth during laying.

In the selection of the landing places special provisions were made for the effectual prevention of any possible deterioration of the cables whether due to the meteorological and hydrographic conditions of the locality or to the traffic and maritime industry connected therewith. Therefore, in addition to works on land, marking with buoys was resorted to, and suitable gear and spare cable were stored close at hand to permit of carrying out any small repair by local means.

The landing was, whenever possible, selected to be near the office with a view to avoiding long and costly underground connecting lines. Where this was not practicable underground connections were laid, using for this purpose multiple cable having the same number of conductors as the submarine cable and as nearly as possible the same characteristics. Therefore, the underground connection was carried out by means of india rubber insulated lead covered conductors, sheathed with steel tapes or wires, laid into carefully planned trenches, along routes which were selected bearing in mind the necessity of avoiding interruptions from road work, corrosion due to stray currents and, above all, any inductive phenomena from electric tramways or power supply lines running near by. The care taken and the expenditure incurred were perfectly justified by the fact that no trouble of any nature has so far been experienced along any of the installations so planned and carried out, with the exception of induction experienced in Barcelona where, in 1927, we were compelled to follow an electric tramline for over one-third of the total length of the underground line. This trouble was eliminated by following, perhaps for the first time in telegraph cable technique,(8) the practice adopted for some time past in connection with telephone cables, that is, by connecting in one circuit the protective lead covering, the sheathing, the return conductors of the tramline and at the same time establishing reliable earths.

It was decided from the very first that the Northern and Southern cables were to make up two independent and uninterrupted communication lines, and therefore the intermediate stations were to be equipped for relay transmission and signal regeneration. This implied, of course, the adoption of the most up-to-date high speed and long distance apparatus, electromechanic magnifiers of the latest type, Brown or Heurtley relays and Western Union or other special type of regenerators.(9)

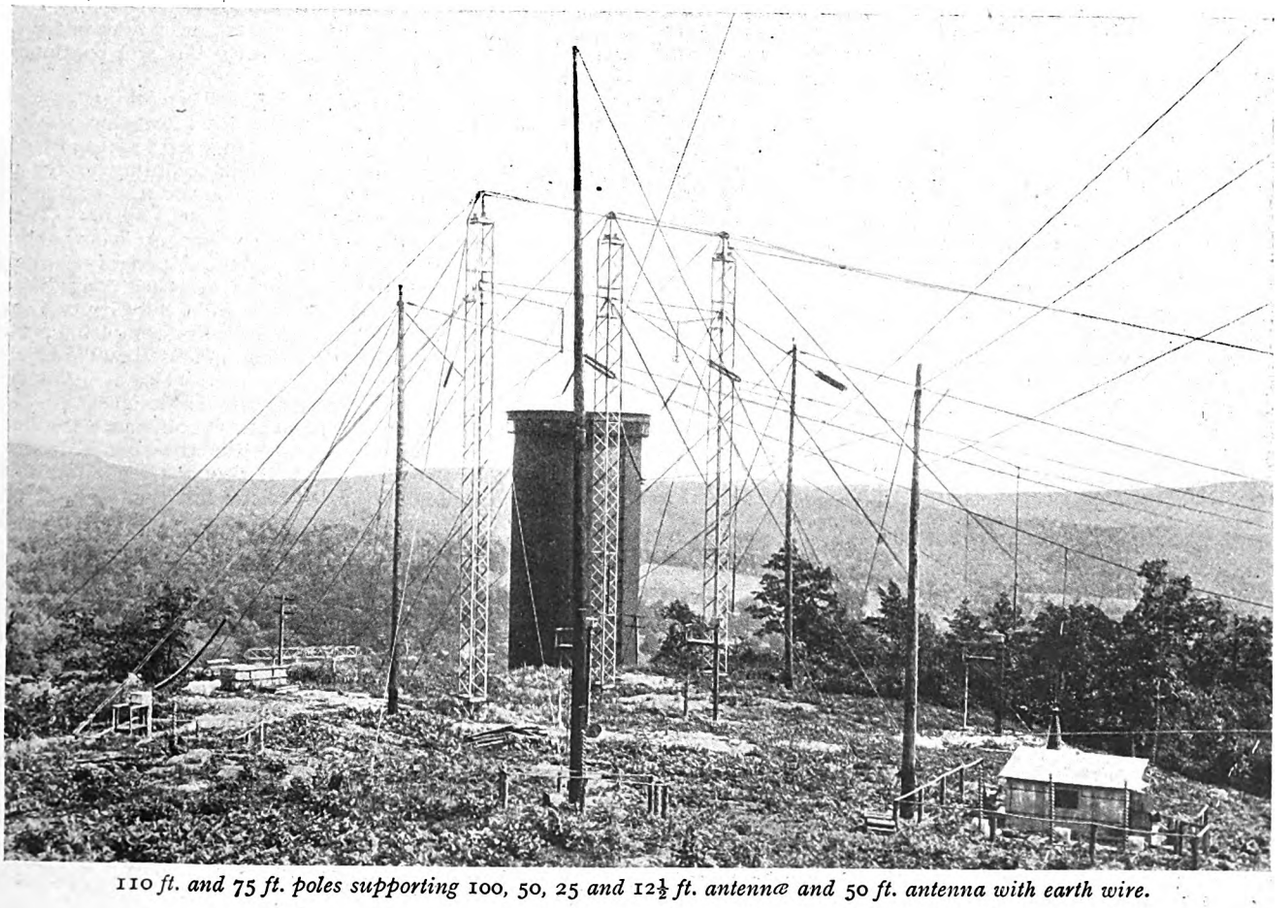
Matters were easy enough with regard to the Northern cable destined to make up a single system with that of the Western Union and so provide a direct line between Rome and New York; not only because the agreements made with the associated companies guaranteed the unrestricted co-operation of their experts for carrying out the installation and supplying the necessary staff, but also because in any case manual retransmission had been provided for at Horta, and there was in consequence only one relay station to be worked. Nevertheless, both at Anzio and Horta, service had perforce to be commenced in March, 1925, with temporary installations and without magnifiers; but after only five months, when the Italian station at Anzio was ready in its permanent form with magnifiers in use, transmission speed increased over 33% as compared with that at first obtained. At Malaga the installation had been completed even earlier and regenerators of the Western Union type inserted. This was a new and brilliant extension of the employment of the Baudot rotary distributor for submarine cables for the retransmission of the previously amplified and repeated signals, making use of local circuits which were entirely independent but operated automatically in perfect synchronism with the incoming signals. In the "Italcable." system the application of the Baudot distributor was at first limited to the simple regeneration of signals—i.e., to the synchronous retransmission of signals of perfect shape and amplitude over an entirely independent circuit in place of the magnified and corrected but still distorted incoming signals.

As soon as the application of the regenerator was effected, it occurred to the "Italcable," as a natural consequence and further development, to adopt multiple transmission and reception by fully utilising the Baudot distributor, and there-

(8) Cf. Jäger: "Influence perturbatrice exercée par les lignes de communication de toutes catégories." "Annales des PP.TT." October, 1926, and "Telegraphen und Fernsprecher Technik," March, 1926.

(9) For Regenerators, see Harrison, THE ELECTRICIAN, January, 1927: "Regenerative Telegraph Repeaters."

THE LIGHTNING LABORATORY, WALLENPAUPACK, PENNSYLVANIA.



110 ft. and 75 ft. poles supporting 100, 50, 25 and 12½ ft. antennæ and 50 ft. antenna with earth wire.

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fore, as had already been done by the Western Union on some of their Northern cables, the "Italcable" proceeded to instal a two-channel system on the Anzio-Malaga-Horta cable.

In practice, however, the problem the "Italcable" proposed to solve was of a quite different nature from that solved by the Western Union. The Anzio cable was the only one at the time connecting Malaga to Italy, and had therefore to serve both the Northern and the Southern line to Rio Janeiro and Buenos Aires. One channel should therefore continue working as before as a single cable between Anzio and Horta, whereas the other could be interrupted at Malaga, thus permitting the traffic between Italy and South America or Italy and Spain on one side, and that between Spain and North America on the other side, to be handled independently.

Complex Technical Arrangements.

Thus on the Northern cable also the different nature of the two systems, "Italcable" and "Western Union," began to assert itself. It was no longer a route between terminals connected up at the intermediate stations, but a route having much more complex characteristics, requiring more complex technical arrangements to secure the perfect synchronism and phasing necessary for transmission at the intermediate and terminal stations.

As regards the Southern Cable, thanks to the co-operation of Messrs. Clark Forde and Taylor and the general good will of the engineers and officials distributed along the route, the line was ready for relay working less than nine months after the Southern cables were laid.

Less than one month after the inauguration the Heurtley-Foll regenerator(10) was tried out at St. Vincent, an apparatus also based on the synchronous substitution of signals passing from one cable to the other, but employing a system of contacts and cams driven by one and the same mechanism in lieu of the usual distributor rotating on concentric contact rings. Between November, 1925, and April, 1926, all five stations between Malaga and Buenos Aires were working regenerators.

Meanwhile experiments were made and are still being made for a gradual increase of the transmission speed, this being necessitated by the ever-increasing traffic requirements, and to ensure in the case of the Southern line also rapid handling of big volumes of traffic that are characteristic of certain times of day, especially in the event of unusual occurrences.

Reverting to the South American cable proper—i.e., the Malaga-Buenos Aires section—traffic transmission by regenerators and relays over this line has been obtained having special regard to the possibility of local transmission of the Spanish and Brazilian traffic which it was the duty of the "Italcable" to carry as well as the Italian and Argentine traffic.

For this purpose special mechanisms were studied and adopted (by actual synchronising retransmitters) to prevent the disturbances due to these insertions of traffic affecting the synchronism of the whole system and to maintain the same amplitude and shape characteristics for signals whether arriving from the terminal or intermediate stations.

The necessity for utilising the highest speeds obtainable without relinquishing the regeneration of signals and preparing for further traffic exchanges and the working of duplicate cables led to the study of a perfect method for obtaining synchronism between all the apparatus working on a cable or system of cables. For this purpose a synchronising system independent of signals has already been installed on the Anzio-Barcelona-Malaga cables (11) based on the continuous transmission over the cable of an alternating current at a conveniently determined frequency intended to drive the tuning forks controlling the phonic motors which operate the transmitter and regenerator distributors. Two-channel multiple transmission is already being worked over these cables, and four-channel transmission will soon be effected. It will then be possible, if so desired, to proceed with an entire division of traffic over the circuits, either according to destination and origin or according to the various classes of traffic.

It strikes one immediately that this first application of the independent system of synchronism opens the way to a great number of technical and traffic possibilities which can be obtained by extending this installation to other cables; and if, after this report of our achievements, we may be allowed to mention what we consider feasible in a not far distant future, we will state that it will then be possible to maintain in phase all apparatus working over cables synchronised by a regulating centre irrespective of the signals actually travelling on the cables, thus facilitating enormously the exchange between the various lines of traffic which it will be possible to achieve without disturbing the technical working.

In fact, if compared with existing conditions, the system will acquire a flexibility permitting it to meet widely differing contingencies without endangering its organic compactness.

The station transmitting the synchronising alternating current will be the sound heart dwelling in an exceptionally robust body, the circulation of which will be rendered absolutely independent of the particular activity of the various nerve centres constituted by the stations.

In addition to land lines in Italy, the "Italcable" has provided a system of direct connections for its exclusive use in Spain, Brazil and Argentina as well as in the Atlantic islands. The total length of the various landline systems now exceeds 7 900 km.

The Anzio-Palermo Cable, over 219 nautical miles in length, has been made part of the Italian landline system, and the same applies to the Palermo-Cagliari cable now laid. These cables are, and will be, worked Baudot, so as to be easily connected up to the company's and the Italian Administration's landlines.

The development of traffic has not only been up to expectations, but has also justified the foresight whereby the company in good time asked for and obtained further grants for the provision of a new system capable of meeting future requirements in world communications. A cable has been recently laid between Malaga and Lisbon, and concessions have already been obtained for cables between Lisbon and North Europe, Bilbao-North Europe, for a new Italy-Azores cable, a second Buenos Aires-Rio Janeiro cable, and a cable between Horta and St. Vincent.

(10) Heurtley-Foll: English Patents Nos. 215434, 1924; 239562, 1925.

(11) Pernot and Rich: English Patents Nos. 196971, 1923; 295144, 1928.

HYDRO-ELECTRIC PROGRESS IN CANADA IN 1929.

5 727 600 h.p. already installed.

THE Dominion Water Power and Reclamation Service of the Department of the Interior of Canada has issued its Annual Review of Hydro-Electric and Water Power Developments in Canada during 1929. The statement shows that the activity which has been so evident in recent years has been fully maintained and the amount of water-power now under construction and projected indicates that this will continue for some years to come.

The total amount of new installations brought into operation during 1929 amounted to 378 400 H.P., bringing the total installation for the whole Dominion to 5 727 600 H.P. Undertakings now under construction will, according to the programme proposed, add more than 1 600 000 H.P. to this total during the next three years.

The Shawinigan Water and Power Company is now actively engaged on the extension of its power resources from the St. Maurice River, and has completed another long-distance transmission line 67 miles in length from the City of Grand' Mère to La Tuque. This represents the first completed portion of the project designed to bring the immense power resources of the Upper St. Maurice River to the service of industry in Quebec. The new transmission line is designed to carry 200 000 H.P. at 250 000 V, but in the first instance the line is carrying power in the reverse direction at 66 000 V from the Laurentide hydro-electric power Station at Grand'Mère to the pulp and paper mill of the Brown Corporation at La Tuque, a station on the National Transcontinental line of the Canadian National Railways. The line is carried on galvanised steel towers, 90 ft. high, placed six to the mile. The route was located by aerial photography. The programme on which the Shawinigan Company has embarked will call for the investment of $100 000 000 in the next ten years. These new projects on the upper St. Maurice will add 600 000 H.P. to the system which to-day has available 806 000 H.P. The company supplies hydro-electric power to some 350 communities in the province of Quebec.

The Southern Canada Power Company has submitted to the Quebec Government plans for the construction of dams and a generating station near Spicer Rapids on the St. Francis River, over large stretches of which the company owns riparian rights. The present plans will involve the expenditure of approximately $6 000 000, and the plant is expected to have a capacity of 50 000 H.P.

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MEASUREMENT OF HIGH RESISTANCE BY LOSS OF CHARGE METHOD.

Limitations of Direct Deflection Method—High Resistance with Very Low Capacity—Effect of Absorption on Result of Test.

By S. T. GASKIN

THE object of this paper is to describe the loss of charge method of measuring high resistances which are beyond the scope of the direct deflection method; to consider what modifications are necessary in the special case of high resistance associated with very low electrostatic capacity; and to examine the conditions which permit a simple formula to be employed with a practical degree of accuracy.

As the loss of charge method is of particular utility to the telegraph engineer, the examples given refer to telegraphic work. The method is, however, easily and quickly applied to other work.

The simple direct deflection method can be employed for measuring high resistances, the value at which the current flowing through the galvanometer becomes too small to produce a deflection which can be observed with sufficient accuracy. This current depends upon the battery available, or permissible, and the sensitiveness of the galvanometer.

The normal Sullivan universal galvanometer, for example, has a figure of merit of 0·02 micro-amperes approximately. When fitted with a special suspension in which the coil is suspended from above, connection being made to the lower end of the coil by means of a non-directive, open phos.-bronze spiral, the figure of merit becomes 0·001 micro-amperes approximately.

Degree of Accuracy.

If the accuracy of measurement is to be within 10% and the deflections can be read to half a division, then 5 scale divisions is the smallest permissible deflection. This will be produced by a current of 0·005 micro-amperes, assuming that the special suspension is in use.

Under these conditions, the highest resistance which can be measured is given by the voltage of the testing battery divided by 0·005.

Frequently, it is not convenient to use more than 200 V, even if permissible, and therefore 40 000 megohms is the highest resistance which can be conveniently measured by the direct deflection method.

Very much higher resistances can be measured by the loss of charge method, described below, using a battery of moderate voltage.

In this method, a charge is allowed to escape through the high resistance to be measured, and the ratio of the initial quantity of the charge to the quantity after a suitable interval of time has elapsed is determined by observations with a ballistic galvanometer.

As the capacity which contains the charge remains constant, these quantities are proportional to the potential of the charge, and therefore the value of the high resistance can be calculated by means of the well-known formula :—

$$R = \frac{0{\cdot}4343t}{K \log \frac{V1}{V2}} \text{ megohms.}$$

where $V1$ = initial potential of charge.
$V2$ = potential of charge after an interval of t seconds.
K = capacity in mfds. which contains the charge.

The following is an example of the method, when the high resistance to be measured is the dielectric of a condenser (see Fig. 1) :—

1. Apply battery for 20 seconds, by closing keys A and B. Note charge throw ($V1$) on galvanometer.
2. Insulate condenser for one minute by opening key B.
3. Apply battery again by closing key B, noting recharge throw. Then $V2 = V1 -$ (recharge throw).

Let a charge throw of (240×10) and a recharge throw of (14×1) scale divisions be obtained when a 1 mfd. condenser is tested.

$$\text{Then } R = \frac{0{\cdot}4343 \times 60}{1 \times \log \frac{2400}{2386}} = 10380 \text{ megohms.}$$

This procedure is suitable so long as the capacity of the condenser is high enough to enable charge and recharge throws to be taken with sufficient accuracy, the period of insulation being chosen to suit the rate of discharge.

When, however, a high resistance associated with a negligible capacity (such as the insulation of a joint in a very short length of core) is to be measured, certain modifications are essential.

(a) *First Method.*—Take a good mica dielectric condenser and test for insulation by the loss of charge method, as above. Then, after thoroughly discharging, connect the unknown high resistance in parallel with it and take another loss of charge test.

The second result will be the joint resistance of the condenser insulation and the unknown resistance.

Now if r = the unknown resistance,
and R = the insulation resistance of condenser,

$$\text{Then } r = \frac{R \times \text{joint res.}}{R - \text{joint res.}}$$

This method can be quickly applied, but involves a lot of calculation, and although it is perfectly accurate in theory, errors are liable to occur owing to the effect of absorption in the condenser dielectric.

Fortunately, both of these objections may be disposed of by adopting the procedure described below.

(b) *Second Method, and Approximate Formula :*

1. Charge the condenser for 24 hours by connecting it to the battery to be used for the test.
2. Take a recharge throw after insulating for one minute. Call this throw d.
3. Connect the high resistance to be tested in parallel with the condenser. Charge for one minute.
4. Insulate condenser with high resistance in parallel for one minute. Then take a recharge throw (D).
5. Obtain capacity constant of galvanometer in scale divisions per mfd.

Then, if t = time of insulation in seconds
and R = resistance to be measured, in megohms.

$$R = \frac{t \times \text{divs. per mfd.}}{D - d}$$

$$\text{or, simply :—Megohms} = \frac{\text{secs.} \times \text{cap. const.}}{\text{divs. due to } R.}$$

Example :—A 1-mfd. condenser was charged for 24 hours. After one minute's insulation a recharge throw of four divisions was obtained. With a yard of faulty I.R. insulated

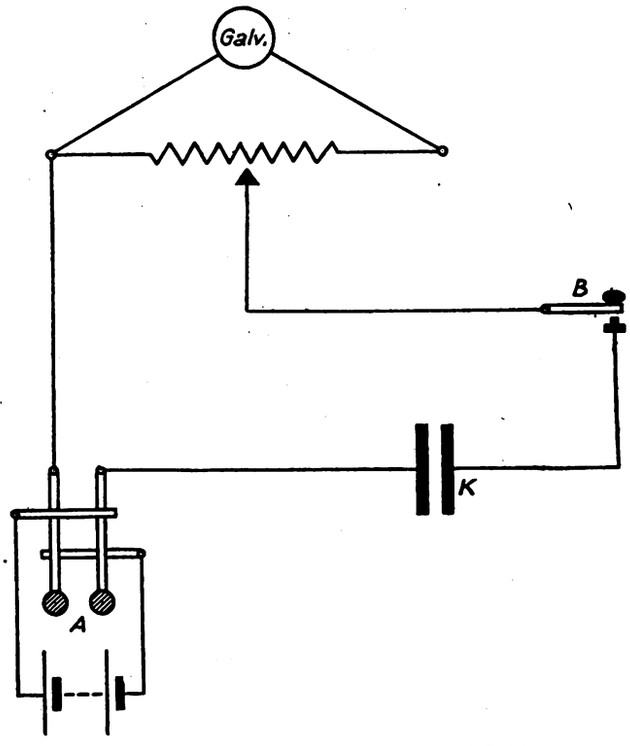

Fig. 1.—Measurement of resistance of condenser dielectric.

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U.G. core in parallel with the condenser a recharge throw of 14 divisions was obtained. Cap. const. of galvanometer 9 650.

$$R = \frac{60 \times 9650}{14-4} = 57900 \text{ megohms.}$$

Once thoroughly charged, the condenser *must not be discharged* until the test has been completed; then the capacity constant of the galvanometer is conveniently obtained by a discharge throw. Of course, a second condenser can be used, if desired, to obtain the constant.

Theory and Conditions Necessary for Accuracy.

The simple formula given above is not strictly correct and always yields a result which is slightly too high.

However, the conditions for a practical degree of accuracy can be ascertained and are easily obtained in practice.

The theory of this method is that a P.D., which is assumed to be constant, maintained across the resistance to be measured causes a current to flow through it, and the quantity which actually passes is observed, thus enabling the value of the high resistance to be calculated.

But as a charged condenser supplies the P.D., which falls as the charge escapes, the formula given is not strictly correct. It is deduced as follows:—

Let K = capacity of condenser.
V = initial P.D. of charge.
Q = original charge.
q = quantity which escapes.
R = resistance through which q passes.
t = time in seconds.

Then $q = \frac{Vt}{R}$

$$\therefore R = \frac{Vt}{q}$$

V is assumed to be constant throughout,

$$\therefore R = \frac{\frac{Q}{K}t}{q} = \frac{Qt}{Kq}$$

The ratio $\frac{Q}{q} = \frac{\text{charge throw}}{\text{recharge throw}}$

and $\frac{\text{charge throw}}{K}$ = scale divs. per mfd.

$$\therefore R \text{ (in megohms)} = \frac{\text{scale divs. per mfd.} \times \text{secs.}}{\text{recharge throw.}}$$

(This formula is very useful for the general loss of charge test described above, when extreme accuracy is not required.)

Actually, V is not constant but falls according to the law

$$-V_t = V\varepsilon^{-\frac{t}{KR}}$$

where V_t is the potential of the charge after t secs. have elapsed

$$\therefore Q_t = Q\varepsilon^{-\frac{t}{KR}}$$

The error due to this loss of charge and consequent fall in potential can be calculated and a correction applied to the result. It is simpler, however, to use a condenser so large that the error is negligible in practice.

In measurements of this kind, an accuracy of 10% is usually satisfactory. To ensure this, so far as the P.D. across R is concerned, conditions must be such that the quantity which escapes through R is not less than 10/11ths of the quantity which would have passed through R, had the initial P.D. been maintained.

The maximum permissible error therefore occurs when

$$\frac{q}{\frac{Vt}{R}} = \frac{10}{11} \quad \ldots \ldots \ldots \ldots \quad (1)$$

$$\text{But } q = Q - Q_t$$
$$= Q - Q\varepsilon^{-\frac{t}{KR}}$$
$$= Q\left(1 - \varepsilon^{-\frac{t}{KR}}\right)$$
$$= KV\left(1 - \varepsilon^{-\frac{t}{KR}}\right).$$

Inserting this value in (1)

$$\therefore \frac{KV\left(1-\varepsilon^{-\frac{t}{KR}}\right)}{\frac{Vt}{R}} = \frac{10}{11}$$

$$\therefore \frac{KR}{t}\left(1-\varepsilon^{-\frac{t}{KR}}\right) = \frac{10}{11}$$

The Measurement of High Resistance by the Loss of Charge 2

Let $x = \frac{t}{KR}$

Then $\frac{1-\varepsilon^{-x}}{x} = \frac{10}{11}$

$$\therefore 1 - \varepsilon^{-x} = \frac{10}{11}x$$

$$\therefore \varepsilon^{-x} = 1 - \frac{10}{11}x$$

Take logs $\therefore -x = \log_\varepsilon\left(1 - \frac{10}{11}x\right)$

Expand by logarithmic theorem $\left\{ \therefore -x = -\frac{10}{11}x - \frac{100}{121}\cdot\frac{x^2}{2} - \frac{1000}{1331}\cdot\frac{x^3}{3} \ldots \right.$

$$\therefore 0 = \frac{1}{11}x - \frac{100}{121}\cdot\frac{x^2}{2} - \frac{1000}{1331}\cdot\frac{x^3}{3} \ldots$$

$$\therefore \frac{1}{11} = \frac{100}{121}\cdot\frac{x}{2} + \frac{1000}{1331}\cdot\frac{x^2}{3} \ldots \ldots$$

Solving as quadratic

$$\therefore x = 0{\cdot}1975 \pm {\cdot}0005$$

that is $\frac{t}{KR} = 0{\cdot}1975$, nearly.

Hence when $t = 60$, $KR = \frac{60}{{\cdot}1975} = 303{\cdot}8$

This means that when the megohms per mfd. of the circuit considered (i.e. condenser plus article under test) are 303·8, the result given by this simple test, using the approximate formula, will be 10% high; and that an accuracy of greater than 10% is obtainable when the megohms per mfd. exceed 303·8.

Of course, this applies only to tests in which the period of insulation is one minute. For two minutes, the megohms per mfd. must be greater than 608; for three minutes, greater than 912—and so on, if an accuracy of greater than 10% is required.

In practice, the megohms per mfd. must be considered together with the battery to be used and the figure of merit of the galvanometer. A suitable value for the condenser can then be determined. The following examples will make this clear:—

(1) A yard of core taken from a drum of i.r. insulated u.g. landline, which is thought to have an insulation of 500 megohms per n.m., is to be tested.

Approx. insulation of 1 yd. $= 500 \times 2029$
$= 1\,014\,500$ megohms.

Approx. capacity of 1 yd. $= \frac{{\cdot}3333}{2029}$
$= 0{\cdot}000164$ mfds.

It is obvious that this very short length cannot be tested by the direct deflection method; also that the ordinary loss of charge method cannot be employed owing to the low capacity.

A battery of 200 V is available. This when applied for one minute will cause $\frac{200 \times 60}{10^6} = {\cdot}012$ microcoulombs to flow through the insulation resistance.

Period of Insulation.

If the Sullivan universal galvanometer (mentioned before) having a constant of approximately 50 divisions per microcoulomb is to be used, then ·012 microcoulombs will be insufficient to produce a good throw, and a longer period of insulation will be necessary.

If this is made 10 minutes then

$$\text{microcoulombs} = \frac{200 \times 600}{10^6} = {\cdot}12$$

A throw of 5 divisions would be obtained for this quantity.

For a period of insulation of 10 minutes it is desirable that the megohms per mfd. shall exceed 3 038. A very small condenser will ensure this, and there is a slight advantage in

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using one having the minimum capacity which will satisfy this condition, since the " divisions due to condenser " will then be a minimum. But usually a good mica condenser of 1 mfd. or ½ mfd. capacity is available, and this can be used.

Of course, it would be very desirable in this case to increase the voltage of the testing battery so as to avoid such a long period of insulation.

(2) A rough trial shows that the insulation between two terminals on a certain base-board is about 50 000 megohms.

The same battery and galvanometer as in (1) are available.

Now to get a re-charge throw of 10 divisions, 0·2 microcoulombs must be allowed to escape through the resistance. With a p.d. of 200 volts this quantity will escape in 50 seconds, so that a period of insulation of 1 minute will be convenient.

In order that the megohms per mfd. shall exceed 304, a condenser of not less than $\frac{304}{50\,000} = 0{\cdot}006$ mfds. must be used.

Given then, capacity constant = 10 000 divs/mfd.
condenser re-charge = 2 divs.
condenser plus leak re-charge = 13 divs.

$$R = \frac{60 \times 10\,000}{11} = 54\,540 \text{ megohms.}$$

In general, a good mica condenser of 1 mfd. capacity is suitable for most tests that are likely to be undertaken.

Effect of Absorption on Result of Test.

A condenser is said to have an absorptive dielectric if, when connected to a source of e.m.f. a gradually diminishing current flows after the initial charging current has ceased.

If such a condenser is short-circuited after having been thoroughly charged, a similar diminishing current will flow (in the opposite direction) after the initial discharge is complete.

Therefore, if an absorptive condenser is tested by the loss of charge method after it has been short-circuited for a long period, the result will not be the same as that obtained by a similar test after the condenser has been charged for some hours, or even minutes.

For, in the former case, during the period of insulation, an absorption current will flow as well as the true leakage current, causing the apparent loss to be greater than the true loss. This produces a low result.

And in the latter case the absorption current will be small. Hence, the apparent loss of charge will be nearly equal to the true loss due to leakage through the insulation resistance, and the result will be higher than in the former case.

Actual figures obtained with a good 1 mfd. mica condenser were :—

18 200 megohms after 1 week short-circuited.

$2{\cdot}25 \times 10^6$ megohms after 24 hours charging at 75 V, and with a paraffin paper condenser (1 mfd.) :—

3 430 megohms after 1 week short-circuited.

240 000 megohms after 48 hours charging at 180 volts.

In the special case—second method—described above, it is imperative that the condenser be charged long enough to ensure that the absorption current has practically ceased.

And in the ordinary loss of charge test of condensers, etc., consistent results will only be obtained if the condenser is short-circuited for a definite period before each test, and a proper interval of electrification chosen.

If there were no absorption, the intervals of electrification and insulation would be unimportant, the same figure being obtained whether the condenser had been charged or short-circuited for a long time.

This, however, is not the case, and therefore a definite routine is necessary, not only when testing condensers, but for all insulation tests by the loss of charge method.

The routine given above, viz.—20 seconds' electrification followed by one minute insulation—is fairly widely used, and has been adopted because it yields an average result of the same order as would be obtained by the direct deflection at the end of the first minute of electrification.

Stockport T.C. has submitted to the Commissioners, for approval, an estimate of expenditure for the extension of the Millgate power station. The estimate provides for a 20 000kW turbo-alternator, four 50 000 lb. boilers, buildings, etc., the total cost being £260 000.

Work in connection with the Crewkerne electricity supply is to be commenced shortly. The application of the South Somerset and District Electricity Co. for the necessary Special Order has been granted by the Electricity Commissioners and confirmed by the Ministry of Transport and now awaits approval by Parliament.

SOUTH AFRICAN RAILWAY ELECTRIFICATION.

Why the Financial Results are Unsatisfactory.

SOUTH Africa's experience with electrification of railways has been distinctly disappointing. In the Cape Town suburban area the short Cape Town–Sea Point line, which was part of the electrified system, was worked at an increasing annual loss, reaching £47 000 in 1928, and has now been closed and dismantled.

Results on the longer Simonstown line have been far from satisfactory from the financial point of view. The electric trains, although giving a fast, frequent and efficient service, have been unable to attract sufficient passenger traffic to cover the interest charges on electrification. The loss on the line during eight months of steam operation immediately preceding electrification was at the rate of £96 000 per annum. For the eight months following electrification the loss was at the rate of £215 000 per annum, and allowing for the off-season in the next four months, the annual loss is not likely to be less than £250 000.

When plans for electrifying the line were considered by consulting engineers, they estimated the increased cost of working by electricity at £52 220 per annum, but they anticipated an increase of 25 per cent. in the passenger traffic, giving increased revenue of £139 500 per annum. Actually, the increase has been only 3 per cent., giving only £12 000 additional revenue. In fairness to the consulting engineers it must be mentioned that intense bus competition has come into existence since their estimates were made, and it is this competition which is largely responsible for the unfavourable results obtained. But the increased running costs, under electrification, have proved to be much higher than the estimate—£95 000 instead of £52 220—and the actual cost of current supplied by the Salt River power station of the Electricity Supply Commission is £20 000 per annum greater than the total steam-running cost. The fact is that Cape Town and its suburbs have not a large enough population to support an electric suburban railway system in addition to trams and buses. The rapid growth which followed the end of the war induced an excess of optimism that betrayed both the consulting engineers and the railway administration.

It was a similar excess of enthusiasm as to traffic possibilities in the immediate future combined with a very serious underestimate (running into seven figures) of the cost of electrification which has upset calculations in regard to the Natal main line electrification from Pietermaritzburg to Glencoe Junction. The coal export traffic through Durban has failed to expand owing to the intense competition in the world's coal trade. Consequently it will be some years before the electrified line in Natal can become a financial success. The line is exceptionally difficult, the up and down tracks frequently being on quite different alignments at considerable distances from one another, and this naturally increased the cost of overhead equipment. Electrical working has proved far superior to steam on the long and severe gradients of which this line is almost entirely composed, but the financial aspect has given the railway administration so much anxiety that the extension of electrification from Pietermaritzburg to Durban is not likely to be considered for some time to come, failing a quite unexpectedly rapid increase in traffic between Durban and the interior. It is not that electrification has failed to do anything that was expected of it in the operating sphere ; miscalculation of the cost of conversion and an over-sanguine expectation of the growth of traffic are the causes of the lack of financial success.

G. H. L.

Glasgow Corporation has declined to agree to the claim of the Clyde Valley Electrical Power Co. for an extension of the agreement for the distribution of electricity by the company within the area of supply authorised by the Shettleston and Tollcross Lighting Order, 1906, so far as the said area is included in the city by the Glasgow Boundaries Acts, 1912 and 1925. The Electricity Committee does not see its way to accept any of the arbitrators suggested by the company, and has agreed that the Board of Trade be asked to appoint an arbitrator.—The Electricity Committee has decided to offer to supply all electricity required by the tramways department in addition to the electricity generated by the tramways department's existing plant at 0·3d. per kWh.—The Electricity Committee has adopted a scheme for the extension of distributing mains at a cost of £54 000.

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ELECTRICAL WATER HEATING.

Domestic Hot Water Supply—Importance of Correct Estimation of Quantity Required—Possibilities of Conversion—Advantages of Thermostatic Control—Types of Installations—Cost not the Sole Consideration.

BEFORE the ordinary business of the Electrical Development Association conference held at the Royal Society of Arts on January 17th was proceeded with, the meeting stood in silence for a short time as a tribute of respect and affection for the late Dr. S. Z. de Ferranti, who was president of the E.D.A.

Unfortunately Sir Hugo Hirst had not recovered sufficiently from his long illness to be able to preside, and Lieut.-Col. W. A. Vignoles (Director and Secretary of the E.D.A.) took the chair.

Choice of System.

Mr. C. Hubert Smith, who presented a paper on domestic hot water supply, stressed the point that there is now available some form of electric water heating system to meet almost any set of conditions that arises, the problem being merely that of understanding the conditions and choosing the best system for the job. The first necessity was to study the arrangements for supplying the proposed electric water heater with cold water. Assuming water to be available from a ball valve cistern and hot water to be required at one point only, a thermostatically controlled displacement type heater with bottom feed would meet requirements, the control being on the cold water inlet, the hot water passing out through an always open spout to the receptacle. If hot water was required at more than one point, the same type of heater could be used, it being provided with a union for the reception of the hot water pipe connection to the several points, and a union at the bottom for the cold water feed from the cistern. An expansion pipe must be run from the union at the top of the tank to a point above the ball valve cistern; there should be no attempt to depart from the hydrostatically balanced arrangement thus produced.

On the other hand, if no cold water cistern was available and hot water was required at one point only, the requirements could be met by a tank with broken feed arrangement, the control being on the inlet, and the outlet spout being always open. If hot water was required at several points it was best to use a cistern type of tank, which constituted a complete hot water system in itself, the main cold water feed being taken to the ball valve fitting.

After pointing to the importance of estimating the quantity of water likely to be required in any particular house as nearly as possible before deciding on the installation, Mr. Smith said that the standing cost incurred in keeping a tank of hot water ready for instant use day and night was on the average one unit per 24 hours. For hot baths, 24 gallons at, say, 105 deg., there would be required 12 gallons from tank at 160 deg., mixed with 12 gallons cold, the units required for each bath being about 4. For wash basins, using a gallon of water at 160 deg. and a gallon cold, about one-third of a unit would be consumed per wash. For washing up and scouring, at 160 deg., 3 gallons per unit. The units consumed per week by a household requiring an average of one bath, six handbasin washes and 15 gallons of water for general domestic use daily, plus standing loss, would be 84 units. At ½d. per unit this would cost 3s. 6d. per week, or at ¾d., 5s. 3d. per week.

The conversion of existing hot water systems by fitting immersion heaters in storage tanks, could be done successfully in some cases, and it was easy to draw the line between success and failure. He emphasised the importance of tracing out all the hot water pipe connections. If hot water pipes disappeared to unknown destinations or straggled about over a house in long runs; if there were secondary circulating systems, possibly supplying hot water radiators in linen cupboards, or towel rails; or if the expansion pipe was taken up outside a high building; one should not attempt to convert by immersion heaters in the tank. If the system was small and compact, and promised well for conversion, a 2 kW immersion heater should be fitted in the storage tank. The heater was best controlled thermostatically but could be controlled alternatively by a series parallel switch. Large capacity heaters with hand control should not be fitted. The heater could, if desired, be considered as an auxiliary to a slow combustion stove situated in the kitchen, the heater being used in the summer months and at night during the winter, a thermostat automatically cutting it off when the stove is in use. Under such conditions the load would be particularly acceptable to the supply engineer.

Another method was to insert a complete stat-controlled heater in the pipe runs, though it was difficult to see the justification for the cost of this heater when equally good results could be obtained in a small installation where the pipe runs were short by inserting an immersion heater in the storage tank.

The immersion heater would only heat water effectively above its own level, so that if the storage tank was only large enough to meet requirements the heater should be placed as near the bottom as possible. If the tank was unnecessarily large, the heater could be placed higher up, according to the proportion of the tank capacity that was considered necessary to meet the household needs. Hot water would not circulate below the level of the immersion heater, so that fear of wastage through hot water circulating down through the boiler need not be entertained. The hot water pipes should all lead away from the top of the storage tank. The storage tank, when electrically fitted, should be heat insulated. Where immersion heaters were to be hand controlled, it was advisable to fit a pilot lamp in a conspicuous position which would indicate when the current is on.

The fitting of an immersion heater in an existing hot water storage tank as an auxiliary to the coke furnace could be usefully extended to much larger premises. For instance, in a block of office buildings or flats centrally heated by a coke boiler and hot water radiators, where there was no resident caretaker, where the temperature of the water was not maintained and the building was cold in the mornings because the furnaces are not properly kept going during the night, the difficulty could be overcome by fitting an electric circulator in parallel with the furnace, the heater being controlled by a thermostat in the domestic hot water storage cylinder or in the return pipe of the hot water heating system. Such an arrangement was particularly suited to night load. A time switch of small current-carrying capacity was inserted in the thermostat-operating coil circuit of the main contactor. This was a sound idea and could be made profitable to all concerned.

Another system was to fit a complete stat-controlled water heater in conjunction with a solid fuel boiler. In this case the water heater took the place of the usual storage cylinder, and was piped in the same way, with expansion, draw off and primary flow and return from the boiler.

Large blocks of flats were being supplied with hot water electrically heated. The cost of current was, of course, higher than would be the actual cost of coke used if the water were supplied from a coke-fired boiler, but the mere cost of coke in a coke-fired system was only a fraction of the total overall cost. There had to be considered the space occupied by the boiler house, the chimney, the distribution piping, the possible annoyance to tenants by smoke and dust, the labour involved in stoking, the entire dependence upon the efficiency of the person responsible for stoking, the storing of coke and many other incidental points. As against this, the electrically heated system was very flexible, it would meet demands more promptly, and the personal factor was eliminated entirely. A separate system could be provided for each block and the storage tanks placed either in the basement or the roof, whichever was the more convenient. Where a constant hot water supply is included in the rental, a group system could be employed where one storage tank supplied a group of, say, 12 to 15 flats, all adjacent. The working temperature of these group systems was of importance, and the thermostat should be set so that the temperature never rose above 170 deg. F.

Installations in Flats.

The fitting of separate tanks in each flat had been found by experience to be the best system to adopt, each flat being entirely self-contained as regards its hot water system, the current being registered through the tenant's own meter, and the risk of careful tenants suffering inconvenience and extra cost due to the wasteful extravagances of others avoided. Mr. Smith instanced five typical flats equipped with lighting, heating, cooking and water heating. The landlord paid the primary kW. charge, which was included in the rent. One meter was fitted in each flat registering all units consumed

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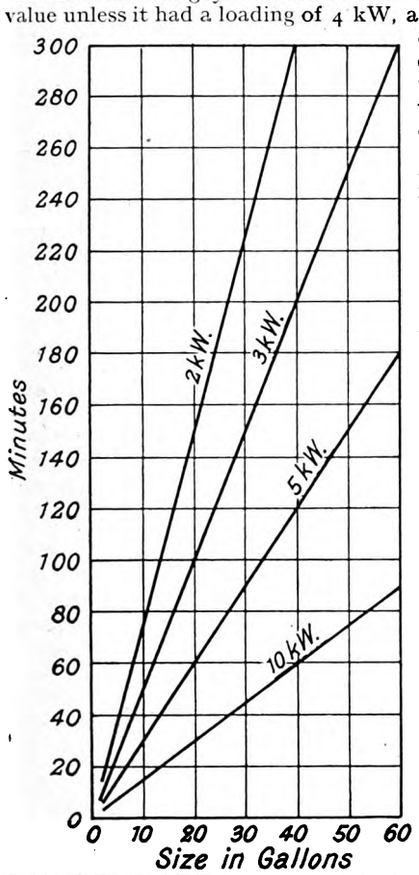
for which the tenant paid at the rate of ½d. per unit. The hot water tanks were considered as fixtures and part of the flat equipment, the landlord meeting the cost. The tenants hired the cookers, fires, and similar appliances. The average consumption per flat per week (one summer and one winter quarter) was 200 units, costing 8s. 4d. In five similar flats equipped with lighting, heating and water heating (no electric cookers) the average per week was 98 units, and the cost 4s. 1d.

A modification of this system was to arrange for the hot water installation in each flat to be completely independent, by fitting a cistern type water heater in each flat, supplied direct from the cold water main. A very large number of tanks of this type had been installed with satisfactory results.

Electric geysers or instantaneous water heaters had a certain field of usefulness, but could be almost left out of consideration as a means of meeting the general demand for hot water. An instantaneous geyser could be considered as of no practical value unless it had a loading of 4 kW, and it was then useful only for wash basins, dentists, and so forth, where small quantities of water were required intermittently. For washing up purposes it was necessary to have a loading of at least 6 or 8 kW, and for bath purposes a loading of nearer 16 kW, to give any real practical results. Such loadings were not welcome to the supply authority, and the cost of wiring was high.



Size of heater required to heat a given amount of water in a given time. (From "Electric Light and Power," January 1930.)

Other installations described included a 200-gallon night storage water heater designed to supply hot water to 12 wash-basins. The heaters were controlled by a time switch which allowed the current to be on between the hours of 11 p.m. and 7 a.m., and during these hours only the cold water was free to enter the tank. The draw-off for hot water was from the bottom of the tank, so that the fullest value of the hot water storage could be obtained during the day. Another installation was a 1 000-gallon tank for supplying a group of slipper baths. The water supply in this case was continuous, but a restricting valve was inserted by which the flow of water could be reduced to 45 gallons per hour, which was a little above the heating rate of the 18 kW loading provided.

Though, generally speaking, it was better to put immersion heaters direct into the storage tanks, this was sometimes inconvenient, and circulators were provided to meet exceptional cases.

Discussion.

Mr. Steele said that from the figures given in the paper, we could not hope to get electric water heating installed in our own and other people's houses until we could get current for the purpose at somewhere about ½d. per unit.

Mr. C. G. Nobbs urged that more definite information for general use should be collected with regard to the consumption of electricity and hot water for general domestic purposes. Such information might be collected by supply managers, and possibly the E.D.A.'s new sub-committee dealing with hot water would obtain figures from all over the country and might be able to arrive at a slogan or formula in relation to hot water, as with electric cooking. Owing to the large variation in the consumption of hot water by various families, one must be careful in answering questions as to cost per week. It was safer to say that 50 gallons could be heated for 12 units. For small domestic hot-water single-pipe systems the daily consumption would probably average 2 units per person, though in individual cases the consumption would probably be much greater. A water temperature exceeding 150 deg. F. was totally unnecessary for household purposes. Leaky taps were a great source of waste, and might be responsible for a waste of from 30 to 50 gallons per day. Local storage, push system or displacement water heaters should have anti-drip syphon or other arrangements to prevent loss of water by expansion during heating up. Installations having live circulation mains from the storage boiler would consume quite an appreciable quantity of electricity in maintaining a temperature in the circulation pipes night and day. A stop valve in the return pipe, when shut down, prevented a live circulation of hot water and the consequent heat loss. Where it was essential to have a live circulation, a return stop valve would effect a big saving if shut down during the night. For most office buildings there was no need to provide a live circulation for the lavatory basins. He urged electricity suppliers to give consumers hot water *ad lib.* and cheaply, without petty peak eliminators or restrictions; they would thereby secure a lucrative business.

Load Factor Variations.

Mr. F. Selley said that statistics relating to London and Greater London showed a load factor varying from 19 to 33. There was no apparatus other than water-heating apparatus on the market which was so beneficial from the load factor point of view, and the load factor could be improved without making additions to generation stations or mains. In regard to cost, if one supply authority could supply cheap units for off-peak load, there was no reason why others could not do the same. The number of units supplied in London and Greater London last year was in the neighbourhood of 1 500 000 000, but by providing sufficient storage and efficient lagging it was possible to double that figure in the near future. If the number of units supplied had been doubled and the load factor increased to 50 per cent., and the profit were 0·1d., the supply authorities in London and Greater London last year would have made a profit of about £600 000. His records, obtained by means of recording ammeters, had shown that if consumers were given supplies for water heating *ad lib.* the load was a non-peak load, and, by governing with time switches, he had found that there were 8 or 9 hours per day to spare for building up the load. It was time the supply authorities got together and made up their minds what was the lowest rate they could accept for off-peak loads.

Mr. Leadbetter (Hampstead) said that he was supplying more water heaters than cookers, and the users were delighted. Cost was not the top and bottom of everything; convenience was very important, and many people did not mind if their hot water cost them an extra 1s. or 2s. per week provided they had the convenience and the reliability of electric water heating.

Mr. Honey (Croydon) said that in Croydon between 1 300 and 1 400 water heaters had been sold since 1925. He was glad to note that supply authorities were beginning to reduce their prices towards the figure of ½d. per unit; the rate in Croydon was 0·75d., on the two-part tariff. Figures obtained in Croydon showed that for an average small house with an 11-gallon heater the consumption was about 5 units *per diem.* Night heating had been tried in Croydon, but the trouble was to provide sufficient storage capacity. It was often difficult to find room for large tanks.

The Chairman, referring to his own installation, consisting of an immersion heater fixed in the tank in the linen cupboard, said the daily consumption in summer, when electricity only was used, was about 12 units, but if the tank were lagged efficiently the consumption would be less. People were prepared to buy things on a basis other than that of low cost, and that was where salesmanship came in. The comfort resulting from the use of an electric water heater was enormous.

Mr. Smith, replying to the discussion, said that at 1d. per unit there was some hope, at ¾d. there was a lot of hope, and at ½d. it was easy. The restriction of water flow in all the cases he had mentioned was on the cold water side, so that the problem of furring did not arise. To provide any restriction on the hot water side was to ask for trouble. When considering costs it was best not to compare the costs of electric water heating with the costs of water heating by coal, coke or gas, but rather to consider whether it was not worth the money to have a perfectly reliable supply of hot water at any time of the day or night, without the trouble of stoking a fire, sweeping up the mess after stoking, and so on.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Our Debt to Ferranti.

[To the Editor.]

Sir,—May I, as the "old man" of the electrical engineering world, be allowed to express how much we owe to Ferranti, whose sudden death last week has saddened us all. I believe that I express the unanimous opinion of electrical men, certainly of this country and probably abroad, that we owe the great progress made during the last 40 years in generating and distributing electrical energy, which is now the most important and best controlled force of nature, to Ferranti, far more than to any other man. For Ferranti, when quite a young man, when working out his Deptford scheme in the 'eighties, encountered and successfully dealt with, in turn, the whole of the difficult problems of generating and distributing electrical energy by alternating currents, which are now so familiar to us all.

It is true that those—I amongst them—who started to deal with the far simpler problem of generating and distributing, at that time chiefly for lighting purposes, by direct-current and accumulators, had made more substantial progress than Ferranti at the time that he was working at Deptford, and that at that time the merits of the two systems seemed to be in the balance, as those who remember the exciting debates which took place at the Institution of Electrical Engineers will testify. But Ferranti soon caught us up, and I was one of the first to acknowledge that Ferranti had beaten us and had given us the extra-urban generating stations in place of the small inter-urban stations with which we had commenced during the early days.

Ferranti, the quietest, most unassuming of men, can now be judged at his real worth, and I, as an Englishman, am proud of him and am deeply saddened by his death.—I am, etc.,

R. E. Crompton.

Kensington Court, W.
January 21st.

Dr. Ferranti's Safety Switchgear.

[To the Editor.]

Sir,—May I be permitted to supplement your excellent memoir on the late Dr. de Ferranti by referring to one branch of his work which saved the lives of many hundreds of central station operators in the early days of h.t. electricity supply in this country.

It was my privilege to serve under him as a draughtsman at the Hollinwood works, 1898–1901, when he was developing his cellular h.t. switchgear which eliminated all exposed busbars, cable connectors and inter-connections by the simple process of mounting these unit parts on the face of the central station wall and protecting them by enamelled slate partitions.

This system ultimately gave birth to the metal-clad switchgear which has become standardised in all British central stations and which is steadily making its way into the power houses of other countries, not excluding the United States of America.

This portion of Dr. de Ferranti's work is apt to be overlooked because his later manufacturing interests were concentrated upon transformers, meters, instruments and during the past three years, upon the fascinating problems of radio reception, but I am confident that central station men who now enjoy complete immunity from danger in the handling of e.h.t. alternating currents would wish that testimony should be given to the famous electrical engineer for his pioneer work in this field.

Some thirty years ago I had painful experience of a type of switchgear (save the term) by which I was blinded due to heavy arcing from inefficient switches and several of my colleagues had narrow escapes from death by electric shock, but happily this apparatus was replaced by the Ferranti safety cellular method.—I am, etc.,

W. E. Warrilow.

Oxhey,
January 17th.

Modernistic Typography,

[To the Editor.]

Sir,—Referring to Mr. J. Arthur Dunville's point of view regarding Modernistic Typography in your issue of January 10th and his statement as to attempts at modernistic treatment ending in the grotesque, I certainly differ in opinion. The modernistic typography is rapidly advancing, and can without doubt convey its message with as much interest as any drawn lettering and even illustrations, therefore, I agree with Mr. J. S. Simmons's view.

I have seen many instances where typography has resembled drawn lettering. To-day, with the great number of faces at our disposal, combined with a perfect sense of balance in layout, plenty of white space, good choice of types and, above all, beautiful modernistic arrangement, I have seen many instances of this modernism which make drawn lettering, shall we say, "feel small."—I am, etc.,

H. Williams.

Streatham,
January 20th.

"EFFICIENCY."

Interesting Discussion at Informal I.E.E. Meeting —Views on Mass Production.

At the informal meeting of the Institution of Electrical Engineers on January 13th, Mr. C. F. Mounsdon was in the chair when Mr. Albert Morgan opened a discussion on "Efficiency." He said efficiency might have a sub-title, "Something for nothing, or success is easier than failure," but he definitely repudiated all idea of associating efficiency with mass production. Mr. Morgan in so many words defined efficiency as matter in the right place, and he displayed an ingenious and formidable time-sheet designed first of all for putting matter in the right place by ensuring that the workman was on his job at the psychological moment; and he had a number of diagrams and graphs showing the accumulative effects of lost efficiency in the early stages of production, either by delay in handling a problem, awkwardness due to unfamiliarity, unsuitable tools, etc. Mr. Morgan exhibited a workman's tool outfit, worn as a belt, and designed to cope with all reasonable emergencies. It embodied in addition to the usual knife, pliers and screwdriver, a spanner, torch, voltage tester, and range of adaptable carbon brushes, etc.

Mr. S. W. Melsom said mass production was one form of efficiency only—how could one measure the efficiency of say, Oliver Heaviside, who worked comparatively few hours per year, but in that short period produced results of the utmost value worth more than very much mass production.

Messrs. J. R. Bedford, J. H. C. Brooking, R. Grigg, S. B. Jackson, J. H. H. Lloyd, C. F. Mounsdon, N. Prentice and E. Kilburn Scott also spoke.

HOME ELECTRIFICATION.

Special Course of Lectures for Women.

A PRACTICAL course of lectures on home electrification for women in electrical showrooms, women architects and decorators has been arranged by the E.D.A. in conjunction with the E.L.M.A. and the Electrical Association for Women, and will be held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, W.C.2, on February 12th–15th. The lectures will include all aspects of the domestic applications of electricity, special attention being paid to suitable instruction on salesmanship. The course, which is the first of its kind, is open to all women who are interested in the subject. There are no fees, but application for reservation of seats should be made either by the reply postcard which is being circulated or by letter.

BOOKS RECEIVED.

"Mechanical World" Year Book, 1930. (London: Emmott and Co.) Pp. 180. 1s. 6d. net.

"Energiewirtschaft." By Dr. Ing. M. Seidner. (Berlin: Julius Springer.) Pp. vi+133. 9 marks.

"Wechselstrom-Leistungsmessungen." By W. Skirl. (Berlin: Julius Springer.) Pp. vii + 278. 14 marks.

"Starkstromtechnik." By E. von Rziha and J. Seidener. (Berlin: W. Ernst and Sohn.) Pp. xix+1 039. 34 marks.

"Elektrobetrieb in der Textilindustrie." By Dr. Ing. Wilhelm Stiel. (Leipzig: S. Hirzel.) Pp. xiv + 652. 33 marks.

"The Fundamentals of Radio." By R. R. Ramsey. (Bloomington, Indiana: Ramsey Publishing Co.) Pp. xi + 372. $3.50.

"The Book of Electrical Wonders." By Ellison Hawks. (London: G. G. Harrap and Co.) Pp. 316. 7s. 6d. net.

"Electric Overhead Travelling Crane Design." By W. A. Barson. (London: Crosby Lockwood and Son.) Pp. vii+120. 15s. net.

"Selektiv-Schutzeinrichtungen für Hochspannungsanlagen." By M. Walter. (Berlin: R. Oldenbourg.) Pp. vi+128. 7 marks.

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NEWS IN BRIEF.

Theatrical Propaganda for Electrical Development—Electric Boats for Children—The Buenos Ayres Exhibition—Sweden's Electrical Exports.

THE Whitworth Society made a donation of £25 to the College of Technology, Manchester, last July, to provide prizes for the encouragement of promising students preparing for the Whitworth Scholarship examinations. The first awards have now been made to Mr. F. F. Butterworth, 54, John Street, Rochdale, and Mr. F. C. Thornley, "Arnside," Stockport Road, Hyde. The society hopes to make similar donations to other colleges as funds may permit.

Electrically heated water is now available in sleeping cars on the London and North Eastern Railway East Coast night expresses.

Ashton-under-Lyne Electricity Committee is seeking a suitable site for new administrative buildings with facilities for displaying electrical apparatus.

Sunderland tramway employees, who threaten to strike as a protest against a new duty sheet, have accepted the report of the deputation elected to confer with the Tramways Committee.

Bombay Corporation is of opinion that the Government should take steps to prevent the proposed transfer of the agency of the Tata Hydro-Electric Power Supply Co. to an American syndicate.

The first of the police telephone boxes in North London was opened at Wood Green on Monday. It is understood that the Scotland Yard authorities are satisfied with the results of the boxes at Richmond.

Bombay Corporation has approved the Municipal Commissioner's proposal for installing electrically controlled and illuminated clocks on the poles of the Bombay Electric Supply and Tramways Co., Ltd. At present only two such clocks are to be installed.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of January 24th, 1880, recorded that the Post Office authorities had at length adopted the telephone—"the combination of Crossley's transmitter with Bell's receiver having overcome their objections to its use."*

It was proposed to use submarine electric lamps in the operations connected with the raising of the submerged girders of the Tay Bridge.

The possibility of utilising the tides to generate electricity was the subject of a leading article.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of January 27th, 1905, a trial trip on the electrified District Railway, between Mill Hill Park and Whitechapel, was recorded.*

Reference was made to a Diesel-electric boat recently placed in service on the Lake of Geneva.

A deputation from the Commons and Footpaths Preservation Society had just waited upon the Postmaster-General to urge that steps be taken "to prevent the disfigurement of commons and places of natural beauty by the erection of lines of unsightly telegraph posts and wires."

* * *

FIFTEEN years ago, THE ELECTRICIAN *of January 22nd, 1915, stated that so many engineers had volunteered for national service that the War Office could not consider further applications.*

* * *

TEN years ago, in its issue of January 23rd, 1920, THE ELECTRICIAN *gave details of the Electricity (Supply) Act of 1919, and expressed the view that it opened "a new and we believe a prosperous period for the supply industry in this country."*

Exhibits for the British Industrial Exhibition in Argentina, which opens at Buenos Ayres on February 18th will be admitted duty free and carried by the authorities to the show grounds.

Eastbourne Watch Committee has inspected automatic signals erected by the Siemen's and General Electric Railway Signal Co., Ltd., Messrs. Barber and Coleman, and the Forest City Co., Ltd. The Chief Constable is to make inquiries at various towns in which either of the types submitted is in operation. Meantime, consideration of the matter is deferred.

Northampton Parks Committee has decided to adopt electric lighting in the Miller's Meadow playground.

South Shields Health Committee has asked the Medical Officer to consult with the Borough Electrical Engineer on the question of heating the discharge block and laundry of the hospital.

London County Council Parks Committee recommends the Council to grant a licence to Messrs. T. and T. Maxwell to hire out electrically driven boats for children on some of the shallow lakes in parks.

The West Wilts Electric Light and Power Co. has equipped the mills of the Trowbridge Tyre and Rubber Co. with electrical plant, including two motors of 250 and 150 H.P. respectively. The supply is taken from Bath Corporation's mains.

Exports of electrical machinery from Sweden in the ten months from January to October, 1929, were valued at 26 654 kr. (against 36 692 kr. in the corresponding months of 1928) and exports of telephone and telegraph apparatus during the same period were valued at 11 222 kr. (compared with 11 144 kr.).

The Bell Telephone Co. of Canada proposes during the next five years to instal a quarter of a million telephones in the provinces of Ontario and Quebec, and to spend in those States about £3 200 000 on extension and replacement of plant. The company's investment in plant has increased more than 105%, and is now about £29 000 000. The number of telephone stations has risen by 61·4%. The number of British telephone stations in four years ended January, 1929, increased from 1 251 852 to 1 730 782, or 31%.

Mr. E. Kilburn Scott sends us particulars of a concert arranged by him and held at the Claremont Central Mission, Pentonville, London, N., recently. Amongst the performers was Mr. H. G. Harrison, who, Mr. Kilburn Scott informs us, produces beautiful music on the æola, a modern development of the original concertina. Mr. Kilburn Scott remarks that this concert was, in a sense, a commemoration of the invention of the English concertina by Sir Charles Wheatstone (the inventor of the Wheatstone bridge) about a century ago.

The Electrical Association for Women's play, "Watts in a Home," produced by J. Shannon, will be given at Rudolf Steiner Hall, 33, Park Road, London, N.W.1 (near Baker Street Station), on February 11th at 8 p.m. The play deals mainly with the development of electricity, chiefly in connection with lighting, from 1880 up to the present day. Mr. T. C. Sterndale Bennett will contribute "Songs and Nonsense" to the evening's entertainment. Tickets (ranging in price from 10s. 6d. to 2s. 4d.) from the Box Office at the Hall or from the E.A.W. headquarters.

Sir Andrew Duncan, chairman of the Central Electricity Board, will be one of the speakers at the annual luncheon of the Glasgow and district branch of the Electrical Association for Women, in the Grosvenor Restaurant on January 27th.

Belfast Corporation is advertising for tenders for the building of 50 tramcars. At a recent meeting of Belfast Trades Council, it was stated that better and cheaper tramcars could be built in Belfast than in cross-Channel factories, and that the sending of £100 000 out of the city in the present state of trade would be a huge mistake. The tramway depot works, it was stated, could be sufficiently enlarged to do the work.

Imports into the Irish Free State in November, 1929, included electrical goods valued at £55 933, compared with £73 244 in November, 1928. The value of electrical goods imported from January to November, 1929, inclusive, was £568 855, against £483 247 in the corresponding months of 1928. Re-exports from the I.F.S. in November last included machinery and electrical goods to the value of £32 391, against £10 059, and the same classes of re-exports from January to November, 1929, amounted to £251 288, against £102 019.

In an article by Mr. G. T. Edwards on "Sugar Beet," in the S.W.S. (Shropshire, Worcestershire and Staffordshire Electric Power Co.) House Magazine, it is mentioned that the West Midland Sugar Beet Factory, situated between Kidderminster and Stourport, takes current from the power company's lines, and that, with the continued increase in production per acre and the possibilities that rural electrification holds out for cultivation and tilling, it may become one of the firmly established industries in the company's area.

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THE SOCIAL SIDE

MEMBERS of the editorial and advertisement staffs of THE ELECTRICIAN were the guests of Mr. R. D. Savage at a theatre and cabaret on January 10th when the occasion was

Mrs. Leslie Gamage (extreme left), daughter of Sir Hugo Hirst, with some of the 100 junior employees of the General Electric Co., Ltd., whom she entertained at the Olympia Circus, London.

thought a fitting opportunity to present to Mr. Bernard C. Holding an inscribed cigarette case as a mark of esteem and a souvenir of his association with the paper as Editor.

At a dinner given to the editorial and advertisement staffs of "The Chemical Age" last week, at the Rendezvous Restaurant, the toast of "Benn Brothers' Jubilee Year" was proposed by Mr. L. J. Moolenaar, who referred to the firm's great past and still greater future, and acknowledged by Mr. F. E. Hamer. During the evening Mr. B. Fullman, who has accepted an appointment on the Non-Ferrous Metal Research Association, was presented with a handsome silver Waterman fountain pen, in case, bearing the inscription "B. Fullman, B.Sc., A.I.C., from his colleagues on the C.A., January, 1930."

The seventh annual G.E.C. Junior Social was held on January 3rd, in the Lecture Hall, Magnet House, when nearly 200 members of the Junior staff were entertained by the committee of the Social and Athletic Club and the directors of the G.E.C. Dancing and singing, interspersed with games and refreshments, provided a most enjoyable programme, which was thoroughly appreciated by all. The dancing competition for prizes presented by Mrs. L. C. Gamage was keenly contested, and the lucky winners had to exercise all their prowess to achieve success in what in any other sporting circle would have been called a close fight. The evening owed much of its success to the hard work of Mr. E. A. Joyce.

The directors of the Stearn Electric Co., Ltd., entertained their sales force to a dinner at the Holborn Restaurant on January 10th. Among those present were Sir Maxwell Hicks, chairman; Mr. Bottome, managing director; Mr. Edgecombe, technical director; Mr. Oldman, sales manager; and Mr. Pollock, sales organiser (Messrs. Maxwell Hicks and Co.). Sir Maxwell Hicks, in the course of his address, expressed the view that in his opinion the commercial problem of this country did not lie in production, but in selling. He reminded the company present that it was their duty to carry on the life-work of the founder of the firm—Mr. Charles H. Stearn—who, along with the late Sir Joseph Swan, was responsible for presenting to the world the gift of modern electric light.

The month of January has many inseparable associations, and one that is eagerly looked forward to by the members of the staff of Ferguson, Pailin, Ltd., Manchester, is the annual party given by the company, this year held on January 11th, in the company's dining rooms. The success of such an event depends in no small measure on a good beginning and an excellent tea was served to the 350 guests. After tea a talented troupe gave an exhibition of acrobatic and character dancing. The guests spent the remainder of the evening in dancing, with the exception of an interlude, during which Mr. George Pailin produced one of his inimitable farces—a pantomime based on the story of "Dick Whittington"—which provoked an abundance of merriment among both players and guests. The function terminated at 11.30 p.m. and as on previous occasions Mr. Samuel Ferguson and Mr. George Pailin presided.

PERSONAL.

MR. C. E. D. Greenhalgh has been appointed electrical engineer to Ilkley U.D.C.

Lord Gainford, vice-chairman of the B.B.C., celebrated his 70th birthday on January 17th.

Mr. R. F. Dixon, late manager of the Mansfield Tramway Co., has been presented with a gold repeating watch by the members of the Tramwaymen's Social Club, of which he was the founder nine years ago and President.

In connection with the notice which appeared on page 42 of our January 10th issue concerning the late Mr. J. W. Willmot, we are asked to point out that the surname should have appeared as above and not as formally printed.

Mr. Lorcan William Kennan, a student of Dublin, apprenticed to Mr. A. G. Bruty, has obtained the silver medal offered by the City and Guilds of London Institute, the gold medal and £20 money prize of the Electrical Contractors' Association, and a scholarship value £25 from the City of Dublin Technical Schools.

Epsom Electricity Committee has received a request from the electrical engineer, Mr. H. W. Watts, that he be paid in accordance with the scale laid down by the Associated Municipal Electrical Engineers. The salary which would be payable in accordance with such scale would now be £760, but the Committee is not prepared to recommend the Council to adopt the scale referred to. Members of the Committee, nevertheless, feel that the exceptional development of the electricity undertaking which has taken place since Mr. Watts was appointed in 1925 should be recognised by an addition to his salary, and recommend that from April 1st next it be increased from £600 to £700 per annum.

In addition to his portrait in oils presented by the staff of his department, Mr. R. A. Chattock, who has retired from the position of city electrical engineer to Birmingham Corporation, has been the recipient of further gifts. The chief officials of all departments of the Corporation have given him a handsome service of Georgian glassware. Mr. Jennings presided at a luncheon and made the presentation on behalf of the City's officials. The members of the Electric Supply Committee have also entertained Mr. Chattock at dinner Councillor Beale presiding, and presenting him with a silver fruit dish, subscribed for by the members of the Committee, together with an illuminated minute of appreciation of Mr. Chattock's services during the past 26 years.

The funeral of Dr. S. Z. de Ferranti took place on January 17th, at the Hampstead Cemetery. Father Reardon officiated. The chief mourners were Mrs. S. Z. de Ferranti (widow), Mr. and Mrs. Vincent Z. de Ferranti, Mr. Denis Z. de Ferranti, Mr. and Mrs. Pyecroft, Dr. and Mrs. Orde, Miss Yvonne de Ferranti, Mr. Castelnau, Mr. M. Z. de Ferranti, and Mr. T. O. Ince. Others present included:—Sir Andrew Duncan and Mr. Archibald Page (Central Electricity Board), Mr. T. Wilmshurst (Electricity Commissioners), Mr. Ll. B. Atkinson (Royal Society of Arts), Dr. F. E. Smith (Royal Society), Colonel R. E. Crompton, Colonel Sir T. F. Purves and Mr. P. F. Rowell, Mr. D. N. Dunlop, Lieutenant-Colonel W. A. Vignoles, Mr. Hirst, Mr. A. C. Cramb, Mr. Nicholls Moore, Mrs. Hammer and Miss Haslett (Electrical Association for Women), Mr. Pendred, Mr. H. W. Kolle, Mr. Seetham, Mr. R. H. Fox, Mr. T. E. Bakker (The Hague), Mr. J. Christie, Mr. Addenbrook, Mr. F. Bailey, Mr. G. W. Partridge, Major Thomas, Major R. W. Cooper, Mr. A. M. Sillar, Mr. and Mrs. A. E. Hadley, Admiral Sir Edward Charlton, Mr. Mordey, Colonel Behrand, Mr. and Mrs. H. C. Lamb, Mr. R. A. Hopkinson, Professor W. C. Clinton, Captain J. H. Donaldson, Mr. V. Watlington, Mr. C. Rodgers, Mr. R. P. Wilson, Mr. Sanderford, Mr. and Mrs. Merz, Mr. J. R. Beard, Mr. C. P. Sparks, Captain A. C. Sparks, Mr. G. H. Lepper (THE ELECTRICIAN), Mr. W. E. Warrilow, Mr. L. S. Morshead, Mr. Schofield, Mr. A. Hall, Mr. Davies, Mr. Bass, Mr. Tyldesly, and representatives of the workpeople. A memorial service for Dr. de Ferranti was held at Manchester at the same hour, and was attended by 1 500 people from the Ferranti works at Hollinwood, Lancs.

Obituary.

MR. BERNARD SANKEY, at Johannesburg, South Africa on January 12th. He was from 1906 to 1912 borough electrical engineer at Whitehaven and left that town to accept an appointment in South Africa. He subsequently became general manager of the Johannesburg Electricity Department, and rose to become President of the South African Institute of Electrical Engineers.

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THE COAL BILL.

Objections Raised by Industrial Associations—Views of the F.B.I.

IN view of the close association of the electrical industry with coal the following views on the Coal Mines Bill are of interest :—

On December 12th, 1929, the Federation of British Industries addressed to the Prime Minister a request for delay in taking the Second Reading of the Coal Mines Bill in the House of Commons on the ground that consumers of coal had had no opportunity of considering a measure vitally affecting their interests, or of communicating any views thereon to the House of Commons or to the Government. This appeal was not effective, and the Second Reading of the Bill was obtained a few days later by a small majority of the House of Commons. The F.B.I. has now had an opportunity of consulting industry in regard to the Bill. Meetings have been held in all the leading industrial districts, and in addition a strong Central Committee representing all the main industries has reviewed the proposals. As a result of this consideration the F.B.I. is in a position to state that the Bill is not only wholly unacceptable to industry, but arouses the gravest apprehensions as to its effect, if ever put into operation, upon the industrial well-being of the country. As the Federation does not concern itself with wages, hours or conditions, the criticisms which it has received do not relate to Part II of the Bill and it does not desire to express opinion thereon.

The Council of the British Engineers' Association has unanimously passed the following resolution :—" The Council of the British Engineers' Association objects to the basis of the Coal Mines Bill, now under consideration, being convinced that Government intervention in the conduct of industry is against the general interests of industry, and in this particular case the Council is extremely apprehensive of its effects on the engineering industry, and fears a further increase of unemployment resulting from a consequential diminution of our exports of manufactured goods."

The Council, in passing this resolution, has been influenced by a sense of the economic absurdity of further shortening the working hours in an industry which admittedly is fighting for its life, and whose only hope lies either in a reduction in costs of production or a commensurate rise in the world level of coal prices. The latter is beyond the control of the coal mining industry of this country, and is unlikely to provide a means of salvation within the time with which practical coal politics need concern itself. It may be regarded as certain that the provisions of the Coal Mines Bill will increase the price of industrial coal, thereby adding to the load borne by the coal-consuming industries, many of which are already struggling under devitalising costs of production and are hard put to it to maintain something considerably less than their pre-war export trade.

Handicapping the British Manufacturer.

The Council of the London Chamber of Commerce has registered an emphatic protest against the Bill, which it considers to be unsound in principle, unpractical in its provisions and damaging in its effects on the trade and commerce of the country as a whole, as well as detrimental to the interests of the private consumer of coal. The Council is opposed, in principle, to any statutory provision for the enforced restriction of output, for the control of supplies, or for the sale of coal at minimum prices. The immediate effect of the Bill will be to raise the cost of coal to the home manufacturer, without any likelihood of a subsequent reduction in price following upon greater efficiency in the industry. On the other hand the Council considers that, with the removal of economic pressure, by the creation of a monopoly and the fixing of prices, a strong incentive towards better organisation in the industry will have been removed. A further point to which the Council desires to draw attention is the probable disastrous effect upon British industry of the marketing proposals, by which coal may be sold abroad at a price below that obtained in this country. The British manufacturer will therefore be further handicapped in order to benefit his foreign competitor and unemployment at home will in consequence be increased.

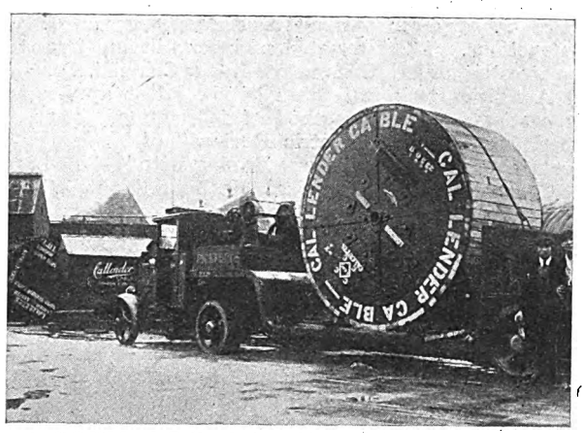
Kettering U.D.C. is applying for a Special Order for extending the area of supply of its electricity undertaking so as to comprise additional parishes in Kettering, Gretton and Oxendon rural districts.

BUSINESS ITEMS.

SUPERLAMP, LTD., announce the opening of a new branch at 11-13, Union Street, Maidstone.

Will the makers of " Sunray " 600 ft. beam torches, or their agents, please communicate with the Editor.

The makers of the " Ideal " electric iron, or their agents are requested to communicate with the Editor.



A DRUM of Callender's cable, weighing 22 tons 5 cwt., leaving the works for shipment abroad.

DAVIES AND JONES, radio and electrical engineers, of Ramsgate, have taken larger premises at 120, King Street.

MR. T. R. CALDICOTT, radio engineer, of 37, Milsom Street, Bath, has disposed of his business to BRISTOL WIRELESS, LTD.

VAC-TRIC, LTD., announce that they have removed to Waterloo Road, North Circular Road, Cricklewood, London, N.W.2.

The Bristol branch of the GENERAL ELECTRIC CO., LTD., has been removed from 81, Victoria Street, to 24, Victoria Street, Bristol. Telephone : Bristol 9550 (three lines).

An agreement has been entered into by Wild-Barfield Electric Furnaces, Ltd., and Gibbons Bros., Ltd., of Dibdale Works, Dudley, for the manufacture by the latter of large " Wild-Barfield " industrial electric furnaces.

With the prospect of a public supply of electricity to Biggar, JAMES STEPHEN AND SONS, of Main Street, are opening an electrical department. An electrical business is also to be opened at Biggar by the TWEEDDALE MOTOR CO., LTD., of Peebles.

We are informed that " Hart " batteries supplied the necessary current for driving the motors and lighting the valves of the Baird television apparatus, the demonstration of which formed such a successful feature at the recent Schoolboys Exhibition held at the Horticultural Hall, London, S.W.1.

An exhibition of electrical apparatus was held by Electrical Distribution of Yorkshire, Ltd., at the Baptist Church Schoolroom, Denholme, from January 14th to 18th. Several manufacturers had stands, and demonstrations of electric cooking etc., were given daily. The exhibition attracted a large number of visitors.

The Trade Commissioner in South Africa (Mr. N. Elmslie) has forwarded to the Department of Overseas Trade copies of the Electricity Supply Regulations for the City of Cape Town and the Municipality of Port Elizabeth. Copies of the regulations are available for loan to British firms, at the offices of the Department, 35, Old Queen Street, London, S.W.1.

We are advised that Nutter, Son and Edge, Cromford House, Cromford Court, Manchester, by arrangement have ceased to represented the FOSTER ENGINEERING CO., LTD., Morden Works, Wimbledon, London, S.W.19, in the Manchester area. Mr. F. Harrison, late of the British Thomson-Houston Co., Ltd., Sheffield, will act in the future as branch manager at 13, Albert Place, Bridge Street, Manchester.

VICKERS-ARMSTRONGS, LTD., Barrow, have secured the order for two P. and O. ships. The vessels will be propelled by turbo-electric machinery manufactured by the BRITISH THOMSON-HOUSTON CO., of Rugby, acting in collaboration with Vickers-Armstrongs, Ltd. The boilers will be of the latest high-pressure type designed by Yarrow and Co., the boilers for one ship being built by Yarrow, and for the second ship by Vickers-Armstrongs.

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FABRICATED STEEL.

Rolled Steel in Electrical Machine Construction—Structural Steel Welding.

THE fabricated steel alternative to costly castings has been adopted not only in America, by the General Electric Co. and the Westinghouse Co., but on the Continent and in conservative Britain the newer development has abundantly proved itself. All the leading manufacturers of electrical machinery in this country are making ever-increasing use of welded constructions. The interested engineer will find from time to time arresting descriptions in the home, Colonial, Continental, and American technical press of the latest applications of this casting-substitute method of fabrication. Thus, in the (American) "General Electric Review" of November, 1929, there are two articles, the one dealing with "Rolled Steel in the Construction of Electrical Machines," the other with "Structural Steel Welding," each being a reprint of a paper delivered before the World Engineering Congress, held at Tokio, October 29th to November 7th, 1929. The articles are well illustrated, the former showing typical stator frames, rotor spiders, upper and lower brackets of a vertical water-wheel alternator, and a hydraulic combined brake and jack, while the examples of structural work include several many-storied buildings. It is well that interested parties should realise that there are pros and cons to consider in this matter of welded steel versus castings. While the innovation has been more than justified in the majority of cases brought prominently before the engineering public, it would be most unwise for the layman in these matters to conclude off-hand that each and every occasion calls for the change. Cases have to be adjudged upon their merits. For the best results to be secured it is necessary to be in the position to decide intelligently for or against. Necessarily highly-complicated shapes, especially where it is a standard component or one in frequent request, are often best negotiated in the cast form. This may be all the more advisable where, in addition, mating conditions are exacting and strict interchangeability is a front rank consideration. It has also to be remembered that in many instances production costs as such show but little difference either way. The great advantages gained under favourable conditions are that patterns and core-boxes, and with them the necessity for storage of same, are eliminated, that weights are reduced and tensile strength increased, that shipping and transport limits are more readily met, and that the largely incalculable but frequently most serious casting strains are obviated.

While it is doubtless impossible to fix rules which are of universal application, the foregoing at least may be regarded as pointers aiding decision. Many factors enter into the expression to be solved, but these should not be overlooked.

E.H.T. DETECTORS.

Simple Apparatus for Use with Overhead Transmission Lines.

TRANSMISSION engineers may be interested to learn that Oswald Record and Co., of 17, Victoria Street, London, S.W.1, are acting as agents in Great Britain for the "Safety First" h.t. detector (Prof. Zipp system) which is manufactured by the Land and Sea Cable Works. This high tension indicator serves for ascertaining without danger whether or not the conductor of an a.c. line is alive. Its operation is based on the principle of displacement currents, and we understand it consists essentially of a condenser and a current indicator mounted in series. The condenser is tested under double the maximum tension for which the indicator is to be used. A Neon gas tube, mounted inside a strong glass tube, is used as current indicator. The narrow part of the vacuum tube is visible through a slot in the ebonite tube which forms the main portion of the device; a metal hook is provided at one end. The h.t. indicators are supplied with one condenser cell for a maximum tension up to 5 000 V, with two for a maximum of 10 000 V and with three for a maximum voltage of 15 000. The length of the ebonite tube thus varies according to the working tension.

The apparatus is used in the following manner:—The end remote from the hook is carefully connected to an earth wire, after which the hook is connected with the conductor to be tested. If the tube lights up the line is shown to be under tension. The tube begins to light up at about one-fifth of the maximum working tension.

WESTERN CENTRE I.E.E.

The Annual Dinner—The Electrical Industry and Coal.

COL. Sir Thomas Fortune Purves, the President, was the guest of honour at the annual dinner of the Western Centre of the I.E.E., held at the Royal Hotel, Cardiff, on January 13th, with Mr. Sidney B. Haslam, Chairman of the Centre, in the chair.

Alderman William Walker, in submitting the toast of "The Institution of Electrical Engineers," commented upon the fact that this Cardiff gathering was the first centre dinner at which he had seen women in attendance.

Col. Sir Thomas F. Purves, in reply, acknowledged the work which was being done by the Western Centre. The success of the centre showed very pointedly that London was not the only fountain of wisdom of the institution.

The toast of "Kindred Societies and Guests" was submitted by Mr. C. G. Morley New, the second past chairman of the Centre.

Principal George Knox, responding, commented upon the remarkable progress made by the electrical industry in a comparatively short time. They were indebted to the electrical engineer for some of the most promising things in life.

Sir Felix Pole, who also responded, said that whilst general manager of the Great Western Railway Co. he endeavoured to look after the transport interests and welfare of South Wales, and was always in Cardiff or elsewhere. With that experience he wanted, when he took over his new appointment as chairman of the Associated Electrical Industries, Ltd., to look after a little bit of electrical development in South Wales, but he was horrified to find that the representatives of the three companies which were operating the electrical industry in South Wales were sometimes taking their orders to what he might term overseas. He should have thought that South Wales had suffered enough from foreign competition without anyone daring to place orders for goods other than in South Wales.

He appealed to everybody in South Wales to support home industries. When he was at Paddington he fought many battles for South Wales, especially in the placing of orders for steel. He appreciated that every ton of steel rails made in South Wales provided employment, and he appealed to the electrical industry to give South Wales as many orders as possible. Whatever the position of other industries, he had discovered that the electrical industry in this country was up-to-date and efficient, and could claim to give the highest value per unit of price and capacity of any country in the world. He had great faith in the future development of the industry.

Other toasts honoured included "The Ladies," proposed by Mr. J. W. Beauchamp and responded to by Mrs. D. Watts-Morgan and Mrs. Morley New; "The Land We Live In," proposed by the Chairman and replied to by Brigadier-Gen. C. G. Bruce, and that of "The Chairman," proposed by Mr. Walter J. Bache.

N.E. COAST CARNIVAL.

Over a Thousand Guests to Attend E.D.A. Ball—Many Prizes Offered.

READERS in the North-East Area will be pleased to hear that the second electrical carnival, arranged by the British Electrical Development Association in Newcastle-on-Tyne, will be held in the Oxford Galleries, New Bridge Street, Newcastle-on-Tyne, on Friday, February 14th, 1930, when, at this early stage, one thousand guests are assured. The function promises to be even better than that held last year, and on this occasion the proceeds will be allocated to the Electrical Trades Benevolent Institution and the Institution of Electrical Engineers Benevolent Fund. A very large range of prizes is already to hand, provided very generously by various manufacturers throughout the country. These will be awarded to the winners of the various novelty dances, treasure hunts, holders of lucky programme numbers, etc., arranged for that night. Tickets (5s. each) may be obtained from the Area Officer, E.D.A. North East Area, Carliol House, Newcastle-upon-Tyne.

Portsmouth Electricity Committee has accepted a tender amounting to £3 985 6s. for the erection of a steel-framed switch house, and tenders aggregating £961 for the erection of three sub-stations.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

SUTTON COLDFIELD CORPORATION.—Manufacture and supply of paper-insulated, lead sheathed, double steel tape armoured cables. Specification, etc., from Mr. Thos. Bloore, borough electrical engineer, Electricity Works, Riland Road, Sutton Coldfield; deposit £1 1s.

COMMISSIONERS OF H.M. WORKS, January 24th.—Erection of submarine cable jetty at Dover. Specification, form of contract, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit, £1 1s.

LEEDS GUARDIANS, January 24th.—Electric light installation in six children's homes. Specification and form of tender from Mr. J. H. Ford, clerk to the Guardians, 11, South Parade, Leeds.

Supply of Copper Bonds.

LIVERPOOL CORPORATION, January 24th.—Supply of 10 300 copper bonds, 35 in. by 65 in. long. Forms of tender from the City Engineer, Municipal Buildings, Dale Street, Liverpool.

MANCHESTER CORPORATION, January 24th.—Supply of sheet steel neutral earthing cubicles, etc., for power transformers, Cumberland Street sub-station. Specification (No. 261) and form of tender from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ECCLES CORPORATION, January 25th.—Supply of 250 kVA three-phase, oil-cooled transformer, 6 600/400 V, 50 cycles Specification, etc., from the Borough Electrical Engineer. Electricity Works, Cawdor Street, Patricroft, Lancs; deposit £1 1s.

NORWICH CORPORATION, January 28th.—Supply and erection of refrigerating plant at the Isolation Hospital. Specification, etc., from Mr. J. S. Bullough, city engineer, Guildhall, Norwich.

WEST HAM GUARDIANS, January 28th.—Installation of automatic internal telephone exchange at Children's Receiving Homes, Aldersbrook Road, Wanstead, London, E.11. Specification from the clerk, Mr. L. E. Fraquet, Board Room, Union Road, Leytonstone, London, E.11.

CLUTTON RURAL DISTRICT COUNCIL, January 29th.—Electric light installations in 55 houses. Specifications, etc., from the engineer, Mr. J. Wayne-Morgan, 6, Church Road, Whitchurch, Cardiff.

COWDENBEATH CORPORATION, January 29th.—Electrical work in connection with erection of 32 houses at Randolph Street, Cowdenbeath. Specifications, etc., from Mr. C. A. Alexander, burgh surveyor, Town House, Cowdenbeath; deposit £2 2s.

WORSLEY URBAN DISTRICT COUNCIL, January 29th.—Twelve months' supply of electric lamps, etc. Forms of tender from the surveyor, Mr. J. Howard, Town Hall, Walkden.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, January 30th.—Electric lighting installations at a block of tenement buildings in Bethnal Green. Specification, form of tender, etc., from Mr. David J. Keep, town clerk, Town Hall, Cambridge Road, London, E.2; deposit £2 2s. Technical inquiries may be made of Mr. Harold W. Couzens, 9, Old Queen Street, London, S.W.1.

ARMAGH COUNTY EDUCATION COMMITTEE, February 1st.—Electric lighting installation at Armagh New Public Elementary School. Plan and specification can be seen at the office of Mr. J. St. J. Phillips, 16, Donegall Square South, Belfast, or at the Education Offices, Armagh. Tender forms will be supplied.

CENTRAL ELECTRICITY BOARD, February 1st.—Supply and erection of 33 000 V overhead transmission lines in South-East England. Specification (No. S.E.E.—S.L. 3) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1 Charing Cross, London, W.C.2; deposit £2 2s.

CLUTTON GUARDIANS, February 1st.-February 14th.—Installation of electrically-driven forehole pump at the Institution, Temple Cloud, near Bristol. Specification, etc., from Mr. J. Wayne-Morgan, 6, Church Road, Whitchurch, Cardiff, until February 1st; deposit £1.

COWES URBAN DISTRICT COUNCIL, February 4th.—Electrical equipment, including wiring, provision of fittings, etc.; and supply and erection of private generating plant at Northwood House, Cowes, Isle of Wight. Plan of building can be seen at the office of Mr. J. W. Webster, engineer and surveyor, Northwood House, Cowes.

ISLINGTON (LONDON) BOROUGH COUNCIL, February 5th.—Supply of steel tube street lamp columns, with c.i. bases and swan-neck fittings; also supply of lanterns each suitable for containing three 300 W or three 500 W gasfilled lamps. Specifications and tender forms from the Borough Electrical Engineer, 60, Eden Grove, Holloway, London, N.7.

KENSINGTON (LONDON) BOROUGH COUNCIL, February 6th.—Twelve months' supply of street lanterns, lamp fittings, glass and electrical goods, lamp columns, etc. Forms of tender from the town clerk, Mr. Horace Rapson, Town Hall, Kensington, W.8.

INVERNESS DISTRICT BOARD OF CONTROL, February 7th.—Re-wiring of electrical installation at Inverness District Asylum. Specification from Mr. C. A. Grut, Electricity Offices, Waterloo Place, Inverness; deposit £2.

BASINGSTOKE CORPORATION, February 8th.—Supply and erection of two heavy oil engines, each coupled to 800 kW three phase 50 cycle alternator; one set to be ready by September 15th, 1930, and the other by September 15th, 1931. Tenders may be for either set or both sets. Specifications, etc., from Mr. F. Swarbrick, borough electrical engineer, Electricity Works, Brook Street, Basingstoke; deposit £1 1s.

PORTSMOUTH CORPORATION, February 10th.—Twelve months' supplies to the tramways department, including insulating materials, lamps and motor windings (section Q); overhead line materials (section R), etc. Specification and form of tender from Mr. B. Hall, general manager and engineer, Tramways Department, Guildhall, Portsmouth.

RUGBY RURAL DISTRICT COUNCIL, February 10th.—Electric lighting installations in connection with housing schemes: Wolston, 26 houses; Brandon, 12; London Road, Dunchurch, 16; Newton, 8; and Churchover, 12. Plans, etc., from the surveyor, Mr. J. E. Weeks, Temple Street, Rugby.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, February 11th.—Twelve months' supply of cables for street mains and services (tender form E.S.1); lamps (E.S 2), meters (E.S.3), creosoted cable protection boards (E.S.4); plywood meter boards and insulators (E.S.5); ironclad service cutouts (E.S.6); street lighting standards and electric fittings (E.S.7); and creosoted wood service tee boxes (E.S.8). Forms of tender from the Electrical Engineer, 37, High Street, Cheadle, Cheshire.

STOKE-ON-TRENT CORPORATION, February 12th.—Supply of an electric mail van (contract No. 3 001). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

EDMONTON GUARDIANS, February 17th.—Six months' supply of electric lamps, X-ray, light and massage requisites, etc. Forms of tender, etc., from the clerk, Mr. E. Ridley, Board Room, 77, Bridport Road, Edmonton, London, N.18. Stamped addressed envelope to be sent.

HAMMERSMITH (LONDON) BOROUGH COUNCIL, February 26th.—Twelve months' supply of electric lighting sundries, insulated wires, ordinary and prepayment meters, insulating compound; h.t. and l.t., concentric, paper insulated cables, etc. Forms of tender, etc., from the Borough Electrical Engineer, 85, Fulham Palace Road, London, W.6.

Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., January 24th.—Supply of cables and accessories, in connection with Madras improvements. Specifications and forms of tender (£1, not returnable) from the Company's offices, 91, Petty France, Westminster, S.W.1.

NEW ZEALAND POSTS AND TELEGRAPHS, January 28th.—Supply of condensers. (No. P. and T. 151/2 087). (Reference B.X. 6 031.)

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NEW ZEALAND POSTS AND TELEGRAPHS, January 28th.—Supply of three-conductor plugs (No. P. and T. 151/2 056). (Reference B.X. 6 028).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates (Schedule No. C. 533). (Reference B.X. 5 899.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 29th.—Supply of condensers (P. and T. 151/2 087). (Reference B.X. 6 031.)

AUCKLAND MUNICIPALITY, January 30th.—Supply of three 3-ton petrol or electric vehicles, for refuse collection. (Reference A.X. 8 994.)

Bell Receivers for New Zealand.

NEW ZEALAND POSTS AND TELEGRAPHS, January 30th.—Supply of 500 bell receivers (P. and T. No. 151/2 088). (Reference B.X. 6 029.)

DUNEDIN DRAINAGE AND SEWERAGE BOARD, February 1st.—Supply of two centrifugal or propeller pumps, with electric motors and accessories (contract No. 737). (Reference A.X. 8 961.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct-coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

MELBOURNE CITY COUNCIL, February 3rd.—Supply of paper insulated cables (specification No. 1 016). (Reference B.X. 6 077.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 3rd.—Supply of protector blocks (carbon and porcelain). (Reference B.X. 5 948.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 4th.—Friction disc saw, with electric motor, for cutting steel joists and rails (tender No. P.W. 3/46). (Reference A.X. 8 998.)

INDIA STORE DEPARTMENT, February 5th.—Supply of 30 000 wood separators for train lighting cells. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW ZEALAND POSTS AND TELEGRAPHS, February 5th.—Supply and delivery of indication alarm fuses. (Reference B.X. 5 947.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specificationNo. 30/3.) (Reference B.X. 5 844.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T., 151/2 025.) (Reference B.X. 5 955.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, February 13th.—Supply of electric tube butt welding set. (Reference B.X. 6 005.)

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, February 15th.—Supply of 1 771 metric tons of telegraph wire. (Reference A.X. 9 047.)

LOUIS TRIECHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of distribution system (poles, conductors, transformers, meters, sub-station equipment, etc.). (Reference B.X. 6 003.)

LOUIS TREICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of two 60 kW sets, comprising two boilers, one economiser, a steel chimney, two engines, two alternators, and accessories, or, alternatively, two 100 kW sets. (Reference A.X. 8 997).

Telephone Accessories.

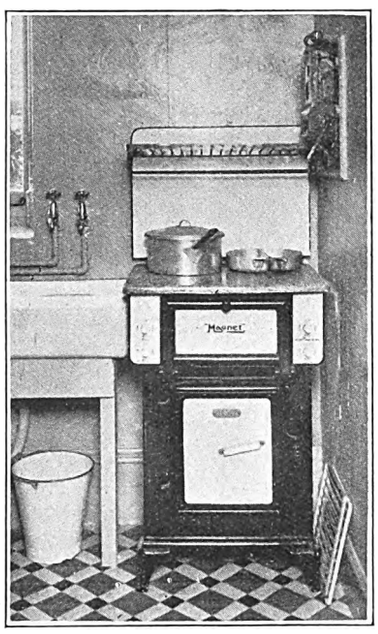
POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (schedule C. 541). (Reference B.X. 5 940.)

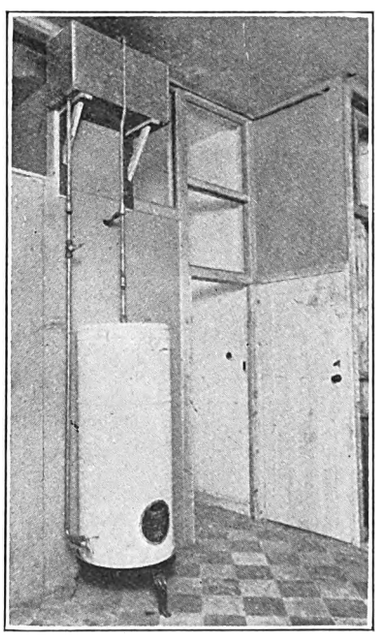
CHILEAN STATE RAILWAYS, February 19th.—Supply of apparatus and material for a signalling service between Maipu and Cartagena stations and between San Fernando and Talca stations. (Reference A.X. 9 008.)

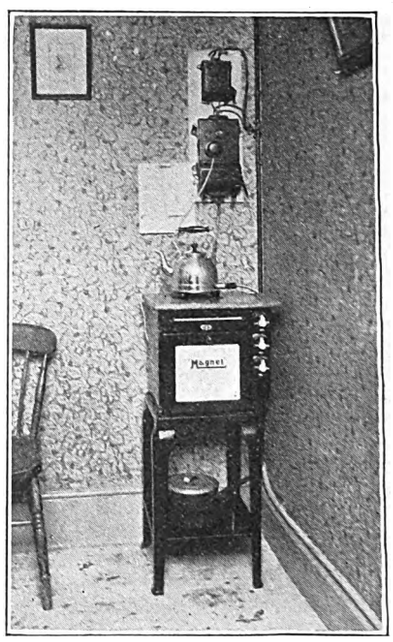
JOHANNESBURG MUNICIPALITY, February 20th.—Supply of switchgear (contract 322). (Reference B.X. 6 044.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of telephone switches. (Reference B.X. 6 018.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Reference B.X. 5 941.)







ENTHUSIASM for electric homes has been shown by a member of the Electrical Association for Women who is the owner of a hitherto unoccupied mansion at Walton-on-Thames. The building has been converted into two sets of 6-roomed, four sets of 4-roomed flats, and a series of seventeen 2-room flats. All have been extensively wired, heating outlets being provided in every room; the larger flats have been equipped with a "Magnet" cooker suitable for four or more persons, while the 2-roomed flats each are fitted with a "Magnet Minor" cooker and 3-pint copper electric kettle with automatic cut-out. The larger flats have their own bathrooms complete with "Magnet" water heaters, while the tenants of the 2-roomed flats have the use of separate bathrooms grouped at each end of the corridors. Hot water for each group of bathrooms is supplied by means of 30-gallon G.E.C. storage water heaters, thermostatically controlled, and the current used by these water heaters, of which there are three, together with that for corridor lighting throughout the building is paid for by the owner. By a special arrangement made with the Walton Electricity Department, the owner of the flats pays to the Council the fixed charge calculated to cover the requirements of the building as a whole, while the individual tenants purchase current as they use it through a slot meter in their own premises. The standard cooker installed in the larger flats is seen on the left with one of the three storage water heaters which serve groups of bathrooms for the smaller flats in the centre. The "Magnet Minor" cooker and electric kettle with which the smaller flats are equipped are shown on the right.

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POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of switchboard plugs (schedule C. 548). (Reference B.X. 5 998.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of magneto and common battery telephones and automatic dials (schedule C. 544). (Reference B.X. 5 999.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 4th.—Supply of automatic exchange power boards (schedule C. 562.) (Reference B.X. 6 072.)

VICTORIAN ELECTRICITY COMMISSION, March 10th (extension of time).—Two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttleton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 11th.—Supply of bells and buzzers (schedule C.552). (Reference B.X. 6 0 3.)

POSTMASTER-GENERAL'S DEPARTMENT, March 24th.—Supply of dial parts (schedule C. 555). (Reference B.X. 6 047.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 25th.—Supply of cordless telephone switchboards (schedule C. 566). (Reference B.X. 6 071.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 1st.—Supply of submarine cable (schedule C. 561). (Reference B.X. 6 070.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o International Construction Co., Ltd., 56, Kingsway, London, W.C.2

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

Tenders Accepted.

WAR OFFICE.—C. Ramsay and Sons, electric light installation, Victoria Barracks, Beverley.

ROTHERHAM CORPORATION.—C. P. Parry, Ltd., two further soot blowers, £460 per set. (Recommended.)

GODALMING T.C.—Tangyes, Ltd., 6-stage turbine pump, belt driven from a 48 B.H.P. oil engine, £698.

DUBLIN CORPORATION.—Haden's Engineering Co., Ltd., electric lighting and power installation at the city abattoir, £1 897.

MANCHESTER CORPORATION.—Ferguson, Pailin, Ltd., 6 600 V feeder extensions; Revo Electric Co., Ltd., electric cookers. (Both recommended.)

ISLINGTON (LONDON) BOROUGH COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., supply of three feeder cubicles and accessories, £3 306.

BARKISLAND URBAN DISTRICT COUNCIL.—Electrical Distribution of Yorkshire, Ltd., public lighting, £3 12s. per lamp per annum, company to supply lamps.

LIVERPOOL CORPORATION.—English Electric Co., Ltd., supply of twelve 750 kVA three-phase 50 period, 6 600/400 V oil-cooled step-down transformers, for sub-stations, £279 each.

HARPENDEN URBAN DISTRICT COUNCIL.—North Metropolitan Electric Power Supply Co., extension of cable to sewage disposal works, and supply of motors, pumps, etc., £357 12s. 8d.

CAPE TOWN CORPORATION.—A. Reyrolle and Co., Ltd., supply of switchgear, £6 741 7s. 6d.; A. Vaux, Ltd., supply of 250 fuses, £331 5s.; British Insulated Cables (S.A.), Ltd., supply of copper and galvanised iron wire, £4 609 5s. (All recommended).

INDIAN STORES DEPARTMENT.—General Electric Co. (India), Ltd., meter-testing equipment, Rs. 4 850; Balmer, Lawrie and Co., Ltd., pumping set, Rs. 2 301; Ingersoll Rand (India), Ltd., compressor sets, Rs. 11 897; Standard Telephones and Cables, Ltd., radio transmitter sets, Rs. 94 826; Greaves, Cotton and Co., Ltd., pumping plant, Rs. 16 219.

HACKNEY (LONDON) BOROUGH COUNCIL.—D.P. Battery Co., Ltd., replacement battery of mains service lorry, 308 Ah capacity at 5-hour rate, £215 12s., credit for old battery, £32. Also tendered: Chloride Electrical Storage Co., Ltd., 290 Ah, £250 3s.; alternative 232 Ah, £272 13s., credit for old battery, £22 3s.; Tudor Accumulator Co., Ltd., 296 Ah, £243 9s. 6d., credit for old battery, £16 15s.

GLASGOW CORPORATION.—Darroch and Espie, electric lighting installation at Shieldhall Hospital, £864 7s. 10d; Kilmarcock Engineering Co., Ltd., brake levers for bogie cars; Hackbridge Cable Co., Ltd., and Standard Telephones and Cables, Ltd., lead covered cable; Hadfields, Ltd., Titan Trackwork Co., Ltd., and Edgar Allen and Co., Ltd., tramway special work. (All recommended.)

BIRKENHEAD CORPORATION.—Ferguson, Pailin, Ltd., supply of feeder panel for Marshall Street sub-station, £69 8s.; George Ellison, supply of four oil circuit breakers, £82 4s. 6d.; General Electric Co., Ltd., transformer cubicle, £101, panel cubicle, £85, and feeder panel, £96. Supply of cables: W. T. Glover and Co., Ltd., £3 214 9s. 6d.; Hackbridge Cable Co., Ltd., £1 405; Macintosh Cable Co., Ltd., £2 257 16s.

MANCHESTER CORPORATION.—Bertram Thomas, extensions to electric main switch; Crompton Parkinson, Ltd., English Electric Co., Ltd., Ferranti, Ltd., and C. A. Parsons and Co., Ltd., static transformers; Chloride Electrical Storage Co., Ltd., replacement battery for electric tower wagon. Electrical installations at Blackley, Newton Heath, Chorlton and Wythenshawe Estates: R. H. Clampett and Co., G. F. Latham, Hall and Stinson, Ltd., and F. L. Napier and Co. Metropolitan Electric Cable and Construction Co., Ltd., electric cables, Longdendale; Forest City Electric Co., Ltd., supply of tramway rail bonds; J. Adams, Ltd., electrical installations at New Moston New School and Levenshulme High School for Girls; A. E. Sudlow and Co., electric lighting installations at Varna Street Infants' School and St. Mary's Road Municipal School.

STOKER EQUIPMENT FOR BATTERSEA.

Order Placed for First Section—The Plant in Brief.

IN view of the prominence which the daily Press has recently given to the subject of smokeless combustion—referring more particularly to the proposed Battersea station—it is interesting to note that the engineers of the London Power Co. have placed an order with the Taylor Stoker Co., Ltd., of Bush House, Aldwych, London, W.C., for the complete fuel-burning equipment for the first section of this station to be constructed. This equipment comprises six Taylor multiple retort underfeed stokers, each twenty retorts wide and forty-nine tuyeres long. These stokers will be equipped with rotary ash discharge mechanism which consists of a deep pocket at the rear of the stoker proper, at the bottom of which are two large, slowly revolving crusher rolls. Preheated air of 330 deg. F. will be used. The stokers will fire six boilers, and each unit will be capable of producing 350 000 lb. of steam per hour continuously at 600 lb. pressure. Any pair of these units will supply sufficient steam for one 65 000 kW turbine at full load.

The new "Kraftwerk-West" of the Berlin Electric Co., is to be supplied with eight equipments of similar design and steam output.

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WORK IN PROSPECT.

ABINGDON.—Housing scheme (50). Particulars, the Borough Surveyor.

BARNSLEY.—School (640 places). Particulars, Mr. A. D. Mason.

BARNSLEY.—Town Hall to cost £130 000. Particulars, the Borough Surveyor.

BEXLEY HEATH.—Church and hall. Particulars, Mr. G. E. Burgess, Dartford.

BIRKENHEAD.—School, Rock Ferry. Particulars, Mr. R. W. Johnston.

CAMBRIDGE. Extensions, Boys' school, to cost £5 800. Particulars, the County Architect, Cambridge.

CREWE.—Additional 45 houses. Particulars, the Borough Surveyor.

CRONBERRY.—School. Particulars, the Clerk, Ayr.

DIDCOT.—Senior school (300 places). Particulars, Mr. W. C. F. Anderson, Reading.

DUMFRIES.—Town Hall to cost £45 000. Particulars, Mr. James Carruthers, Glasgow.

HAYDOCK.—School to cost £36 000. Particulars, the County Architect. Preston.

HEREFORD.—Housing scheme (40). Particulars, Bettington and Son, Palace Chambers.

HOYLAND NETHER.—School (250 places). Particulars, the Clerk, County Hall, Wakefield.

NEWSOME (YORKS).—Housing scheme (115). Particulars, the Surveyor.

PAULTON.—School extensions. Particulars, Mr. A. J. Pictor, 14, Queens Square, Bath.

PRESTON.—Houses. Particulars, P. A. Baines and Sons, and Mr. A. Swarbrick.

SIDCUP.—School (250 places). Particulars, Mr. E. S. Davies, director of education, Maidstone.

SLOUGH.—Block of factories, for Slough Estates, Ltd.

ST. HELENS.—Houses. Particulars, Messrs. Chappell and Sons, Ltd., Swinton, Manchester.

TAMWORTH.—Houses (90). Particulars, Eadie Towers and Co., Wolverhampton.

TRURO.—Extensions, Royal Cornwall Infirmary. Particulars, Messrs. Cowell, Drewitt and Wheatley, Mansion House.

TUNBRIDGE WELLS.—School to cost £24 000. Particulars, the Director of Education.

WAKEFIELD.—150 all-electric houses on the Eastern Estate. Particulars, the City Architect.

WATFORD.—Additional housing scheme (600). Particulars, from Borough Surveyor.

WHITEHAVEN.—School. Particulars, the Borough Engineer.

WINDSOR.—Houses (26). Particulars, Cain and Co., Hounslow.

WISBECH.—Post office and telephone exchange for the Commissioner of Works. Particulars, Contracts Branch, H.M. Office of Works, King Charles Street, S.W.1.

WORKINGTON.—New maternity ward at the Infirmary. Particulars, Mr. H. Oldfield.

WREXHAM.—Housing scheme (160). Particulars, Mr. J. H. Edwards, Imperial Buildings.

WREXHAM.—Houses. Particulars, Mr. T. Heywood, Ellesmere Port; Mr. Alun Edwards, Ffrith; Griffiths Bros., Rhos; Mr. Aneurin Roberts, Rhos; Mr. O. D. Stephens, Bersham; and additional 140 houses. Particulars, the Surveyor.

CANADIAN TELEPHONE DEVELOPMENTS.

THE Bell Telephone Company of Canada is contructing in Ontario, at a cost of $1 500 000, a new line from Oshawa to Sudbury, via North Bay. The line, about 300 miles long, will be operated on the "wired wireless" principle, making it possible for eight persons to converse at one time over the same pair of wires, or for two people to talk and 40 people to be in communication on teletype or telegraph simultaneously.

Construction will be completed in a year from the beginning of operations, and the line will handle not only the increasing telephone business between Toronto and the northern Ontario mining districts, but will be a link in the Atlantic-Pacific system. On the completion of this transcontinental project, now being brought into existence by co-operation between the Bell Telephone Company and the various telephone systems in the Maritime Provinces and Western Canada, persons in Halifax will be able to talk to Vancouver over an all-Canadian route.

IMPORT TARIFFS.

New Duties Proposed under Revised Egyptian Customs Tariff.

THE modified Egyptian Import Tariff, which it is proposed to put into force on February 17th, contains the items set out below. The rates of duty are stated in millièmes, indicated by "m." 1 000 m. equal £E./1=£1 os. 6d. sterling: Electric generators, electric motors and transformers, weighing:—(a) 1 000 kg. and over, 800 m. per 100 kg.; (b) from 50 to 1 000 kg. exclusive, 1 200 m. per 100 kg.; (c) from 10 kg. to 50 kg. exclusive, 1 800 m. per 100 kg.; (d) less than 10 kg., 3 000 m. per 100 kg. Electric locomotives, 400 m. per 100 kg. Electric batteries and parts, 12% *ad val.*. Electric accumulators and parts, 1 800 m. per 100 kg. Magnetos and sparking apparatus for internal-combustion motors, 120 m. per kg. Electric fans, 12% *ad. val.* Arc lamps, and metallic parts, 50 m. per kg. Electric lamps and valves: (a) For wireless, 300 m. per kg.; (b) Other, 150 m. per kg. Telegraphic and telephonic apparatus of all kinds, including wireless telephone and wireless telegraph apparatus, 12% *ad. val.* Electric signalling and safety apparatus for railway and other purposes, 10% *ad. val.* Electro-medical apparatus, including that used for dentistry, 8% *ad. val.* Electric heating apparatus, electric and electro-technical apparatus for domestic use; (a) Electric irons, and detached parts thereof, 15% *ad. val.*; (b) Other, 15% *ad val.* Insulated wire and cables for electric use: (a) Submarine and underground cables, 500 m. per 100 kg.; (b) Other, 15 m. per kg. Parts and articles of carbon, agglomerated or baked, for electrical use, 45 m. per kg. Parts, mainly for electrical use, made of insulating materials, not specially mentioned in the Tariff: (a) Of porcelain, faience, earthenware, stoneware, glass and the like: (1) Weighing 100 grms. or more each, 5 m. per kg.; (2) Weighing less than 100 grms. each, 12 m. per kg.; (b) Of asbestos or asbestos board, stabilite, mica, micanite, meglionite, ambroine, bakelite, rubber, ebonite, vulcanised fibre, galalith and other similar materials, without parts of metal or other materials, 35 m. per kg.; (c) Insulating tubes, and joints and junction boxes for insulating tubes: (1) Without metallic covering, 45 m. per kg.; (2) Other, 12 m. per kg. Parts made of insulating materials combined with parts of metal or other materials fall under the classification of electrical and electro-technical apparatus and parts, upon which the duty is 10% *ad val.*) Electrical and electro-technical apparatus and parts thereof, parts of dynamo-electric machines and apparatus for the application of electricity in general, not elsewhere specified, of any weight, 10% *ad val.* Electric meters and apparatus of all kinds for measuring electricity, 15% *ad. val.*

Australian Tariff Amendments.

The following are further amendments of the Australian Customs Tariff which became operative on November 22nd, 1929. The rates under the British preferential tariff are indicated by (*a*), and those under the general tariff by (*b*), the previous rates being given in parentheses: Electrical fittings wholly or partly of metal, viz.: switches, fuses, and lightning arresters, n.e.i. (*a*) 65% (35%); (*b*) 75% (50%). Regulating, starting and controlling apparatus for electrical purposes, including distributing boards and switchboards, n.e.i. (*a*) 65% (35%); (*b*) 75% (50%). Dynamo-electric machines: a.c. motors, 1 H.P. to 125 H.P. (*a*) £5 each, and in addition 55s. per H.P., or 45% *ad val.*, whichever is the higher (40% each motor over 75 H.P., or 45% up to 75 H.P.), (*b*) £5 each, and in addition 15s. per H.P. or 60%, whichever is the higher (55% each motor over 75 H.P., or 60% up to 75 H.P.). Static transformers, up to 25 kVA (*a*) 50s. per kVA, or 60% (35%), (*b*) 50s. per kVA, 75% (50%); (*a*) over 25 kVA, up to 150 kVA, 25s. per kVA, or 60% (35%); (*b*) 25s. per kVA, or 75% (50%); over 150 kVA up to 500 kVA, (*a*) 15s. per kVA, or 60% (35%), (*b*) 15s. per kVA, or 75% (50%); static transformers n.e.i., including induction coils, (*a*) 60% (35%), (*b*) 75% (50%). Current rectifiers, (*a*) 45% (40% over 75 kW, or 45% up to 75 kW); (*b*) 60% (55% or 60%). Ironclad or moulded switches; ironclad or moulded airbreak switches and fuses combined, up to 60 A, (*a*) 8s. each, or 65%, whichever is the higher (3s. or 45%), (*b*) 10s. or 75% (5s. or 60%); over 60 A, (*a*) 65% (3s. or 45%); (*b*) 75% (5s. or 60%). Dry batteries and cells, up to 1 lb. each, 4d. each (27½%); (*b*) 6d. each (40%); over 1 lb., 7d. each (27½%); (*b*) 10d. each (40%).

The operation of the deferred duty on electrical mining fuses is further postponed to January 1st, 1931.

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ELECTRIC TRACTION.

Three-mile Extension of the Metropolitan Electric Railway.

AN extension of the Metropolitan Railway, about three miles in length, is to be constructed from Preston Road (between Wembley Park and Harrow) to Canons Park, Little Stanmore.

Portsmouth Corporation is to promote a Bill in Parliament to provide for the substitution of trolley vehicle systems for the tramways of the Corporation, with power to the Minister of Transport to authorise further trolley vehicle routes within and outside the city.

Eight stations on the proposed Piccadilly Tube Railway extension from Finsbury Park to Cockfosters will be at Manor House Corner, Turnpike Lane, Wood Green, Brownlow Road (Bounds Green Road), Arno's Grove (Bowes Road), Southgate Chase Side, East Barnet Road, and Cockfosters. It is hoped to obtain Parliamentary sanction by the end of July, and the work on the extension will then begin.

London County Council has allocated £5 000 for the construction of an experimental tramcar of a new pattern. Several different designs have been suggested by experts, and one of the suggestions is that vestibule ends should be provided as an integral part of the car, to accommodate about 20 more standing passengers than those carried on the present cars, while another change proposed is that entrances should be at the ends of cars and not at the sides, so as to avoid passing vehicles.

Torquay Corporation has resolved to sanction, under certain conditions, the substitution by the Tramways Co. of trolley buses for the existing tramcars. One of the principal factors leading to this decision is the congestion which is said to be caused by the trams in the main streets. The agreement with the Company provides that the Corporation shall have the option at the expiration of 14 years, and at the end of every subsequent seventh year, of purchasing the undertaking, and all the electrical energy has to be taken from the Corporation's works.

Of the total expenditure of £4 300 000 authorised by the Southern Railway directors for the present year, nearly £600 000 is to be devoted to electrification. The sections of line to be electrified this year, in addition to the Reigate, Redhill, Brighton, and Worthing routes already announced, are Twickenham to Windsor (27 miles), and Dartford to Gravesend (14 miles). Work on the long section between Twickenham and Windsor will cost £366 000, and the Dartford scheme £159 500.

METAL AND CHEMICAL PRICES.

TUESDAY, January 21st.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£77 0 0	5s. 0d.	—
Electro Wirebars	,,	£83 15 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	,,	11⅛d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	18.2½d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	—
Foreign or Colonial	,,	£21 10 0	—	2s. 6d.
Tin—				—
Ingot	per ton	£174 0 0	—	£1 0 0
Wire, basis	per lb.	2s. 4d.	—	¼d.
Aluminium Ingots	per ton	£95 0 0*	—	—
Spelter	,,	£19 10 0	2s. 6d.	—
Mercury	per bottle	£23 5 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2½d.
Sodium Bichromate—Per lb., 3½d.
Rubber—Para fine, 8½d.; plantation, 1st latex, 7⅜d.

. The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

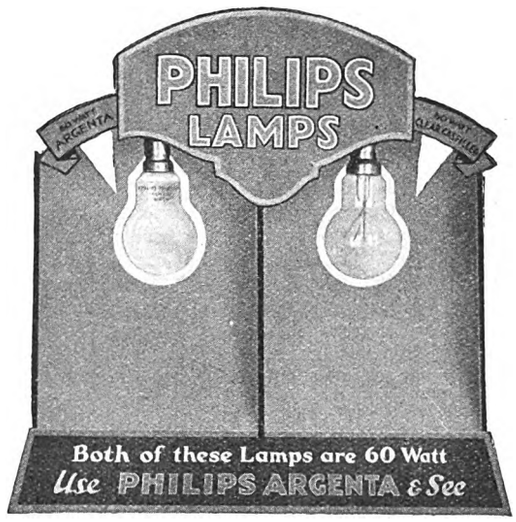
According to James Forster and Co., the lead market has been quiet, and closing prices on January 17th were £21 10s. for January, £21 11s. 3d. for February, March and April, or again unchanged on the week.

TRADE PUBLICATIONS.

THE current stock list of HIGGS MOTORS, LTD., Witton, Birmingham, has been received.

The current stock list of the A.E.G. ELECTRIC LTD., 131, Victoria Street, London, S.W.1, is now available.

The current stock list of WOLF AND MORGAN, LTD., 66, Victoria Street, London, S.W.1, has been sent to us.



A highly decorative cardboard stand which has been designed to demonstrate the superiority of the opal lamp over the clear gasfilled lamp for most home lighting purposes. This publicity material is offered free by Philips Lamps Ltd.

"Hot Water in the Home" is the title given to a new publication by SADIA, LTD., 22, Newman Street, London, W.1.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have issued list No. 181 dealing with "Argenta" lamps.

Two new illumination glassware lists have been published by W. E. BEARDSALL AND CO., LTD., 5, Victoria Bridge, Manchester.

Publication P.F.66, dealing with "Copperweld" earthing rods, has been published by BRITISH INSULATED CABLES, LTD., Prescot, Lancs.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have issued a new edition of list No. 192L dealing with "Arlita" lamps.

Catalogue No. 160, dealing with street lighting, has been published by HOLOPHANE, LTD., Elverton Street, Vincent Square, London, S.W.1.

Colour folder S.L. 5277, relative to stage lighting effects has been issued by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

The ELECTRICAL EQUIPMENT AND CARBON CO., LTD., 107, New Oxford Street, London, W.C.1, has published list No. M.17 entitled "Elm Mercury Rectifiers."

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., has issued leaflet No. 6 620, dealing with components for the "Magic Four" receiver.

ALLOY WELDING PROCESSES, LTD., Ferry Lane Works, Forest Road, London, E.17, have sent us a copy of Bulletin No. 55 entitled the "A. W. P. Hire Service System."

A well-produced leaflet entitled "Some Thoughts on Automatic Control for A.C. Motors," has been produced by BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.

The 1930 catalogue of RUNBAKEN MOTOR AND ELECTRICAL ACCESSORIES, LTD., Magneto Works, Ardwick, Manchester, has been received and this includes a number of new accessories.

The Callender C.T.S. wiring system is dealt with in a special publication just issued by CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4.

FRANCIS POLDEN AND CO., LTD., 56, Cannon Street, London, E.C.4, have issued in leaflet form illustrations of a number of different classes of buildings in which they have put complete installations, including the Olympia, London; Bawdsey Manor, Felixstowe; Denham Place, Denham; Walton Hall, Warrington; and the National Safe Deposit building.

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ELECTRICITY SUPPLY.

Rural Supplies at Omagh—North Wales Co's Rural Scheme—Sale of Monmouth Undertaking—Biggar Council Adopts Electric Street Lighting—Hull's Change-over Proposals—Unemployment Relief Grants for Electrical Works.

STOKE NEWINGTON (London) Electricity Committee is to extend cables at a cost of £1 353.

Hackney (London) Electricity Committee seeks sanction to borrow £5 000 for the free-wired prepayment scheme.

Tunbridge Wells T.C. has applied to the Commissioners for loans of £13 201 for mains extensions, and £1 514 for sub-station pillars and equipment.

Ballymoney ratepayers have decided by 90 votes to 78 against purchase by the U.D.C. of the undertaking of the Ballymoney Light and Power Co.

Marlborough T.C. having failed to obtain a supply of electricity in bulk from Swindon Corporation, is negotiating for a supply from the Wessex Electricity Co.

Omagh R.D.C. has decided to give its consent to the proposed Order which will enable the Urban Council to supply supplies of electricity to consumers in the rural area.

Bradford Electricity Committee recommends the provision of additional feeders, at a cost of £6 250, in connection with the substitution of railless vehicles for trams on the Allerton route.

The Generating Station Committee of the Stalybridge, Hyde, Moseley and Dukinfield Joint Board has granted the Central Electricity Board a site for a new sub-station at Hartshead, Stalybridge.

The North Wales Power Co. has applied under the Development Act for grants in aid of a scheme for the completion of the transmission scheme to place electricity supply within reach of every part of rural North Wales.

Colchester Corporation has applied for a loan of £7 107 for the proposed line from the generating station to Ardleigh. This sum includes £1 501 13s. 6d. for e.h.t. cables, £4·628 12s.6d. for e.h.t. overhead lines, and £429 for a transformer and switchgear.

Consent has been given by Darlington R.D.C. to an application by the Corporation to extend its supply of electricity to a number of parishes in the rural area. Under the proposed Order, the maximum price is to be 10d. per unit, but it is stated that the actual charge will be about 6d.

Sanction has been received by Winchester Corporation to a loan of £2 053, in connection with a supply of electricity to Twyford and Compton. The charges are to be 5d. per kWh for power and 9d. per kWh for any other use.—A supply is to be given to houses which are being erected at St. Martin's Close.

Monmouth T.C, decided last week to sell its electricity supply undertaking to the General Electric Co. The purchase price was stated to be £14 000, the corporation retaining its obligation to discharge the sum still remaining due on loans, which, at the end of the financial year, will be about £3 900.

Burnley Corporation electricity undertaking supplied 198 electric fires to consumers during December last. Heating and domestic appliances connected now amount to 10 024 kW, an increase of 2 446 kW during the past year. The new electricity showrooms disposed during the year of appliances valued at £8 684.

Biggar T.C. has unanimously resolved to adopt electricity in place of gas for public lighting. Terms have been arranged with the Clyde Valley Electrical Power Co. for carrying out the work. A fair response from residents and shopkeepers resulted from a recent canvass by the company to ascertain the probable number of private consumers.

Bacup T.C. has decided to submit schemes for the extensions of electricity mains, involving an expenditure of £10 900, to the Unemployment Grants Committee, as an unemployment relief scheme. Mr. J. Ireland, chairman of the Electricity Committee, states that the expenditure will bring no charge to the rates, as it can be borne by the electricity undertaking.

The Unemployment Grants Committee has notified a grant to Sunderland Corporation of 50% of the interest on approved expenditure out of a loan not exceeding £133 704 for laying electric mains and the erection of electrical apparatus in connection with the corporation's electricity undertaking. It is proposed to raise £99 655 of the loan for 20 years, and £34 059 for seven years.

Hull Electricity Committee has agreed to a 10% reduction of the charge for electricity for power purposes.—The Committee has decided to agree to an application to the Electricity Commission for consent to the changing over of the whole area from d.c. to a.c., so that the change can be carried out as and when convenient to the Corporation, without further application to the Commissioners.

Bexhill T. C. has decided to provide a sub-station at Mount Idol Farm at an estimated cost of £2 757, to extend the h.t. cable at a cost of £1 635, to provide a l.t. feeder, £1 471 15s.10d., and to lay a distributor cable through Mayo Lane to Watermill Lane, £353 6s. 2d. The Electrical Engineer has submitted a scheme for extensions in the north part of the town, including Sidley, at a cost of about £11 500.

Application is to be made by Manchester Electricity Committee to the Electricity Commissioners and to the South-East Lancashire Electricity Advisory Board for sanction to instal the additional boiler plant now required at the Barton station.—The Committee has obtained sanctions to borrow £250 000 for new distributor mains; £6 000 for sub-station building; and £34 000 for sub-station plant.

Rotherham Corporation seeks powers to extend the area for the supply of electricity to parts of the parishes of Ecclesfield and Wentworth, and to exclude such parts from the area of supply of any other undertakings. The Electricity Committee is asking for authority to abstract water from the river Don and the Sheffield and South Yorkshire Navigation, for the purposes of the electricity generating stations.

Birkenhead Electricity Committee has decided to proceed with the provision and laying of 6 600 V mains from Bentinck Street works to South End sub-station, from South End sub-station to New Ferry sub-station, from Borough Road to Bedford Avenue, and from Stanley Road to Gautby Road, the erection of two kiosks and the installation of two 200 kVA transformers, and switchgear in connection with the extensions.

The Central Electricity Board has asked whether Bradford City Council desires to be heard in connection with an application to be made by the Board to the Ministry of Transport for consent to the placing in the city of overhead lines in connection with the Bradford-Kirkstall-Wakefield transmission. It has been decided to endeavour to secure an alteration of the route or to express a desire to be heard on the application.

Mr. J. W. Burr, borough electrical engineer of Swansea, recommends, with a view to relieving unemployment, that works to be put in hand forthwith should include replacement of the existing d.c. distributors and feeders, and the whole of the a.c. mains which are fed through triple concentric cables in the following areas: Swansea, west, £28 050; centre of town, £25 969; Swansea north, £6 435; and Morriston, £7 507. The Electricity Committee has adopted the recommendations.

Crewe T.C. has received from the Electricity Commissioners a suggestion that electricity mains should be laid in any street in which there is a reasonable prospect that within the next three years the annual revenue would defray the additional outgoings, with a view to assisting the Government in dealing with unemployment. The Commissioners have also urged the initiation of schemes of assisted wiring and extended facilities for the hire and purchase of electrical apparatus. The Electricity Committee has instructed the Engineer to prepare a scheme for the laying of a cable in every street in the town not already provided for.

Hastings Electricity Committee has reported to the Town Council on schemes for relief of unemployment, following a communication from the Electricity Commissioners. These deal with laying conduits and with overhead and underground lines, etc., for the Hastings, Bexhill, and extended areas, amounting to £64 912, and the Committee, on being informed that the maximum financial assistance obtainable amounted to 50% of interest on loan (£947 per annum) recommended that the work be carried out. The council has adopted the report.—The Electricity Committee has prepared schemes for extensions in the town, including a feeder for bulk supply to Bexhill at a cost of £37 887.

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COMPANY NEWS.

Little Increased Activity in Electrical Share Market—Allocation of Communications Co's. Shares—Ever Ready Co's. Increasing Sales—Reports and Dividends.

BUSINESS in the market for electrical supply, transport and equipment stocks and shares has not yet shown much increased activity; and few outstanding features are shown by our usual tabular contrast of price quotations.

Radio Corporation of America shares have fallen nearly to 36, which is seven points below the figure of a week ago. Hydro-Electrics are a little lower at under 43, as are also International Holdings at 5½. Cables and Wireless issues still hang fire, and the "B" stock has given way a couple of points to 35½. Eastern Telegraph 3½% per cent. preference stock has recovered a point, and is again 62½.

In the manufacturing section, British Insulated Cables, Callender's Cable and W. T. Henley's ordinary shares have each risen 1s. 3d., to £3 18s. 9d., £3 13s. 9d. and £6 1s. 3d. per share respectively. British Thomson-Houston preference have improved from 22s. 9d. to 23s. 3d. and General Electric "B" preference from 25s. 6d. to 26s. Associated Electrical Industries ordinary are 6d. better at 28s. Ever Ready ordinary have fallen from 18s. 9d. to 18s. 6d., but 7% participating preference are firm at 29..

The principal movement among electricity supply companies' descriptions has been a rise of 3s. 9d. in Bournemouth and Poole ordinary shares, bringing the price up again to the mid-November level of 61s. 3d. Scottish Power Co. ordinary shares are up 1s. to 30s., and London Power Co. 5% debenture stock and Tokyo mortgage sterling bonds are each a point higher at 100 and 93, respectively.

The railway and tramway group makes a good showing, with 2-point rises in a number of instances. British Electric Traction preferred ordinary stock is up from 122½ to 124½, and City and South London ordinary from 67 to 69. Metropolitan ordinary stock has risen from 64 to 66½, and District from 72½ to 74. London Electric ordinary stock is a point higher at 72½, and Underground Electric Rlys. ord. shs. have spurted 1s. 6d., from 22s. to 23s. 6d. Rio de Janeiro Tramway Bonds are a couple of points higher at 85½. Metropolitan District Preference have also risen a point to 80½.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6½	" " C. Cum. Pref. ..	21/-	21/-	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	61/3	57/6	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	48/1½	48/1½	56/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	36/3	36/3	41/6	26/6
8	" " " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	46/3	46/3	68/6	25/9
6	" " " " 6% C.P.	22/6	22/-	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " " 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	89	89	92	80½
—	Hydro Electric Securities ..	42¾	43¾	87	20
—	International Holdings	5½	5⅝	35½	6½
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/6	27/6	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/6	27/6	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	26/6	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	100	99	104	95
10	Melbourne Electric Ord. Stk. ..	170	171	180	150
1/9½	Metro. Elec. Sup. Ord.	37/6	37/6	53/-	24/9
4½	" " " 4½% C.P.	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	28/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	10¾	10¾	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(e)	St. James & P.M. Ord. (£1) ..	25/-	25/-	28/6	23/6
8	Scottish Power Ord.	30/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	25/6	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	93	92	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	61/3	61/3	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	80½	80½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	88½	88½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	122½	152	117
7·67	" " " " 6% Pf. Stk.	125½	125½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/6
5	" " " 5% Cum. Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	77½
5	City & S. London, Cons. Ord. ..	69	67	64	56
4	" 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	72½	71½	75½	42½
4	" " " " 4% Pf. Stk.	72	72	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	50½	50½	65	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	73½	62
5	" " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	66½	64	81	54½
3½	" " " 3½% Pf. Stk. ..	62	62	76	60½
3½	" " " 3½% Deb. ..	67½	67½	73½	67½
5	Met. Dist. Rly. Ord. Stk.	74	72½	77½	58½
4½	" " " 4½% 1st Pref. ..	80½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	85½	83½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	23/6	22/-	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	28/-	27/6	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	78/9	77/6	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	22/9	24/9	19/7
7	" " " 7% Deb.	103½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	73/9	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	21/-
4	" " 1st Mt. Deb. ..	69½	69½	75	68
20	Enfield Cable Works Ord. ..	97/6	97/6	82/-	60/-
7½	" " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	5/-	5/-	15/9	5/-
—	" " 6% C.P.	7/6	7/6	18/9	7/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb. ..	68½	69½	107½	65
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/6	18/9	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	46/3	46/3	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P. ..	26/-	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	120/-	120/-	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord.	25/-	25/-	36/6	24/9
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	24½	24½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	225	225	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	61½	61½	63½	56½
6	" " " 6% Prefd. Stk...	102½	102½	105½	91
1½	" " " Deferred Stk...	25	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	76½	76½	—	—
—	"B" Ord. Stk.	35½	37½	—	—
—	5½% Cum. Pref. Stk. ..	98½	98½	—	—
3½	Eastern 3½% Pref. Stk.	62½	61½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	76	76	80	74½
22	Great Northern Telegraph (£10)	31	30½	43½	26
—	International Teleph. & Teleg. ..	$75	$75	161½	48½
15	Marconi Int. Mar.	46/3	47/6	90/-	16/6
4½	New York Telep. 4½% Mt. Bds...	97½	97½	101	96
12	Oriental Telephone Ord.	56/3	58/9	65/-	42/-
—	Radio Corporation of America ..	36½	43	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	87½	87½	89½	82
4	Western Tel. 4% Deb. Stk. ..	77	77	82	76

(a) 19⅝d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. (g) 2s 2⅝d. per share.

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Directors' Reports, etc.

ATLAS ELECTRIC AND GENERAL TRUST.—Intm. div. of 2%, less tax (same as last year), will be payable on Feb. 15.

ALLIED POWER AND LIGHT CO.—Qrtrly. divs. of $1·25 p. sh. on $5 1st pfd. and 75 c. p. sh. on $3 pref. will be payable on Feb. 15.

DELHI ELECTRIC SUPPLY AND TRACTION CO., LTD.—Intm. div. of 4%, less tax (same as last year), will be payable on Jan. 31.

S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—Transfer books and register of members of 7½% cum. pref. shs. are closed until Jan. 31, inclusive, preparatory to paymt. of half yearly div.

ELIN AKTIENGESELLSCHAFT FUR ELEKTRISCHE INDUSTRIE, VIENNA.—Coupons falling due on Jan. 31 off 7½% 25-year bonds should be presented for payment at the offices of Messrs. Helbert, Wagg and Co., Ltd., 41, Threadneedle Street, London, E.C.2. Coupons to be left three clear days.

NORTH AMERICAN EDISON CO.—An issue of $25 000 000 (£5 000 000) 40-year 5% debs. of North American Edison Co. was made in New York on Jan. 15. The debs. were priced at 95½ to yield over 5·25%. Proceeds of issue are to be used for makg. additnl. investmts. in subsidiaries of the North American Edison Co.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—The poll demanded at the mtg. on Jan. 10, in regard to the proposals of the directors regardg. the limitatn. of the maximum number of shs. to be held by foreign shhldrs., has resulted in 1 061 438 votes being cast in favour of the proposals and 77 071 agst. The requisite three-fourths majority in favour of the scheme has therefore been secured.

WEST INDIA AND PANAMA TELEGRAPH CO., LTD.—An extraordinary mtg. of the company will be held on Feb. 3 to consider resolutns. providg. that no more than 25% (nom. value) of issued amt. of any class of shs. may be held by or in trust for, or be under the control of other than British subjects or corporations; and that only British subjects may be appointed directors (except directors of Cables and Wireless, Ltd.)

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—The board has declared regular qrtrly. cash div. on ord. shs. of 50 cents p. sh., payable on March 1. Announcement was recently made of the intention of the directors to declare a stk. div. of 1% on the ord. shs. subject to the obtaing. of the necessary supplementary letters patent. Formal notice is now given of a mtg. to be held on Feb. 4 to authorise the company to apply for the supplementary letters patent.

CEARA TRAMWAY, LIGHT AND POWER CO., LTD.—Net rev. for year ended June 30, £28 147, agst. £27 572. Deb. int. required £9 977, agst. £9 993. To res. £12 500 (same as last year). Div. 5%, less tax (same). Fwd. £8 832, agst. £7 737. Tramway receipts continued to fall, owing to omnibus competitn. Loss was offset by increase in sale of current for power purposes and receipts from company's omnibuses. Increase in demand for power makes further extensn. of generatg. plant necessary. Orders are about to be placed for complete new unit which will double present effective capacity.

CITIES SERVICE CO.—Net earngs. for 1929, $43 452 386, an increase of over 29%. To stks. and reserves $36 477 185, or 5·30 times pfd. divs. (agst. 4·38 times). To com. stks. and reserves $29 591 440, or $1·18 p. sh. (inc. $6 714 685, or 29·35%). Extent of subsidiaries' operatns. was correspondingly increased during year. Over $100 000 000, was spent for constructn. and acquistns. in 1929. In public utility divisn. most important developmt. was formatn. of East Tennessee Power and Light Co. Number of hldrs. of Cities Service Common stk. increased from 100 000 to 349 000 and hldrs. of all Cities Service securities now number over 600 000. For 1930 an expansn. programme involvg. expenditure of $150 000 000 is announced.

COMPANIES STRUCK OFF THE REGISTER.—The following companies have been struck off the Register of Joint Stock Companies: Aladdin Lamps (Midlands); Electric Car and Accessories Co.; Farad Electrical Co.; F. C. Brown (Electricity); General Battery Co.; Midland Radiotelephone Mfrs.; N.S. Battery and Equipment Co.; Win-sum Electric Diffusers; Auto-Sign Co.; Skipton Electrical Co.; Wireless Distributing Co. The following will be struck off the Register unless cause to the contrary is shown before Jan. 29: Electrification; Northern Radio and Electrical Factors; Power Patents. The following will be struck off unless cause to the contrary is shown before March 17: Dartmoor Electric Supply Co.; Magneto and Spare Part Co.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Gross rev. for year ended Aug. 31, 1929, £839 156, agst. £801 514; operatg. exes. and taxes £388 432, agst. £389 568; net rev., £450 724, agst. £411 946. After writg. off cost of issue of new cap. and scrapped plant, etc., and providg. for int. and sinkg. funds on deb. stks., blce. on net rev. acct. is £331 533. To gen. res., £90 000, makg. £270 000, to contingency res. £15 000. Fwd. £226 533. After providg. for div. on preference shs., intm. div. on 8% pfd. ord. shs., and intm. div. of 6% on ord. shs., directors recommend fin. div. for second half-year on 8% pfd. ord. shs., and fin. div. of 6% on ord. shs., makg. 12% for year, leavg. £127, to which is added £31 902 brt. fwd., makg. £32 029 to be carried fwd. Reserves available for depreciatn. and contingencies stand as follows: gen. res., £270 000; div. equalisatn. acct., £60 000; contingency res., £15 000; sinkg. funds, £275 426; pft. and loss acct., £32 030, total £652 456. Area of district covered by company's statutory powers is approximately 3 314 sq. miles, with estimated populatn. of 325 000, and a supply of electric light and power is now available in 1 240 miles of streets, increase 75 miles during year. New consumers connected during year 2 855, bringing total number connected to 82 495.

IMPERIAL AND INTERNATIONAL COMMUNICATIONS, LTD.—The company announces that for the purpose of acquirg. the whole or part of the undertakgs. of the undermentioned companies, and for providg. for the purchase price of the Pacific Cable Board's Pacific cable undertakg. and West Indian telegraph system, and of the Imperial Atlantic Cables, the sh. cap. of the company has been increased from £100 to £30 000 000 divided into ord. shs. of £1 each. These shs. have been allotted as follows: Eastern Telegraph Co., Ltd. (*a*) in respect of transfer of communicatns. assets, 10 626 608, (*b*) at par in respect of cash provided for purchase of Government undertakgs., 552 947; Eastern Extension, Australasia and China Telegraph Co., Ltd., (*a*) 6 533 050, (*b*) 287 957; Western Telegraph Co., Ltd., (*a*) 4 724 845; (*b*) 239 333; Marconi's Wireless Telegraph Co., Ltd., (*a*) 4 225 517; (*b*) 186 249; African Direct Telegraph Co., Ltd., (*a*) 330 397; Europe and Azores Telegraph Co., Ltd., (*a*) 132 689; Eastern and South African Telegraph Co., Ltd., (*a*) 1 414 439; West African Telegraph Co., Ltd., (*a*) 206 105; London Platino-Brazilian Telegraph Co., Ltd., (*a*) 193 481; Pacific and European Telegraph Co., Ltd., (*a*) 89 587; River Plate Telegraph Co., Ltd., (*a*) 31 928; West Coast of America Telegraph Co., Ltd., (*a*) 224 868; total, 30 000 000.

Company Meeting.

EVER READY TRUST AND FINANCE CO., LTD.—Mr. Magnus Goodfellow, presiding at the meeting last Friday, said they had co-operated with the Ever Ready Co. (Great Britain) in the acquisition of an interest in Lissen, Ltd., which interest (so far as the Trust were concerned) was represented by the holding of 500 000 8% cumulative preference shares. It was not the intention of the directors to hold so large an investment in one concern indefinitely, and it was, therefore, provided at the time of the purchase that there should be a public flotation of Lissen, Ltd. The state of the stock market during the year, however, had not been such as to enable this intention to be carried into effect. Being a private company, there was no market quotation for the shares of Lissen, Ltd., but the accounts of that company for the year ended September, 1929, showed a substantial advance in profits compared with the previous year. As to the Trust's holding of 128 845 ordinary shares of the Ever Ready Co., the market price to-day showed a depreciation compared with the cost of £29 000, which he was satisfied was due to general conditions only, for having regard to the unbroken progress of that company in past years, and the advance in its sales in the current year, the fact that these shares stood at a price which yielded over 9% he could only regard as temporary. Miscellaneous investments, £26 174, to-day showed a depreciation of £10 000, but this also he hoped would prove to be only temporary. With regard to the revenue account, the bank interest was heavy, but this was due to the fact that the investment of £500 000 in Lissen, Ltd., was made early in December, 1928, from moneys borrowed from the bankers pending receipt of the calls due subsequently. The Board did not recommend the payment of a dividend on this occasion, as they felt that it was in the best interests of all to build up a strong financial position. He could, however, strike a hopeful note for the future by drawing attention to the fact that the gross annual revenue from their investments in the Lissen and Ever Ready companies on the present basis exceeded £50 000.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BROSAN, Mr. R., 267, High Road, Willesden Green, wireless dealer. £42 12s. 7d. December 2nd.

BURTON, R. A., Post Office, Sawbridgeworth, wireless dealer. £17 18s. 4d. December 3rd.

COULSON, F. A., 273, Archway Road, Highgate, wireless factor. £14 8s. 6d. November 26th.

HYDE AND COWLEY, 94, Abbotsbury Road, Weymouth, electrical and wireless engineers. £23 3s. 8d. December 3rd.

JONES, A. S., 9, Newborough Street, Caernarvon, wireless dealer. £11 7s. 4d. December 3rd.

OWEN, J., 23, Church Street, Atherton, near Manchester, wireless dealer. £13 8s. 11d. December 3rd.

PEWCO ELECTRIC CO., 38, Broadway Parade, Crouch End, electrical and wireless engineers. £20 os. 8d. November 18th.

Bill of Sale.

BAWTREE, Donald Wells, Bendoran, Salisbury Court Road, Banstead, wireless dealer. Dated January 3rd, filed January 7th. £100.

Deeds of Arrangement.

GOLDSMAN, Jacob Louis, 100, High Holborn, W.C., radio engineer. Dated January 18th; filed January 20th. Trustee, R. Stephens, 31, Lombard Street, E.C. Liabilities unsecured, £1 782; assets, less secured claims, £780.

WILD, Eveline Hannah (wife of Hubert Wild), trading as C. B. PORTABLE RADIO CO., 117A, Abergele Road, Colwyn Bay, wireless apparatus dealer. Dated January 13th; filed January 14th. Trustee, A. Armstrong, 41, Corporation Street, Manchester, I.A. Liabilities unsecured, £649; assets, less secured claims, £250.

WILKINSON, Henry Orwin, 913, Brighton Road, Purley, wireless and electrical engineer and contractor. Dated January 16th; Filed January 20th. Trustee, C. Latham, 78, New Oxford Street, W.C. Secured creditors, £120; liabilities unsecured, £1 556; assets, less secured claims, £1 127.

Receivership.

BURGOYNE WIRELESS, LTD. G. Gore, of 33, Waverley Avenue, Wembley, was appointed receiver and manager on January 7th, 1930, under powers contained in debenture dated October 18th, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

ANDERSON'S WIRELESS SALES AGENCY, LTD., 39, Farringdon Road, E.C. A meeting of the creditors was held on January 20th, Mr. Greenberg, the sole director of the company presiding. Mr. W. G. Dunn, of 11, Great Turnstile, High Holborn, W.C., who had been appointed the liquidator of the company, submitted a statement of affairs which disclosed liabilities of £1 903, all due to unsecured trade creditors, and total assets estimated to produce £1 855, less debentures and preferential creditors amounting to £1 190, or a deficiency of £1 238. It was stated that there might be a claim for royalties and income tax, but the amounts had not yet been ascertained. It appeared that the company took over the business from Mr. Greenberg, the vendor, in October, 1927, the purchase price of £1 000 being satisfied by the debenture for £1 000 on all the assets of the company. Mr. Greenberg was disposed to put aside the question of acting under his debenture, and preferred to make an offer to the creditors. After discussion he undertook to guarantee to the satisfaction of the committee of inspection a composition of 6s. 8d. in the £, payable as to 1s. 8d. in seven days 2s. 6d. on February 10th and 2s. 6d. on March 10th. Subject to the guarantee the creditors confirmed the liquidation with Mr. Dunn as liquidator, and appointed a committee of three creditors.

WILKINSON, H. O., electrical engineer, 913, Brighton Road, Purley, Surrey. A meeting of the creditors of the above was held recently, when it was reported that the liabilities were £629, made up as follows: Trade creditors, £339 8s. 3d.; rent, £150; and bank overdraft, £140. The assets comprised book debts, £368; tools, £50; and stock and plant, £754; making a total of £1 172, or a surplus of £543, subject to realisation. It was stated that proceedings had already been commenced by certain creditors, and in order to avoid an execution being levied, it was decided that a deed of assignment should be executed with Mr. C. Latham, accountant and auditor, 78, New Oxford Street, London, W.C., as trustee, together with a committee consisting of the representatives of Auto Sundries, Ltd., Falk, Stadelmann and Co., Ltd., and L.E.S Distributors.

London Gazette, etc.

Winding-up Petition.

GRAMOPHONE CABINETS.—A creditor's petition for winding up has been presented by A. E. Webster, trading as London Electrical Co., 1, Sherborne Lane, King William Street, London, electrical accessories dealer, and is to be heard at the Royal Courts of Justice, Strand, London, on January 27th.

Companies Winding-up Voluntarily.

ANDERSON'S WIRELESS SALES AGENCY, LTD.—By reason of its liabilities, January 10th. W. G. Dunn, chartered accountant, 11, Great Turnstile, High Holborn, W.C, appointed as liquidator.

DONARELLI PHONO-ELECTRON, LTD.—By special resolution, January 13th, H. H. Gay, 74, Cheapside, E.C., appointed as liquidator.

Bankruptcy Information.

IRVING, Richard John, 4, Bridge Road, Kirkstall, Leeds, trading as R. IRVING, wireless dealer. Receiving order, January 11th. Debtor's petition.

MORPHY, Donal William, 4 and 5, Dorset Mews, North Upper Gloucester Place, London, N.W.1, manufacturer of wireless apparatus. Receiving order, January 15th. Debtor's petition. First meeting, January 28th, 11 a.m., and public examination, March 7th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

QUINTRELL, William Henry, Higher East Street, St. Columb Major, Cornwall, electrical and mechanical engineer. First meeting, January 24th, 11 a.m., Official Receiver's Offices, 12, Princes Street, Truro. Public examination, February 3rd, 11.45 a.m., Town Hall, Truro.

Notice of Dividend.

SMITH, Boulton, trading as H. WORTON, The Crescent, Spalding, electrical engineer. First and final dividend, 1s. 4¼d. per £, payable January 27th, 4 and 6, West Street, Boston, Lincs.

Notices of Intended Dividends.

HUNT, Sydney Everest, 8A, Torwood Street, Torquay, electrical engineer and contractor. Last day for receiving proofs, January 31st. Trustee, E. H. Hawkins, 4, Charterhouse Square, London, E.C.1.

MILLWARD, Eric Rodney, trading as WEST OF ENGLAND RADIO, at 67, High Street, Barnstaple, wireless engineer. Last day for receiving proofs, February 1st. Trustee, W. R. COCKS, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver.

WARNES, Elizabeth Ann (widow), 10, Crescent Gate, Wilmslow Road, Rusholme, Manchester, electrical and radio engineer, formerly trading as VICTORIA RADIO CO., but now as E. A. WARNES AND CO. Last day for receiving proofs, January 31st. Trustee, A. T. Eaves, 47, Mosley Street, Manchester.

Bankruptcy Proceedings.

HUDSON, Rex Chadwick, 1 and 2, Bridge Road, Chatburn, Lancs., electrical contractor. The public examination of this debtor was held last week at the County Court House, Victoria Street, Blackburn, when a statement of affairs was produced showing a deficiency of £2 024. The debtor attributed his failure to insufficient turnover and bad trade. It would seem that he commenced trading in September, 1922, but he was not successful. In November, 1925, he purchased eight houses in Bridge Road, at Chatburn, for £1 550, obtaining a mortgage of £690 from a building society, and borrowing £400 from a relative. Before completion he sold four of the houses for £1 010, and paid the balance of the purchase price out of the proceeds. In March, 1929, he obtained a mortgage of £600 from another building society, who paid off the original mortgage which had been reduced to £427. He had also borrowed money from various members of his family, but no claim had been made by his father and mother.

It was stated that the debtor had been employed as a subganger platelayer before entering business as a jeweller and electrical contractor. He admitted, in answer to the Official Receiver, that he had no previous experience in either trade, and that during practically the whole of 1929 he had sold stock at less than cost and had incurred a loss of about £11 per week. He had been heavily pressed by creditors.—The Official Receiver: Is not the real reason for your failure the fact that you are not competent in either trade? Debtor: Yes, there might be something in that.—The Official Receiver said that although he regarded debtor's answers as unsatisfactory, he did not think any useful purpose could be served by adjourning the examination.—The Registrar: I take the opposite view. It is desirous that this matter should be thrashed out publicly. This man starts business as a jeweller and electrician without the slightest possible experience. He has not the remotest idea of the value of stock and goes on trading with other people's money. He has carried on recklessly and has sold at less than cost goods which were obtained from creditors in the ordinary way of business. The hearing was adjourned.

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ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by* GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.

ARGAPHOTO.—505 347. Class 13. Electric lamps and electric lighting fittings, all being metal goods not included in other classes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Emmasingel 13d, Eindhoven; manufacturers. August 16th, 1929. (Date claimed under International Convention, May 8th, 1929.) To be associated with No. 463 335 (2 491).

STROMBO.—507 040. Class 13. Connecting sockets for electric lamps and the like. Archie Emanuel Howard, 5, High Holborn, London, W.C.1; merchant. October 18th, 1929.

AEONICLOCK. 505351. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Aeonic Radio, Ltd., 90, Regent Street, London, W.1; manufacturers.—August 16th, 1929. (By consent.)

STENODE. 507 503. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer.—November 5th, 1929. To be associated with No. 507628 (2700) and others.

VICEROY. 507538. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including gramophones, gramophone records and gramophone accessories. Carreras, Ltd., Arcadia Works, Hampstead Road, London, N.W.1; manufacturers.—November 6th, 1929.

STENODYNE. 507628. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer.—November 8th, 1929. To be Associated with No. 507503 (2700) and others.

STENOLITH. 507629. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. James Roginson, 76, Millway, Mill Hill, London, N.W.7; engineer.—November 8th, 1929. To be Associated with No. 507503 (2700) and others.

RADIOSTENODE. 507626. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer.—November 8th, 1929. To be associated with No. 507503 (2700) and others.

STENOSTAT.—507630. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer.—November 8th, 1929. To be associated with No. 507503 (2700) and others.

RADIOSTENOSTAT. 507627. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer.—November 8th, 1929. To be associated with No. 507626 (2700) and others.

PROXIMETER.—508215. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes, instruments and apparatus for teaching. Frederick Bateman and Co., Ltd., 43, Great Marlborough Street, Regent Street, London, W.1.; sight testing opticians.—November 27th, 1929.

DENSOR. 508236. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Arthur Preen and Co., Ltd., 22, Cricklewood Lane, London, N.W.2; manufacturers.—November 27th, 1929.

STENOPHONE.—507 502. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer. November 5th, 1929. To be associated with No. 507 503 (2 700) and others.

PIXIE.—508 097. Class 8. Sound reproducing apparatus and parts thereof, wireless telephonic apparatus and parts thereof, and wireless telephonic apparatus in combination with gramophones. Perophone, Ltd., 76–78, City Road, London, E.C.2; manufacturers. November 22nd, 1929. To be associated with No. 459 076 (2 468).

RADIOPATH.—507 625. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. James Robinson, 76, Millway, Mill Hill, London, N.W.7; engineer. November 8th, 1929.

DUBILIER (sign).—502 432. Class 8. Electric batteries (not for medical purposes). Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.C; manufacturers. May 3rd, 1929. To be associated with Nos. 447 532 (2 435) and 458 873 (2 470).

SABUR.—503 845. Class 8. Accumulators and batteries for use in connection with wireless telephony. Joseph Aaron Isaacson, trading as The District Gramophone and Wireless Co., 323, Old Kent Road, and 107, Tower Bridge Road, London, S.E.1; gramophone and wireless dealer. June 21st, 1929. (By consent.)

ARMAFLEX.—507 608. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including photographic cameras, electric batteries and cells, or thermionic valves, and not including any goods of a like kind to any of these excluded goods. John Neale, 25, Craven Street, London, W.C.2; civil engineer. November 8th, 1929.

LEWBESTITE.—507 687. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. The London Electric Wire Co. and Smiths, Ltd., 7, Playhouse Yard, Golden Lane, London, E.C.1; manufacturers. November 11th, 1929. To be associated with No. 442 591 (2 391) and others.

RECORDION (sign).—507 769. Class 8. Instruments consisting of a combination of a gramophone with a radio receiving set. Radio Recordion, Ltd., 16, Lisle Street, Newcastle-upon-Tyne; manufacturers of combined wireless and gramophone sets. November 13th, 1929.

INO.—507 779. Class 8. Instruments and apparatus for use in wireless telephony, but not including electric batteries. Gas Light Fittings Co., Ltd., 322, Walworth Road, London, S.E.17; merchants.—November 13th, 1929. To be associated with No. 494 478 (2 662).

GOVERNMENT PUBLICATIONS.

The following publications have been issued by H.M. Stationery Office, London, etc.:—

South-West England and South Wales Electricity Scheme, 1929. 1s. 6d.
Do. Supplementary Particulars. 3s. 6d.
National Physical Laboratory: Collected Researches. Vol. XXI, 1929:—
II–IV. Three Papers on Mutual Inductance Standards. 2s.
V and VI. Note on Shielded Non-Inductive Resistances; also a General Theorem on Screened Impedances. 2s.
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XV, XVI and XVII. Three Papers on the Investigation of Wireless Waves Arriving from the Upper Atmosphere. 3s.
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XX and XXI. The Propagation of Radio Waves; also the Polarisation of Radio Waves. 2s.
General Post Office: Engineering Department: Technical Instructions: XXV. Automatic Telephone Exchange Systems:—Part 5. Siemens' No. 16 System (Provisional Issue). Diagrams. December, 1929. 1s.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

320 443 D. MONTAGUE and S. MONTAGUE. Wireless receiving apparatus. (31/7/28.)
295 386 SIEMENS-SCHUCKERTWERKE AKT.-GES. Electric distributing systems with duplicate bus-bars. (12/8/27.)
320 455 GENERAL ELECTRIC CO., LTD., N. M. HILL and W. WILSON. Electric power plant for running-in fluid-pressure engines. (16/8/28.)
320 460 A. H. WHITELEY. Wireless valve-holders, coil-holders and the like. (21/8/28.)
305 644 E. BODER. Electric switching systems controlled by timing apparatus. (10/2/28.)
299 390 SIEMENS-SCHUCKERTWERKE AKT.-GES. Means for controlling electrical fault indicating and protective devices. (25/10/27.)
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297 801 WAYGOOD-OTIS, LTD. Elevator system. (28/9/27.)
320 511 C. W. DENNY. Electric illuminated advertising and display devices. (28/9/28.)
301 377 SIEMENS-REINIGER-VEIFA GES. FUR MEDIZINISCHE TECHNIK. Method of and apparatus for X-ray investigation. (28/11/27.)
320 526 G. HANEKOP and W. SCHMIDT. Electrolyte for galvanic elements or cells. (15/10/28.)
299 314 SIEMENS-SCHUCKERTWERKE AKT.-GES. Connecting means for electric conductors of aluminium or aluminium alloy. (22/10/27.)
320 537 G. W. BROWN. Illuminated signs. (29/10/28.)
320 540 A. E. O'DELL (SIEMENS-REINIGER-VEIFA GES. FUR MEDIZINISCHE TECKNIK). Method of and apparatus for taking X-ray photographs with a short exposure. (29/10/28.)
302 891 I.G. FARBENINDUSTRIE AKT.-GES. Protecting carbon electrodes from consumption in the atmosphere. (23/12/27.)
300 179 BRITISH THOMSON-HOUSTON CO., LTD. Methods of colouring glassware. (7/11/27.)
300 647 SIEMENS-SCHUCKERTWERKE AKT.-GES. Quick-acting switches for heavy currents. (17/11/27.)
320 551 L. F. GARDNER (BING WERKE VORM. GEB. BING AKT.-GES.). Holder for electric lamps for use in projection apparatus. (14/11/28.)
300 920 FELTEN AND GUILLEAUME CARLSWERKE AKT.-GES. Electric cables. (19/11/27.)
320 555 H. H. BERRY. Electric fires or radiators. (23/11/28.)
303 881 FELTEN AND GUILLEAUME CARLSWERK AKT.-GES. Electric cables. (12/1/28.)
320 563 F. G. BAUM. Dynamo-electric machines. (1/12/28.)
301 915 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Induction-type electricity meters. (9/12/27.)
301 935 COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ. Meters for the charge and discharge of electric accumulators and the like secondary batteries. (8/12/27.)
320 566 GENERAL ELECTRIC CO., LTD., and L. GRAF. Conveying apparatus. (13/12/28.)
311 313 AKT.-GES. BROWN BOVERI, ET CIE. Electric insulators. (9/5/28.)
320 588 MAXLUME LIGHTING AND HEATING CO., LTD., and F. W. THORPE. Globe-supporting galleries of electric and gas lighting fittings. (28/1/29.)
307 358 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Electric remote control systems. (3/8/27.)
307 760 ALLOY WELDING PROCESSES, LTD. Electrodes for electric arc welding or soldering. (12/3/28.)
320 596 ALLOY WELDING PROCESSES, LTD., and E. J. CLARKE. Electrodes for electric arc welding or soldering. (13/3/29.)
320 330 W. H. SCOTT, G. J. SCOTT and H. D. WHEELER. Braking of electric winches or the like lifting and lowering apparatus. (4/7/28.)
320 639 J. L. BAIRD and TELEVISION, LTD. Synchronising devices for television and like systems. (16/4/28.)
289 401 M. URBINATI. Devices for the commutation in the transformers of electric alternate currents into direct currents and vice versa. (26/4/27.)
320 654 G. R. SEARLE. Loud speakers for wireless apparatus or the like. (21/4/28.)
289 439 A. BLONDEL. Systems for the electrical transmission of synchronous movement. (27/4/27.)
302 882 CUTLER-HAMMER MANUFACTURING CO. Control means for electric motor-driven devices. (23/12/27.)
293 299 SCHMID-PATENT CORPORATION. Electric batteries. (2/7/27.)
320 615 BROOKHIRST SWITCHGEAR, LTD., and J. A. HIRST. Method of and apparatus for starting and controlling electric motors. (16/6/28.)
292 172 INTERNATIONAL GENERAL ELECTRIC CO., INC. Dynamo-electric machines. (16/6/27.)
292 509 BRITISH THOMSON-HOUSTON CO., LTD. Construction of stators of dynamo-electric machines. (20/6/27.)
320 605 L. ADAM. Automatic telephone system. (9/7/28.)
320 634 GENERAL ELECTRIC CO., LTD., A. E. ANGOLD, and F. BARRELL. Automatic control of electrical apparatus. (16/7/28.)
320 622 W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., and W. H. NICHOLS. Electric cut-outs. (16/7/28.)
320 624 E. GERARD. Emergency supply arrangements for working plants supplied with electric energy. (16/7/28.)
320 647 F. W. LANCHESTER. Moving-coil loud-speakers. (18/7/28.)
320 652 C. S. FRANKLIN. High-frequency feeders and the like for use with radio aerial systems. (18/7/28.)
320 662 G. D. POWELL. Apparatus for the electrical reproduction of gramophone or like records. (19/7/28.)
294 606 TRICO PRODUCTS CORPORATION. Antenna. (27/7/27.)
294 257 L. THURM. Optical system for radio kinematographic transmitting and receiving apparatus. (21/7/27.)
320 670 J. LUCAS, LTD., and O. LUCAS. Motor vehicle electric headlights. (20/7/28.)
320 671 O. FULTON. Systems for the electrical transmission and reception of pictures, diagrams or other representations. (20/7/28.)
320 673 O. FULTON. Process for the control of electric current impulses for the purpose of remote picture transmission or of television or the like. (20/7/28.)
320 676 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Vibration-damping devices. (20/7/28.)
320 677 H. R. SETRIGHT. Indicating apparatus for use with totalisators. (20/7/28.)
320 700 HOTPOINT ELECTRIC APPLIANCE CO., LTD., and W. J. SIMS. Electric boiling plates and the like. (26/7/28.)
294 659 SIEMENS AND HALSKE AKT.-GES. Apparatus for indicating the direction of travel of a train.

Applications for Patents.

October 4th.

30 136 ELECTRICAL RESEARCH PRODUCTS, INC. Loading conductors. (6/11/28, U.S.)
30 137 ELECTRICAL RESEARCH PRODUCTS, INC. Submarine cable systems. (31/5/29, U.S.)
30 138 ELECTRICAL RESEARCH PRODUCTS, INC. Television systems. (21/12/28, U.S.)
30 119 ELECTRO-MECHANICAL BRAKE CO., LTD., and S. SMITH. Automatic control devices for air compressors.
30 167 M. E. ELLIOTT. Electric amplifying systems.
30 083 HARRIS AND SHELDON, LTD., and R. G. TURNER. Electric switches for motor vehicles, etc.

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0 093 A. Law. Suppressing undesired signals in wireless telegraph receivers.
0 172 Lignes Telegraphiques et Telephoniques. Protecting intercommunication lines against external disturbances. (18/10/28, France.)
30 173 Lignes Telegraphiques et Telephoniques. Manufacture of tele-communication cables. (18/10/28, France.)
30 152 Siemens-Schuckertwerke A.G. Coil piece for submarine cable. (6/10/28, Germany.)
30 151 Siemens and Halske A.G. Electric discharge vessels. (5/10/28, Germany.)
30 100 R. T. Waite. Electric plugs, etc.
30 081 W. C. West. Telephone memorandum stand, etc.
30 135 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Signal interpolating systems.

October 5th.

30 264 Associated Electrical Industries, Ltd. Immersion heaters. (6/10/28, U.S.)
30 265 Associated Electrical Industries, Ltd. Control system for elevators. (6/10/28, U.S.)
30 260 Automatic Telephone Manufacturing Co., Ltd., and M. O. Williams. Electromagnetic relays.
30 273 E. Bauer and L. Szmodics. Accumulators.
30 257 R. Dreyse and R. Michel. Telegraphic transmission apparatus.
30 214 Electrolux, Ltd. Heating absorption refrigerating apparatus.
30 228 C. A. Ely. Locking electric lampholders.
30 277 R. Gunn. High frequency oscillator systems. (6/10/28, U.S.)
30 262 T. D. Kelly. Electric furnaces.
30 244 J. Türck. Means for cutting off supply of current to overhead conductors upon breakage. (6/10/28, Germany.)

October 7th.

30 295 W. Aitken. Telephone systems, etc.
30 421 Associated Telephone and Telegraph Co. Microphones. (8/10/28, U.S.)
30 328 A. W. Blair. Electric heating apparatus.
30 337 F. Clark and General Electric Co., Ltd. Tuning arrangements for wireless receiving circuits.
30 416 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Incandescent lamps.
30 417 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Amplifier circuits.
30 418 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Incandescent cathode X-ray tubes.
30 419 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electrode systems.
30 375 R. D. Duncan and Wired Radio Inc. High frequency broadcasting over-power lines.
30 329 W. G. W. Fahey. Electric hair brushes.
30 390 Felten and Guilleaume Carlswerk Akt.-Ges. Switches for electric motors, etc. (31/10/28, Germany.)
30 303 R. T. Kemper. Insulation panel. (27/3/29, Germany.)
30 373 H. L. Kirke. Wireless aerial systems.
30 405 Kye Electrical, Ltd., and H. Silverberg. Incandescent lamps, etc.
30 409 Marconi's Wireless Telegraph, Co., Ltd. Signalling. (5/10/28, U.S.)
30 400 E. J. Marriott. Thermionic valves, etc.
30 420 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone systems.

October 8th.

30 430 Associated Electrical Industries, Ltd., and E. Y. Robinson. Vacuum electric tube devices. (19/6/28.)
30 562 A. E. Chapman. Electric gas discharge vessels.
30 520 W. P. Crilly. Remote control system for radio instruments, etc. (10/10/28, U.S.)
30 491 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Lighting fixtures.
30 492 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). High pressure mercury vapour discharge tubes.
30 493 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric pick-ups.
30 559 G. F. Dutton. Microphones.
30 560 H. G. East. Automatic dimming switch.
30 487 Electric Furnace Co., Ltd., and W. J. Millar. Electric resistance furnaces.
30 550 Electrical Research Products, Inc. Rotary distributors. (7/12/28, U.S.)
30 551 Electrical Research Products, Inc. Loading signalling conductors. (8/11/28, U.S.)
30 494 International General Electric Co., Inc. Devices for gauging variations in level of liquids. (8/10/28, Germany.)
30 541 Johnson and Phillips, Ltd., and A. P. Pyne. Flexible conductors, etc.
30 508 L. Koros. Filter circuit for smoothing pulsatory direct current. (16/10/28, Hungary.)
30 538 J. J. Mettes. Radio receiving sets.
30 532 J. Robinson. Thermionic valve systems.
30 507 Siemens-Schuckertwerke Akt.-Ges. Electric generator protector. (29/10/28, Germany.)
30 442 A. M. Taylor. Electric power transmission.
30 529 Telefonaktiebolag L. M. Ericsson. Telephone apparatus. (12/10/28, Sweden.)
30 549 Telefonaktiebolag L. M. Ericsson. Telephone systems. (7/3/29, Sweden.)
30 530 K. Ungerer. Glow lamps. (1/3/29, Germany.)

October 9th.

30 610 Abba Electrical Co., Ltd., and E. Denholm-Young. Thermo telephone receivers.
30 676 Associated Telephone and Telegraph Co. Television, etc., apparatus. (9/11/28, U.S.)
30 675 Automatic Telephone Mfg. Co., Ltd., and S. R. Smith. Telephone instruments.
30 611 F. J. G. van den Bosch. Telephonic communication systems.
30 597 British Brass Fittings, Ltd., and R. A. Jones. Electric switches.
30 582 R. Brown and S. Yarwood. High tension batteries for wireless installations, etc.
30 568 W. Bullen. Wireless signalling apparatus.
30 624 F. G. Creed, Creed and Co., Ltd., and R. D. Salmon. Telegraph reproducing apparatus.
30 632 H. and M. Farman. Arrangement of dynamos of internal combustion engines. (8/10/27, France.)
30 613 Franco-British Electrical Co., Ltd. Advertisement signs, etc.
30 627 A. Graham and Co., Ltd., and W. Stott. Microphones.
30 668 E. R. Grote. Incandescent lamps, etc.
30 650 Marconi's Wireless Telegraph Co., Ltd. Electric condensers. (10/10/28, U.S.)
30 623 C. B. V. Neilson, Standard Telephones and Cables, Ltd., and H. J. Turton. Telephone systems.
30 661, 30 662 A. G. Owens. Accumulator.
30 679 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone systems.
30 631 Siemens und Halske Akt.-Ges. Jointing for sparking plugs, etc. (23/2/29, Germany.)
30 625 Standard Telephones and Cables, Ltd. (C. E. Stevens). Switching arrangements for telephone systems.
30 571 M. M. Tarver. Wall bracket for telephone receiver.
30 622 Tatra-Werke Automobil und Waggonbau Akt.-Ges. Electrically-driven automobiles. (31/12/28, Germany.)

October 10th.

30 769 Akt.-Ges. Brown, Boveri et Cie. Electric rectifiers. (3/12/28, Germany.)
30 729 Allmanna Svenska Aktiebolaget. Electric power station systems (13/10/28, Sweden)
30 762 Arcturus Radio Tube Co. Heater elements for electric discharge devices. (11/10/28, U.S.)
30 690 J. B. Bower. Electric game.
30 810 C. A. Brereton and H. Eckersall. Switches for preventing energisation of electric circuits.
30 758 British Thomson-Houston Co., Ltd. Electric transformers. (10/10/28, U.S.)
30 759 British Thomson-Houston Co., Ltd. Electric condensers. (10/10/28, U.S.)
30 721 E. H. and F. M. Burris and H. A. Malpas. Television, etc., system.
30 789 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric protection devices.
30 791 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Push-pull amplifier circuits.
30 794 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric pick-ups.
30 751 Federal Telegraph Co., and A. M. Trogner. Frequency changing switches.
30 698 D. S. Gough. Boxes for electric lamps, etc.
30 754 Graham Amplion, Ltd., A. D'A. Hodgson. Electrical supply means for wireless apparatus.
30 755 Graham Ampion, Ltd., A. D'A. Hodgson. Transformers.
30 738 H. T. Harrison. Light reflecting bodies.
30 750 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Automatic remote-control radio set.
30 765 J. E. G. Lahousse. Insulating material for electric condensers, etc. (22/10/28, France.)
30 812 J. C. Laurent. Electric winding of timepieces. (16/10/28, France.)
30 806 Siemens Schuckertwerke Akt.-Ges. Lead sheathed cables. (13/10/28, Germany.)
30 816 Siemens Schuckertwerke Akt.-Ges. Centrifugal condensers. (10/10/28, Germany.)
30 817 Siemens und Halske Akt.-Ges. Metal vapour arc lamps. (11/10/28, Germany.)
30 801 Telefunken Ges. für Drahtlose Telegraphie. Signalling by modulated energy. (31/10/28, Germany.)
30 820 Victor Talking Machine Co. Thermionic valve amplifying systems. (10/10/28, U.S.)
30 777 Westinghouse Electric and Manufacturing Co. Safety apparatus for elevators, etc. (10/10/28, U.S.)

October 11th.

30 936 Automatic Telephone Manufacturing Co., Ltd. Telephone instruments
30 937 Automatic Telephone Manufacturing Co., Ltd., and W. H. Paulett. Electrical Indicating devices, etc.
30 939 Automatic Telephone Manufacturing Co., Ltd., and H. Jackson. Automatic switches for telephone systems, etc.
30 842 T. Batchelor, A. B. Smith, and Wandsworth Electrical Manufacturing Co., Ltd. Electric switches.
30 961 A. T. Beaumont. Electric pedestrian signals.
30 944 R. W. Blades, J. H. Roberts and J. F. Watson. Electric bonding devices.
30 850 30 851 W. Bullen. Wireless signalling apparatus.
30 913 Burgess Battery Co. Battery hand lamps. (16/10/28, U.S.)
30 881 J. P. D. Coleman and Wild-Barfield Electric Furnaces, Ltd. Electric furnaces.
30 857 M. von Devecis and Waldberg Soc. Anon. Galvanising or electric plating processes.
30 853 A. F. de Fraine. Wave trap for wireless receiving sets.
30 919 H. C. Heide (Motor Meter Gauge and Equipment Corporation). Electric measuring instrument.

COMING EVENTS.

Friday, January 24th.

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington. Paper by Miss W. A. Leyshon on "Characteristic of Discharge Tubes under 'Flashing' Conditions, as Determined by the Use of a Cathode Ray Oscillograph." 5 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre Students' Section).—Armstrong College, Newcastle-upon-Tyne. The Students' Lecture, "Electric Traction," by Lt.-Col. H. E. O'Brien. 7.15 *p.m.*

Monday, January 27th.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Discussion on "High-Tension Distribution." Opened by Mr. G. V. Twiss. 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-upon-Tyne. Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched Arc Switch." 7 *p.m.*

Tuesday, January 28th.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Falcon Café. Ordinary meeting.

Institution of Electrical Engineers (Students' Section of the North-Western Centre).—Engineers' Club, Albert Square, Manchester. Informal discussion on "Illumination, Domestic Appliances and Industrial Heating." 7.15 *p.m.*

Institution of Electrical Engineers (South Midland Students' Section).—Afternoon visit to Messrs. Metropolitan Cammell Carriage, Wagon and Finance Co., Ltd., Saltley, Birmingham.

Electrical Power Engineers' Association.—Junior Institution of Engineers, 39, Victoria Street, London. Paper on "Changing D.C. Networks to A.C." 7.15 *p.m.*

Institution of Electrical Engineers (North Midland Students' Section).—Hotel Metropole, Leeds. The Students' Lecture, by Lt.-Col. H. E. O'Brien, on "Electric Traction. 7.15 *p.m.*

Wednesday, January 29th.

Electrical Contractors' Association (Croydon Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

Institution of Electrical Engineers (South Midland Centre).—Midland Institute, Birmingham. Joint meeting with the Midland Centres of the Institutions of Civil and Mechanical Engineers. Faraday lecture, by Capt. P. P. Eckersley, on "Broadcasting by Electric Waves." 7 *p.m.*

Thursday, January 30th.

Institution of Welding Engineers.—Chamber of Commerce, 95, New Street-Birmingham. Paper by Mr. C. A. Hadley on "Modern Improvements in Electric Resistance Welding Machines." 7 *p.m.*

Friday, January 31st.

Institution of Electrical Engineers (North-Eastern Students' Section).—Armstrong College, Newcastle-upon-Tyne. Joint meeting with the Graduates of the North-East Coast Institution of Engineers and Shipbuilders. Paper by Mr. W. G. Thomson on "The Electrical Propulsion of Ships." 7.15 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster, London, S.W. Informal meeting. Paper by Mr. F. Onions on "Superheating." 7.30 *p.m.*

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The Electrician, January 31, 1930. THIRD OVERHEAD LINES and RURAL ELECTRIFICATION NUMBER.

THE ELECTRICIAN

Vol. CIV.—No. 2696. Friday, January 31, 1930. [Registered at the General Post Office.] One Shilling

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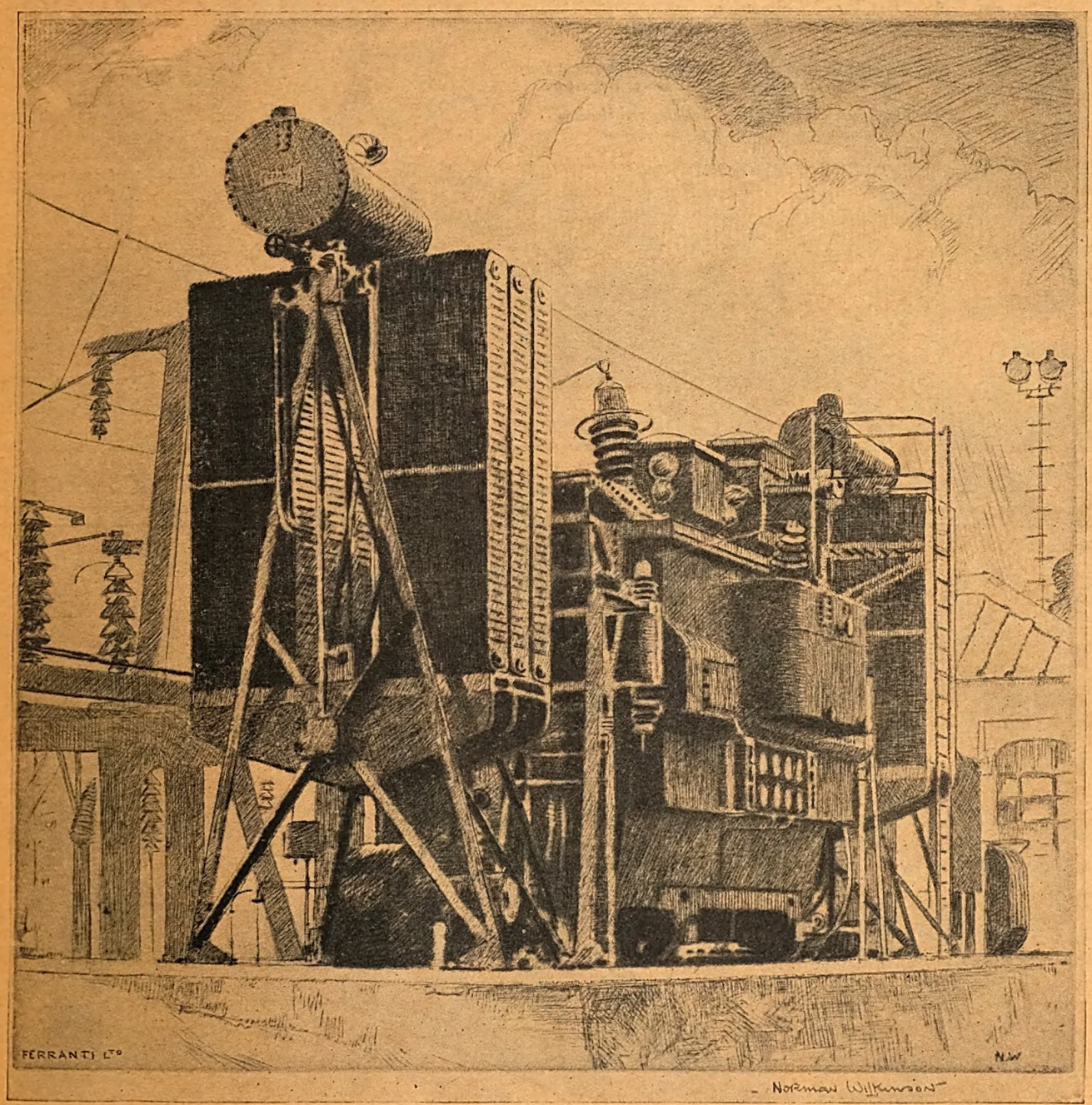

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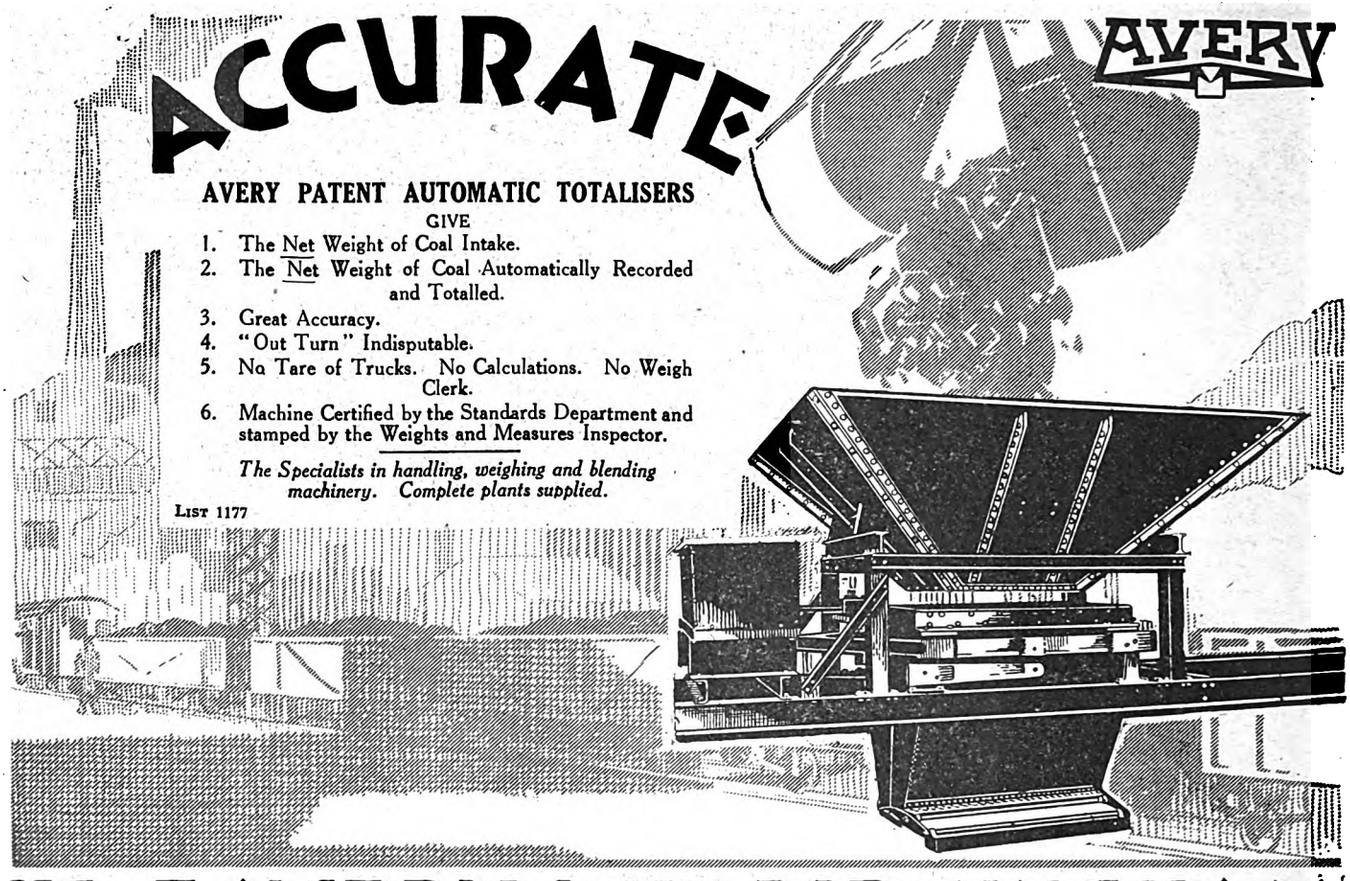

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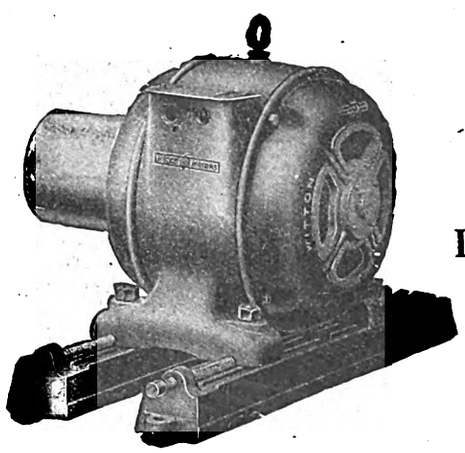

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THE ELECTRICIAN

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Current Topics.

Overhead Lines.

THIS week's issue is the third of our annual Overhead Lines Numbers. Material progress has taken place regarding the development of overhead networks since the first number was in preparation, and the fact that both the two previous numbers were sold out almost immediately after publication showed that they were appreciated. This year's number will, we think, be found of at least equal interest. Among its special features are notes on practice at home and abroad; some people are so insular that they think it almost unpatriotic to discuss what is going on elsewhere. Yet in some countries power transmission worthy of the name and rural distribution began about 40 years ago, whereas only during the last decade has material progress taken place in the same direction with us. We were the first country to develop such world benefits as steamships, railways, textile machinery, engineers' machine tools, and Portland cement, and FARADAY was one of us; if our engineers and business men had not been fettered by dog-in-the-manger legislation and other artificial obstacles, we might have been leaders in aerial high tension work as well. There is nothing *infra dig.* in studying what other people are doing; they may be right or may be wrong, but even their faults convey a lesson. In overhead line work many engineers are doing to-day what others have done years ago, similar circumstances having led to the adoption of familiar methods or remedies.

Insulators.

SOME worthy people shudder at the very idea of controversies technical or social. In engineering matters experts frequently differ, the discussion of differences opens the door to progress; that is one of the reasons why we have given prominence to the views of Professor VELLANDRE, of Stockholm, on the subject of porcelain insulators. Regarding specifications, the ideal is to obtain the correct balance, otherwise one may be robbing Peter to pay Paul when going too far in one direction. There have been acute differences regarding the desirability of existing tests under oil. A great deal of attention has been given undoubtedly to electrical tests of porcelain insulators, and mechanical tests have never received the attention they should have had. Up to date vitreous insulators hold the field for high tension lines; what is badly wanted is a high grade insulating material which can be relied upon to stand heavy tensile stresses, something non-fragile, inorganic regarding composition, something which can be moulded without fear of carbonisation which will stand material sectional temperature variations and will resist damage due to salt spray. It is difficult, however, to imagine something which will stand up to a bad arc with vast power behind it.

Line Supports.

WE have by no means reached finality regarding line supports. Wood is getting dearer, and eventually it rots; steel is handy, but in time it rusts; concrete when well made lasts indefinitely, but, unless it is carefully designed and made, the advantages may be killed by excessive weight and transport costs. Centrifugal concrete certainly looks neat, and so do some cast posts. They make an appeal, as compared with lattice work, to lovers of rural amenities.

Conductors.

MUCH progress has taken place in the use of aluminium-steel for h.t. conductors. Owing to its large diameter and therefore the extra transverse stresses to be allowed for as compared with copper or copper alloys it is not so attractive for light rural lines as for feeders or transmission mains. It will be interesting to see whether high tensile aluminium alloys have come to stay—they have been used for some years in Switzerland and recently in Italy on trunk transmission lines. On the long span rural lines at home their light weight may stand in the way of their use, owing to whipping under longitudinal wind gusts.

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Several British makers now seem to be tackling other forms of conductor, cadmium, copper, and copper-clad steel; some improvements have taken place regarding galvanising which should make stranded steel galvanised conductors more popular where tensile strength is more important than amperes. The developments taking place abroad to obtain flexible large-diameter conductors to minimise corona losses at the highest commercial voltages are mechanically and electrically interesting.

Test of the Storms.

IN recent months this country, and some others as well, have been visited by a series of exceptionally heavy storms. Although chimney pots and elm trees have been tumbling down, and chicken houses and garage roofs have been waltzing over hedges, enquiries made in all parts of the country indicate that overhead power lines have been behaving most sedately. Most of the little trouble that has occurred has been due to unauthorised trespassing bodies, from branches of trees to chunks of hay ricks, which have been wandering around in the air, causing some strain on the vocabularies of those in charge of circuit breakers.

Kites and Overhead Mains.

WHEN BENJAMIN FRANKLIN drew lightning from the skies by means of his kite, he probably had no inkling that an American youth a century and a half later would meet his death by unwittingly tapping with his kite string harnessed energy of the kind which FRANKLIN'S experiments helped to reveal to man. The Iowa Supreme Court has recently decided that the electricity supply company concerned was not liable for the electrocution of a boy nine years old who was flying a kite with a copper string which came into contact with a power line. The Court ruled that, although those who maintain dangerous agencies must be held to a high degree of care and that rigid supervision is required to ensure that the danger does not threaten others or constitute an "attractive nuisance" to children, there must also be supervision of the children. The moral is that children should be taught something about electric power lines and instructed as to the nature of conductors and insulators. Now that a great extension of overhead h.t. mains is taking place in this country, it is desirable that elementary education should take cognisance of the fact and endeavour to prevent a repetition of the Iowa tragedy on this side of the Atlantic.

The Hatry Sentences.

WITH the conclusion of the Hatry trial we may hope that this sordid and disgraceful affair, which has hung like a poisonous fog over the financial life of the country for the past six months, is entering on its last phases. There is still plenty to do in clearing up the mess, and it will be a long time before the severe blows dealt, not only at private credit, but at that much more vital thing, the credit of the City of London, fade from memory. It is difficult to understand the mentality of those who are speaking of the sentences passed on Hatry and his associates as unduly severe—apparently on the ground that their victims were mainly banks and wealthy individuals or concerns, or because no evidence could be produced that any of the gains from these fraudulent transactions had been permanently annexed by the guilty individuals. Any common bank robber who lives up to his income is equally deserving of sympathy on such pleas. Those who lightly accept them not only forget the thousands of ratepayers who have been victimised, but show a deplorable lack of understanding of the wider aspects of the affair. The weakening of public confidence in the security of investments hitherto regarded as in the gilt-edged class is a blow at national credit and prosperity for which no conceivable legal penalty could be too strong. Only those who desire to see all foundations weakened in order to further their own subversive policies, or the unthinking individuals who are the tools of the actively malevolent and form one of the chief dangers which threaten democracy, will join in regarding lightly a series of frauds which have done greater damage to our reputation for financial morality than anything that has happened in living memory. One other point deserves public attention. One hesitates to advocate any fresh legislation at a time when Parliament could be more usefully employed in repealing superfluous and obsolete laws, but we should not be sorry to see a short Bill introduced to make it impossible for convicted criminals to sell their pens to newspapers for sums equivalent to many years' earnings of writers who have not qualified for the highest scale of remuneration by going to gaol for some offence of the first magnitude.

Government Policy.

ON another page we print Sir JOHN CORCORAN'S letter on the effect of Government policy on British trade, a subject to which we have already given some attention. There is no doubt that the atmosphere of uncertainty which now exists in regard to taxation, the increase of doles, the price of fuel and the future of certain duties is having a very detrimental effect. When to this uncertainty is added the shock to credit resulting from the Hatry affair and other difficulties which have occurred in the City during the past few months, it is no wonder that unemployment has mounted to the 1 500 000 level. The electricity supply undertakings are beginning to take an active interest in the effect of the Coal Mines Bill on their fuel costs, and the letter from Mr. W. B. WOODHOUSE draws attention to a serious aspect of the matter. In the case of one of the medium sized undertakings in the Home Counties it has been calculated that an increase of 4s. a ton in the price of coal will add a substantial fraction of a penny per unit to the generating cost. If increasing the cost of electricity, gas and solid fuel to industry and to the 40 000 000 inhabitants of the island who are not engaged in coal mining or dependents of miners in order that the miners may work half an hour a day less is the Government's idea of promoting the national well-being, we are indeed living in a topsy-turvy world.

The Jubilee Dinner.

TO-MORROW night's Jubilee Dinner of the firm of BENN BROTHERS, LTD., at the Wharncliffe Rooms, promises to be a notable gathering. Sir ERNEST BENN will take the chair and a company of 450 will sit down. The speakers will include Sir WILLIAM PLENDER, Mr. WALTER RUNCIMAN, M.P., and the DEAN OF ST PAUL'S. The Right Hon J. H. THOMAS, M.P., Lord Privy Seal, will be the guest of honour, and among the other guests at the top table will be Mr. ARNOLD BENNETT, Mr. R. D. BLUMENFELD, LORD HAMBLEDEN, LORD CHARNWOOD, Mr. WEDGWOOD BENN, M.P., Secretary of State for India, and several Ministers of foreign States.

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PROGRESS OF THE GRID.

Over 800 Miles to be Built by End of 1930—Contracts Worth £11 000 000 Already Placed—Greenock-Bonnybridge Main Completed—Supply of Rural Areas—Nation-Wide Effort Needed to Ensure Success.

UP to the end of December last nearly 60 miles of the 132 000 V lines which are to form the grid system had been completed. Progress during 1930 will be much more rapid for it is estimated that well over 800 miles of 132 000 V route will have been built by the end of this year and the value of the contracts already placed by the Central Electricity Board exceeds £11 000 000.

The six schemes which have already been authorised will have a total mileage of nearly 2 000. This month the South West England and South Wales scheme (739 miles) was published; so that when the latter scheme has been authorised a total mileage of over 2 700 will have been sanctioned. There remain East Anglia (Norfolk and Suffolk) for which a scheme is in preparation (possibly this area will be added to South East England), North Scotland and South Scotland to complete the whole of Great Britain. Some progress has been made in South Scotland but consideration of the sparsely inhabited North Scotland region is likely to be deferred for the present.

Of the work to be carried out during 1930 the greater part will be in Central Scotland and South East England in both of which areas transmission lines to the extent of about 250 miles will be constructed this year. By the end of December next the Central Scotland scheme will be completed and more than half the total contemplated mileage in South East England will have been built. In Central England over 150 miles and in the North West England and Mid East England areas another 150 miles or so, divided fairly equally between the two, are due for completion this year. The contractors are keeping well up to schedule although the exceptionally wet weather of the past four months has naturally made across country work very difficult in many parts of the country.

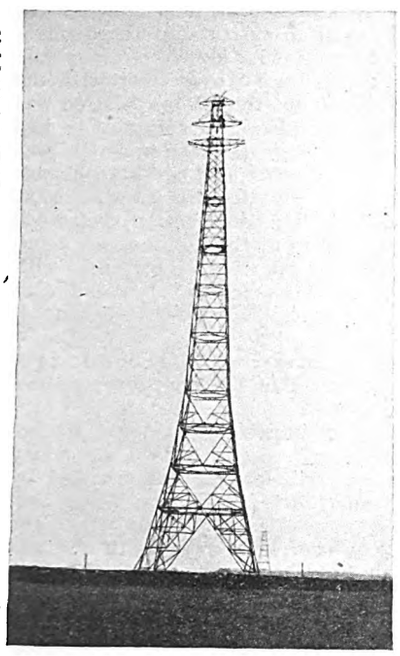

Fig. 1.—338 ft. tower at the Forth crossing—3 050 ft. span.

The principal main 132 000 V line that has been completed extends from Greenock via Glasgow to Bonnybridge. It includes several high river crossings, that at Yoker over the Clyde and the Cart crossing requiring the provision of high towers to carry the cables above the vessels which use these rivers. The towers at the Forth crossing, on the extension from Bonnybridge towards Dundee, are 338 ft., the crossing span being 3050 ft. with a clearance of 100 ft. above river level. The Clyde towers are 270ft. high and those over the Cart are 238 ft.

Other sections in use are the secondary line from Stockport to Macclesfield and a short section of 132 000 V line in Bedfordshire which is temporarily employed to carry a lower voltage.

While construction is making good headway, the effects of which will be much more apparent to the eye in a few months time than they are to-day, the basic problem of connecting the less densely populated rural areas to the grid has still to be solved. The country has embarked on an undertaking the magnitude of which very few people realise, but merely to cover the country with thousands of miles of h.t. transmission lines connecting up generating stations and serving towns which are already obtaining electricity at reasonable rates is far from being all that is needed to ensure the success of the grid. For it is necessary that it should not only be technically successful but that it should realise the full purpose with which it was conceived. To achieve this it must enable consumers in small towns and villages and on farms to obtain cheap power. It will not pay anyone to attempt to supply such rural and semi-rural areas except as part of a larger district which includes towns of some size. In the first place urban undertakings must be induced to spread their distribution network as widely as possible into surrounding territory and nurse the rural demand for a time, until they have succeeded in attracting as many consumers as possible to their mains. In the end they will undoubtedly reap the reward of a far-sighted policy. Without a general realisation of the importance of courageous development on these lines the grid cannot do what its sponsors hope that it will do in the direction of rural electrification, Failure would react on the urban classes of consumer in the long run, so that it is in the real interests of those classes that they should be willing to postpone a portion of the benefit that they may expect to reap from a cheapening of the cost of current in order to assist in widening the circle of consumption to embrace neighbouring rural areas.

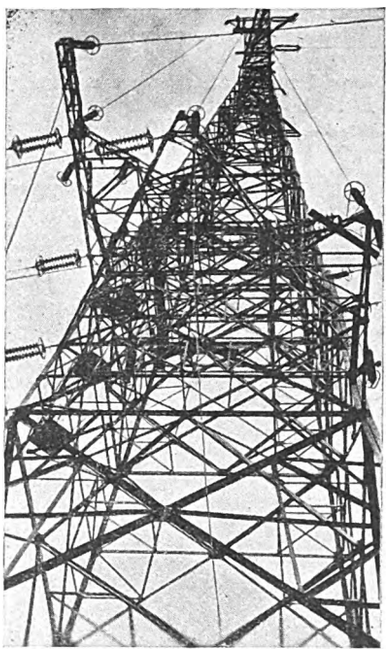

Fig. 2.—View of one of the Clyde crossing towers, Yoker, taken from the base.

There is not too much time left in which to work out a practical scheme of supply in rural districts. The grid is daily extending itself and in a comparatively short time its great conductors will link up all the populous parts of the island. But arteries are useless without an efficient and universal capillary system. Provision of that network is the urgent task that must now be taken in hand. National prestige as well as a large amount of capital is at stake and a nation wide effort is required to bring the undertaking to full fruition.

G. H. L.

OVERHEAD LINES.

A recent publication of the British Engineering Standards Association is Specification No. 215–1930 dealing with aluminium and steel-cored aluminium conductors for overhead lines. This is a revision of the 1925 edition and differs from its predecessor mainly in that the value of the resistivity has been slightly altered in order to conform to the value recently adopted by the International Electrotechnical Commission; the tables given in the Specification have been recalculated in accordance with the new value of the resistivity. Provision has also been made for certain of the mechanical tests to be carried out both before and after stranding. Slight modifications have also been made in the galvanising test.

ISSUE OF £7 000 000.

The second issue of stock of the Central Electricity Board, to the amount of £7 000 000 in 5 per cent. stock at 97½ was offered for subscription last Saturday. The first issue (£3 000 000 of 4 per cent. stock, now quoted at about 80) was made last summer. The Board has power to borrow up to £33 500 000 and the Electricity Commissioners have now given consents in respect of £17 900 000 (£5 400 000 for standardisation of frequency and £12 500 000 for construction and acquisition of main transmission lines, etc.).

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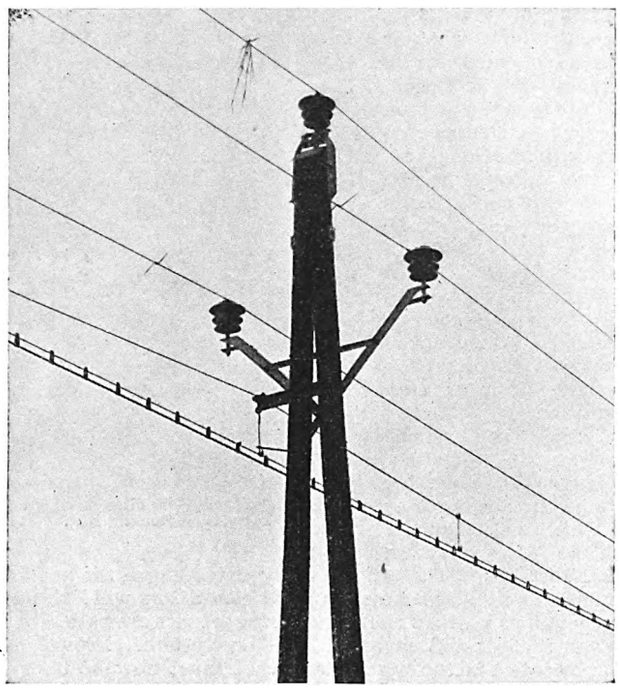
OVERHEAD LINES IN THE STORMS.

Little Trouble Experienced—Satisfactory Behaviour During Exceptionally Bad Weather—Danger from Falling Elms—Advantage of Weak-necked Insulators.

IN view of the exceptionally stormy weather of the past few months and the severe testing to which overhead transmission lines have been exposed, we asked a number of chief engineers of power companies in all parts of the island to send us particulars of the behaviour of their overhead routes during the gales of the autumn and winter. Their replies for the most part may be summarised by the phrase "nothing of special interest to report"—negative testimony which is a remarkable tribute to the strength and reliability of the British overhead line systems. We give below extracts from some of the replies received, which are not purely negative in character :—

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Nothing of interest to report other than confirmation of our previous experience that, whereas a certain amount of pole settlement is to be expected on the more recently erected lines, those on which the ground has become thoroughly consolidated are



Straw guards used by the North Metropolitan E.P.S. Coy.

practically free from pole settlement. Trouble has been experienced through straw blowing along the line wires and bridging across the pin insulators, but this has been effectively met by the fitting of straw guards as shown on the photograph. These consist of a single strand of 8-gauge wire made off round the line wire about 2 ft. 6 in. from the line insulators and projecting 4 to 5 inches. The guards are usually fitted only in the vicinity of straw or haystacks, and on the southerly or westerly side of the pole, no trouble being experienced through other than south-west winds.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—The main transmission lines of this undertaking consist of 66 000 and 33 000 V net work with 11 000 V intermediate lines of an approximate length within the neighbourhood of 250 miles. From these, two hundred or so l.t. overhead village distributions are supplied. During the period of November, December and up to time of writing the Anemo Biagraph at our central control registered the following maximum wind speeds: November 11th, 64 miles per hour; December 6th, 68 miles per hour; December 12th, 62 miles per hour. Directions of wind mainly south-westerly. Although supports on various sections of lines were flooded up to a depth of 5 ft. there is no instance on either e.h.t. transmission lines or l.t. distribution lines where trouble occurred due to constructional collapse under adverse conditions. It is the standard practice of this undertaking to fit foundation baulks on all single pole e.h.t. lines and this has undoubtedly assisted materially in preventing damage to the many miles of 11 000 V lines within our area. The only trouble has been due to dead branches of trees.

In the case of the 33 000 V line running between Gloucester and Cheltenham, it was decided, on account of the possibility of salt deposit, to insert an extra insulator disc, and insulation on this line gave no trouble whatever.

MID-CHESHIRE ELECTRICITY SUPPLY CO.—Our overhead system—consisting of 25 miles of 33 000 V lines, and perhaps twice that quantity of lower voltage lines—has so far stood up without any mishap. The only trippings which we have had during the windy weather have been due to a shunting ribbon on a 33 000 V isolating switch becoming detached from the other laminations and making an occasional earth on to an insulator spindle. This shows the importance of having woven flexibles instead of flat strip laminations or even straight flexible shunting wires. It would be interesting to know if low pressure lines put up since the spring of 1928 to the lower factor of safety allowed by the Electricity Commissioners have given any trouble.

TAUNTON CORPORATION ELECTRICITY DEPARTMENT.—We have had no serious trouble with our overhead lines during the recent heavy gales. In one case the bough of a tree caused a short circuit on a low tension distributor but did not bring it down. A 7/12 S.W.G. galvanised steel e.h.t. line with spans of 400 ft. in a very exposed position gave no trouble whatever.

TORQUAY ELECTRICITY DEPARTMENT.—No great or extensive damage was experienced. The weather has been such that by the perpetual rain and intermittent wind storms, it gave any structures a very severe test, inasmuch as the foundations were soaked to such an extent that the bending moment reaction was considerably reduced. About one mile of one of our main transmission lines "went over with the wind" to an angle of 60 degrees, but the job in question was comparatively new, having been placed in commission last July. Therefore, the pole-hole reinstatement, which was replaced during the dry summer weather, had had little chance of getting firmly "bedded in." This feature shows the inherent weakness in a single pole line construction, inasmuch as all the factors under the control of the designer are more than able to withstand a wind storm up to 100 m.p.h. with perfect confidence, but the ground reaction is incapable of standing up to the stress unless special care is taken in respect to the foundations.

We on the south-west coast were exposed to the full force of the various storms, with the result of finding another weakness—the elm tree, which is very common in Devonshire.

The foregoing is the result of inquiries in respect to two separate incidents experienced with regard to two secondary lines. In both cases, the transmission was interrupted by elm trees having been uprooted and falling across the line, which brings out another important point in respect to the layout of a job near elm trees—i.e., keep away from them at least a tree and a half length, because sooner or later they will come down and cause trouble. When the trees came through the lines the porcelain insulators merely snapped off at the neck and liberated the line, with the result that the line poles were little affected. It seems desirable that this should be a feature of insulator design, and a weak-necked insulator should be fitted where there is any likelihood of trees being blown down across lines—i.e., actually design the insulators to break off at the neck when the lateral stress is greater than the prescribed legal standard.

AYRSHIRE ELECTRICITY BOARD.—In this district we have had gales continuously for the last two months, but as far as the velocity of the wind is concerned we have had no breakdowns. We have had trouble, however, on a particular transmission line which runs along the coast, due to the wind blowing the sea salt on to our insulators and causing them to flash over. Although these lines are working at a pressure of 11 000 V the insulators are designed for 25 000 V. In addition to gales we have had rather severe lightning and on a number of occasions the lightning has struck our transmission lines, causing our automatic switches to operate. Our experience is that lightning occurring in the winter is very much more severe than that occurring in the summer.

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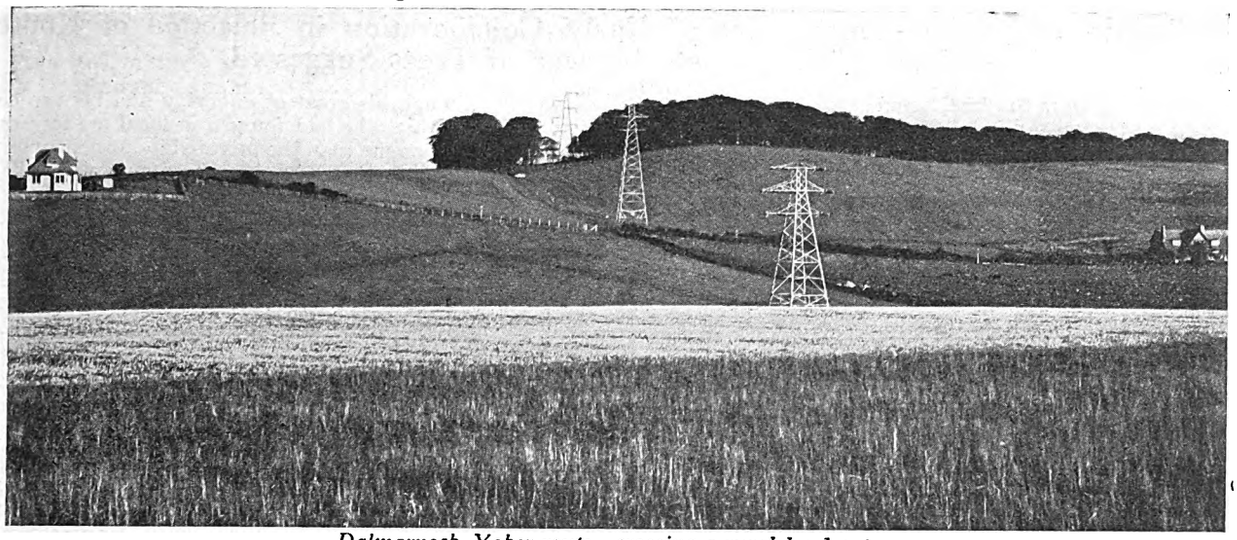
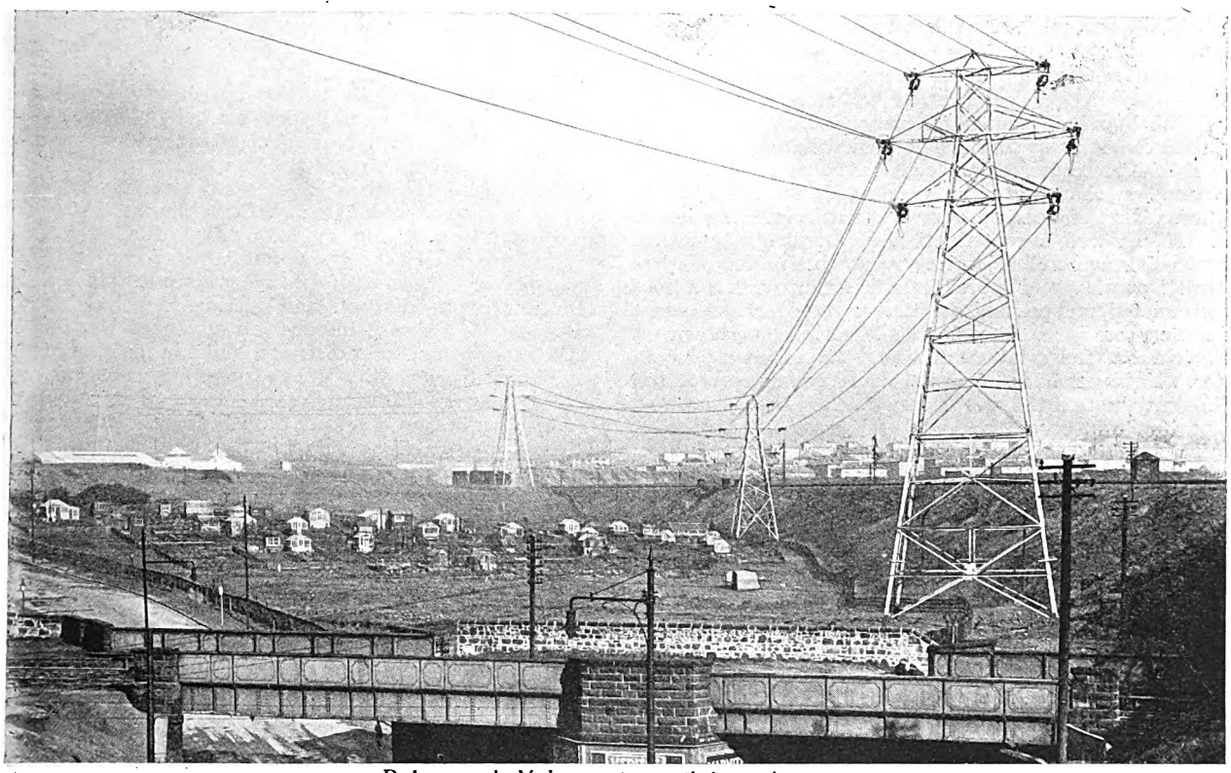
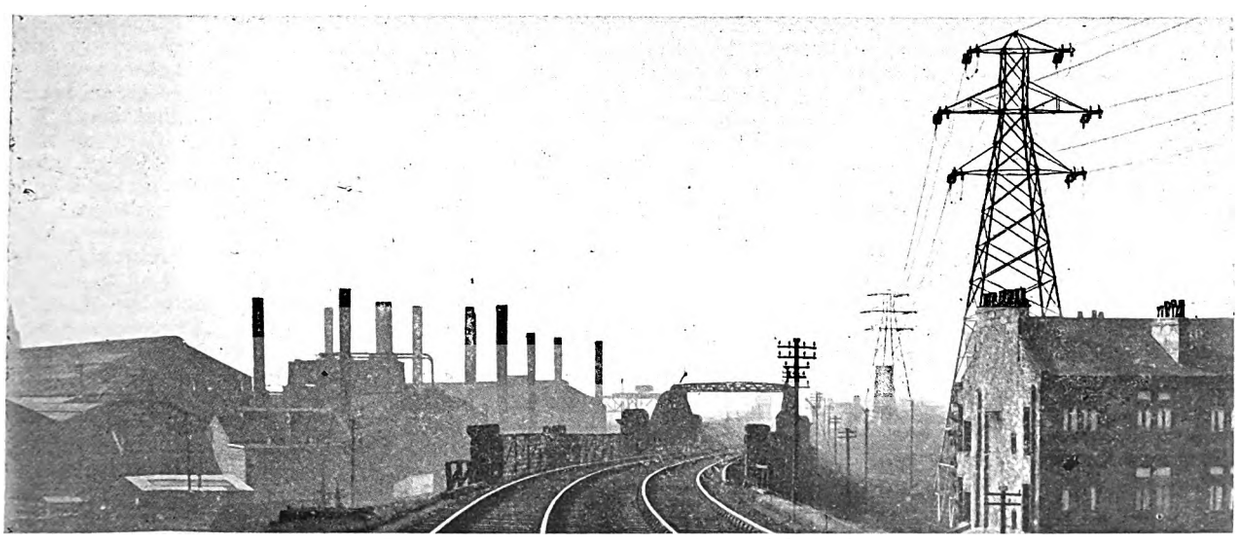
VIEWS OF THE GRID IN SCOTLAND.



Dalmarnock–Yoker route—crossing a rural landscape.



Dalmarnock–Yoker route—outlying urban area.



Dalmarnock–Yoker route—an industrial district.

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OVERHEAD LINES AND RURAL AMENITIES.

A Valuable Discussion—Importance of Early Collaboration in Selection of Routes—Colours of Insulators—Screens of Trees Suggested.

ON January 15th, at the Institution of Electrical Engineers, a joint discussion took place between the Overhead Lines Association and the Councils for the Preservation of Rural England and Wales on the subject of the distribution of electricity in rural areas and the preservation of the amenities of the countryside. On December 15th last, the Councils for the Preservation of Rural England and Wales placed a report on this subject before the Ministry of Transport, and some reference was made to this report during the discussion.

Mr. Theodore Stevens (President, Overhead Lines Association), who was in the chair, opened the discussion with a general statement of the circumstances which led to the formation of the Overhead Lines Association, and emphasised the point that its objects are to develop the distribution in rural areas on economical lines, at the same time co-operating, to the fullest extent, in preserving the amenities of the country.

Mr. Stevens, in asking the representatives of the Councils for the Preservation of Rural England and Wales and others interested in amenities to state their case fully and frankly, said the object was to consider how it was possible to crystallise the hope expressed in THE ELECTRICIAN of January 10th, that practical steps might be taken to substitute close collaboration for controversies.

Wayleave Difficulty.

Mr. C. W. Marshall (Central Electricity Board) said that the greatest difficulty in connection with the grid scheme had been in obtaining wayleaves, and called attention to the unfair Press campaign that had been conducted, for instance, in connection with the lines that were to run across the South Downs. He showed a reproduction of an illustration that had appeared in a London journal, purporting to depict what the South Downs would look like when the overhead lines were constructed, and pointed out that if the overhead cables were in the same proportion to the landscape, as shown on that illustration, the conductors would be about 15 in. in diameter. Lantern slides of actual construction emphasised how different the real thing is from what had been suggested in this particular instance.

Mr. W. Fennell (Mid-Cheshire Electricity Supply Co.) showed a number of lantern slides indicating what had been done in his area in regard to secondary transmission at 33 000 V, and drew special attention to the manner in which the pole lines blended with the general surroundings and did not even put any land out of cultivation although they ran across arable land. One slide showed poles carrying 3 000 V lines at the top and the low tension distribution lines below. This avoided running two pole lines to supply a village, and was, he thought, a line of development that should be encouraged. The particular line illustrated had been sanctioned although there had been a certain amount of difficulty with the Electricity Commissioners. Referring to the Report of the Council for the Preservation of Rural England (Schedule B), Mr. Fennell said the suggestion was made there that this particular Council should be added to the list of authorities to whom plans and details should be submitted when any scheme was contemplated, the suggestion also being that there should be a sufficient period of delay to enable this body to consider any such scheme before it was proceeded with. He objected to that as another of the obstacles that had to be overcome in connection with rural electrification and felt that it might be done in a better way. The method he proposed was that the engineer responsible for any scheme should collaborate with those concerned with amenities in the very early stages before the scheme actually got on to paper in any detail. In that way it should be possible for such an organisation as the Council for the Preservation of Rural England to assist the supply authority to obtain wayleaves and thus keep lines away from the public roads, where they were more objectionable than if they were carried across the country. He therefore suggested that collaboration between the supply authority and those responsible for amenities should be a general and not a formal thing. Indeed, he felt there was an obligation on the C.P.R.E. to assist in this way and to arrange that somebody should be available locally with whom this collaboration could take place.

Mr. B. G. Drummond, who showed some illustrations of overhead line work that had been erected in East Anglia, said that although his greatest difficulty had been in connection with wayleaves, he had found the local authorities were much less troublesome than the private landowners in granting wayleaves. A line that had just been completed between Ipswich and Stowmarket, at 33 000 V, was dead straight for more than six miles. He believed this was one of the longest lengths of straight line in the country, and in that case there had been no difficulty in getting the necessary wayleaves. The line had been in operation for two or three months and the local residents now regarded it as a permanent feature of the landscape. In his company's Essex areas, in the case of one important line, all the wayleaves except one had been obtained, and as it was necessary to appeal to the Minister of Transport over it, there would probably be a delay of three or four months and supply to the villages to be served by this line would be held up. It would be an excellent thing if there were local representation of such a body as the C.P.R.E., with whom the supply engineer could collaborate in the very early stages of any proposal.

Major Theodore Rich remarked that in this country we were in about the same position as regards rural electricity supply that the Continent was in before the war, because there had been greater obstruction to getting electricity to the farm and the countryside than there had been on the Continent. It had frequently happened that a local authority would refuse to allow an overhead line to be constructed and at the same time complain of the high cost of electricity, which was due to the cost of having to place the line underground. In France no fewer than 21 000 villages were receiving an electricity supply, a good many of them before the war. After the war, the French Government, guided by men of many years experience, appreciated that it was not a question of generation or super-power stations or of massive grids, but that it was purely a matter of distribution and getting the electricity to the villages. As a result, money was advanced without interest in the case of the poorer districts, whilst in the case of the more populated districts, the necessary money was advanced at interest and amortisation, and so it was that 21 000 villages in France now had a supply of electricity. In some parts of Northern France from 70 to 90% of the population had a supply, whilst in Germany he believed there were 35 000 villages which had a supply of electricity. As regards Holland, which had been mentioned, that was a country where the subsoil was extremely bad and it was difficult to find planting places for poles. The atmosphere on the coast was also such that there was great trouble with insulators, and that was why so much of the 10 000 V lines in Holland were placed underground. Major Rich showed a number of lantern slides of concrete pole work on the Continent.

Architectural Features.

Mr. Clough Williams-Ellis (president, Council for the Preservation of Rural Wales) said there were very few places in which he would not welcome the centrifugally cast posts that had been shown by Major Rich. Incidentally, he added that he had little doubt that in course of time these overhead transmission lines would all be placed underground. He would rejoice if that were the case, but there would still be certain other things left above ground, such as transformer and sub-stations, and it was to be hoped that the architectural features of these would be made to fit in with the surroundings. He did not think it fair to describe the C.P.R.E. as another obstacle. Everybody recognised that electricity supply must come and for the moment by way of overhead lines, but what the C.P.R.E. sought to prevent was unnecessary uglification. Moreover, it desired to help to prevent irresponsible criticism of electricity supply schemes by means of overhead lines, and if only those who were responsible for these schemes would go about the work with some tact and some regard for the amenities of the country-side, with some goodwill and small concessions, there would not be a great deal of criticism. Many districts were already satisfied with the exception of the matter of the insulators, a small point, perhaps, but yet one deserving of some consideration. Why use white insulators which showed up so on the country-side? If there were no technical objection, he suggested that green or brown insulators would be better. What the C.P.R.E. asked for was to be informed when new schemes were contemplated and not

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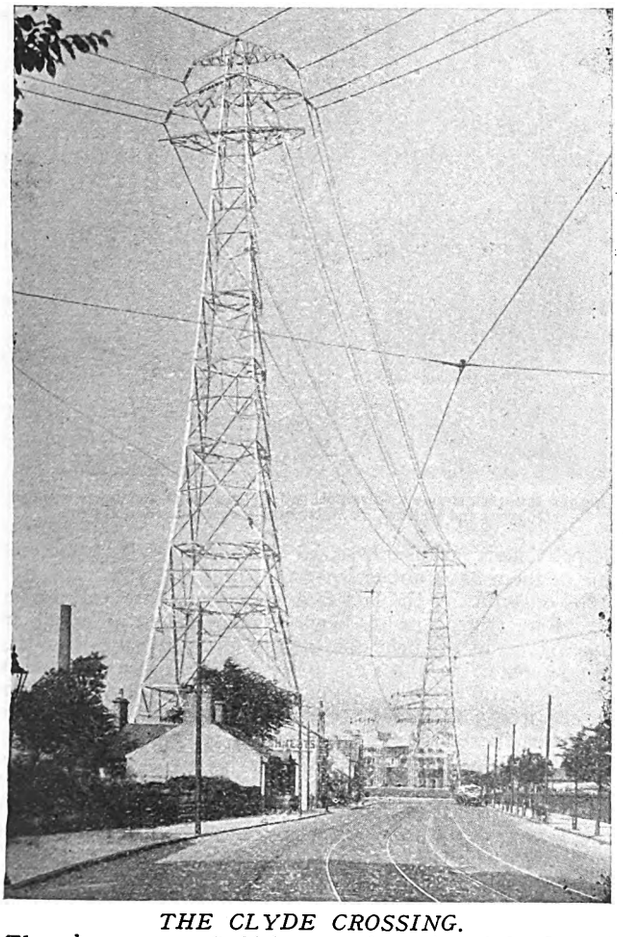
necessarily to be given complete drawings, because, as an architect, he knew that by the time the drawings were out things had gone a long way and it might be difficult to make modifications. If, however, the C.P.R.E. representatives were consulted in the very early stages, it would often be possible to agree on a route and thus facilitate the work in a very marked way. There had already been many cases in which that had been done to the general satisfaction, and he regarded the suggestion made by Mr. Fennell in that connection as worthy of acceptance.

Mr. S. C. Bartholomew (General Post Office) said that the Post Office was in a slightly different position from supply authorities, because most of their lines were along the highways and they were subject to some control on the part of the local authorities. A few cases had been taken to Court, but it had been very seldom that a decision had been given against the Post Office on the question of amenities. In some cases the difficulty had been overcome by the local people paying part of the cost of putting the line underground, and he gave



THE CLYDE CROSSING.
These towers, 270 ft. high, carry the mains of the Central Scotland grid across the river.

that as a suggestion to electric power supply people when they found themselves faced with wayleave difficulties and there was no other way out. He was inclined to think there was something in the point made with regard to coloured insulators.

Mr. W. A. Turnbull (Aylesbury) also spoke of the satisfactory manner in which he had collaborated with a representative of the C.P.R.E. in connection with the rural electrification work he has been doing in the Aylesbury district. In one case there was opposition, but the representative of the C.P.R.E., without knowing the route which he himself had previously chosen, actually suggested that very route as the best.

Sir Richard Paget, who is responsible for the C.P.R.E. electrical side, emphasised that the C.P.R.E. was entirely in sympathy with the idea of electrifying rural England. At the same time, it was felt that this electrification should be done in the best possible way. In the matter of preserving the amenities of the countryside and of assisting electricity supply authorities to obtain wayleaves without trouble, the C.P.R.E. could be of great assistance if only the supply engineers would consult that organisation at the earliest possible stage in any proposed scheme. Speaking on one or two points of detail, Sir Richard emphasised the need for consideration to be given to the design of poles and towers and suggested that anything in the nature of an Eiffel tower, construction was extraordinarily incongruous in proximity to old Elizabethan cottages, for instance. On the other hand, concrete construction in these circumstances could be perfectly congruous.

Mr. E. K. Scott said, in regard to transmission line towers and poles generally he thought that they could be made less objectionable if trees were planted round them to hide them as much as possible. He added that in 50 years all power lines would be placed underground, but in the meantime the supply must be got to the villages in the cheapest possible manner.

Mr. H. G. Griffen (secretary, Council for the Preservation of Rural England) confirmed the general attitude of his organisation on the question of rural electrification that had been outlined by previous speakers, and said that the representatives of the C.P.R.E. had always met with the greatest courtesy from the engineers to the Central Electricity Board, and the local supply engineers. He did not think Mr. Fennell, in speaking of the C.P.R.E. as an obstacle, could be aware of the constitution of that body. The Council of the C.P.R.E. had represented on it all the large municipal associations, the country council associations, and also all the large professional associations. He acknowledged the great assistance that Mr. Kennedy, of Messrs. Kennedy and Donkin, had been to the organisation, and said that the report that had been drawn up and submitted to the Ministry of Transport had been largely based on that advice and assistance. The C.P.R.E. had its own regional planning experts which had been sent to various areas and had been successful in obtaining modifications of proposals after consultation with the local electrical engineers, and in this way had prevented a great deal of local protest.

Mr. W. Fennell, replying to the comments that had been made as to his remark that the C.P.R.E. was another obstacle, said that he had spoken from the point of view of what was stated in Schedule B of the Council's report. The suggestion there, to which he had already referred, was an obstacle, in his opinion, to the rapid development of rural electrification. The suggestion that had been made by the various speakers that those concerned with amenities should get into touch at the earliest possible stage with the supply engineers was a different matter altogether, and if adopted would prevent the delay which he foresaw would follow from the adoption of the proposal in the report.

Mr. Griffen, interposing, said that it was at the request of the local authorities themselves that this proposal had been put into the report.

Mr. J. Edward Seager (Deputy Clerk, East Sussex County Council) spoke with the object of making clear the position of the East Sussex County Council in relation to the dispute with the Central Electricity Board and the carrying of overhead lines over the Sussex Downs. It was maintained that the County Councils should be heard in relation to these matters, and he suggested that in future, quite apart from the Electricity Act, County Councils should be consulted before definite steps were taken in regard to any proposal, instead of them being placed in the position, as they had been, of being told that wayleaves had been obtained and that no alterations could be made. Another difficulty was that the Board went on with its schemes piecemeal, and a County Council having obtained a modification to a part of a scheme, found that this very modification introduced further difficulties.

The President then proposed the following resolution which, he said, had been approved by Sir Richard Paget, on behalf of the Council for the Preservation of Rural England, before he had been obliged to leave the meeting :—

> " That the Council for the Preservation of Rural England and the Overhead Lines Association agree to co-operate fully regarding the construction and location of power lines and all arrangements connected therewith."

Mr. Leonard Stanton, who seconded the resolution, objected strongly to the suggestion that engineers have no sense of beauty. He hoped the very educational discussion that had taken place would not be allowed to remain where it was but that a committee would be formed with the object of keeping all interested parties closely in touch with each other, so that, as Mr. Fennell had suggested, they could co-operate at the very earliest stage in regard to any proposals.

The resolution was carried unanimously.

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RURAL ELECTRIFICATION.

Early Obstruction—Spread of Broader Views—An Asset if Carried Out on Common-sense Lines—Varying Conditions at Home and Abroad—Choice of Voltage.

(FROM A CORRESPONDENT)

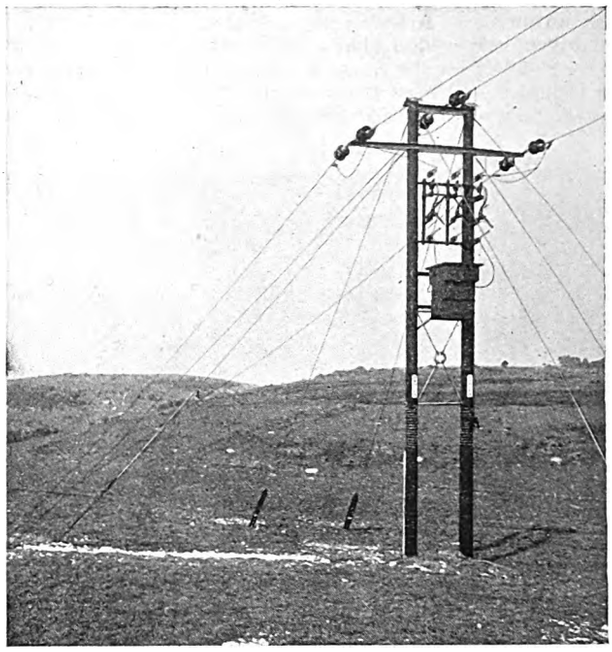
ONE can say without hesitation that Great Britain has been one of the last countries in the world seriously to take up the electrification of the countryside; we had no water power to stimulate the supply to rural districts near turbine power stations and, further, most of our early power systems were started in big centres, not merely because the direct current system, so much used at first, was not sufficiently elastic to supply rural areas, but also because the regulations on the one hand and the preliminary costs, the outcome of pettifogging obstructionists, were such that many who tried to go ahead were worn out with time-wasting worries.

At home, and also in some districts abroad, were to be found people connected with cable-making and other interests who were so short-sighted as to oppose by various means the erection of overhead lines, because they thought that by doing so they would encourage the use of more directly profitable cables; the capital cost of cables with the cost of laying being such that if overhead lines were not allowed thousands of villages and farms would not be able to afford the capital cost of the necessary mains at all. In some places the opposition to overhead lines in the past on æsthetic grounds was such as would lead one to presume that it was inspired.

In recent years in most cases the broader view has been spreading that a village supplied with electricity through overhead lines, that otherwise could not be supplied at all, could become a little centre of demand for house wiring materials and accessories, for small motors and household appliances, almost all of which would bring grist to the mill of those interested in wire drawing, cotton covering, rubber cabling and items required for house wiring. Firms which grasped the common-sense view practically from the start were Messrs. Johnson and Phillips, of Charlton, and Messrs. Crompton, of Chelmsford, undertakings which had done pioneer work overseas in the direction of overhead lines.

During the war many thousands of "Tommies" went around the North of France and Italy and found electric light in scores of villages and wondered why they had not similar facilities at home; even now some people travelling abroad have been heard to say that engineers in Switzerland or Italy must be much more up to date than ours because electric light is to be seen in so many remote places.

A few years back professional politicians jumped at the conclusion that an electrical millennium would come if only power stations were big enough, and some of those who had obstructed overhead lines suddenly became ecstatic over pylons and grids "to save agriculture," not realising that the sparser the consumers per square mile the greater the retailing costs; whereas with modern plant, large or small, it makes but little difference where the wholesale supplies come from.

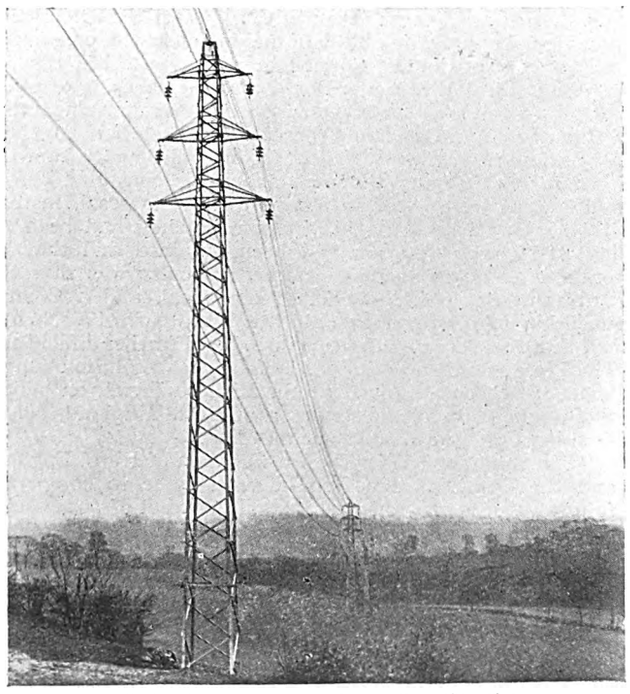


Rural transformer station with vertical pattern horn switch and bomb type fuse (Johnson and Phillips), on Portsmouth Corporation rural system.

The politicians, as usual, seized the wrong end of the stick; some of them have not grasped the right end yet.

It is only during the last five years or so that the problem of rural electrification has been seriously taken up at all, and quite a crop of applications for authority to supply villages are now made to the Commissioners each year; there is, however, one feature to be guarded against—rural electrification is not a gold mine. It is an absurdity to compare impoverished Britain and war-stricken Europe with America, where many natural resources have hardly been scratched. Across the Atlantic enormous wealth was made during the war, and in many parts money is so easily gained that people often leave on their lights for days because it is too much trouble to turn them off. Rural electrification can be an asset to the nation, when carried out on common-sense lines. Given encouragement at the start it can pay its way, but it cannot stand company promoters' inflated profits or boom-watered capital; it should be aided in every way, but viewed by the investor and the authorities in a proper perspective.

When telegraphs and telephones were first invented, overhead lines were used because air is such a cheap insulator; the metal conductor, a post every 50 to 100 yards, and insulators, and the line would operate satisfactorily. Some people have been heard to say that as the Post Office has installed thousands of miles of underground cables, electric power authorities should follow suit. Many of those who read about the effect of storms on Postal pole line circuits naturally assume that power lines must be equally vulnerable and, owing to the voltage used, many times more dangerous. In the first place, the demand for the passage of simultaneous communications has increased enormously, which involves the multiplication of conductors, despite multiplex working; it is now possible with the aid of valve amplifiers to utilise pairs of very light gauge copper conductors in paper and air space cables of a type and for distances impossible not so long ago, and, further, comparatively light gauge aerial conductors large enough electrically for communication duties are weak mechanically



Stockport-Macclesfield secondary section of the Grid.

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when subject to severe storm stresses.

Electrical power circuits have to carry amperes, not milliamperes, excessive voltage drops through resistance involve corresponding losses of energy worth money on the market; the much larger conductors used naturally have greater mechanical strength and, therefore, capacity to stand up to storms. The limit of voltage is that which the air will stand for a given conductor diameter and distance apart without severe energy losses through corona discharges; there is also the advantage with aerial conductors that the heating effects such as those imposed with cable transmissions do not so materially limit the amperage, which can be carried by a conductor of given size.

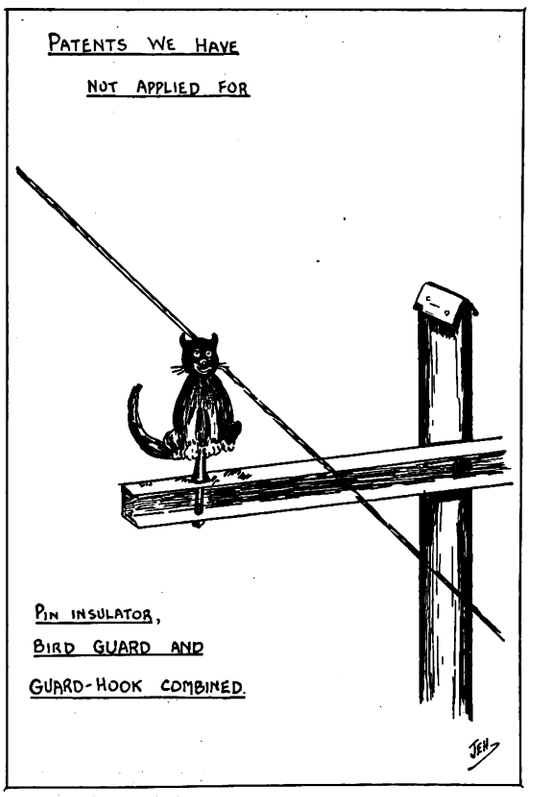
The engineering problem before those who plan overhead line systems is to use as high a voltage as possible consistent with line insulation, transformer and apparatus costs, as small a conductor as is mechanically desirable, having regard to the load to be carried, with the lowest cost for supports and wayleaves.

The minimum conductor is in most countries limited by regulations; at home No. 8 S.W.G. (or 0·201 sq. in.) for line conductors and No. 10 S.W.G. for service lines. In France 3 mm. diameter (0·0109 sq. in.) is allowable for high tension, although there are very many miles of 3·5 mm. diameter (0·0149 sq. in.) and 4 mm. (0·0195 sq. in.) line. (about 8 S.W.G.) in use on rural lines.

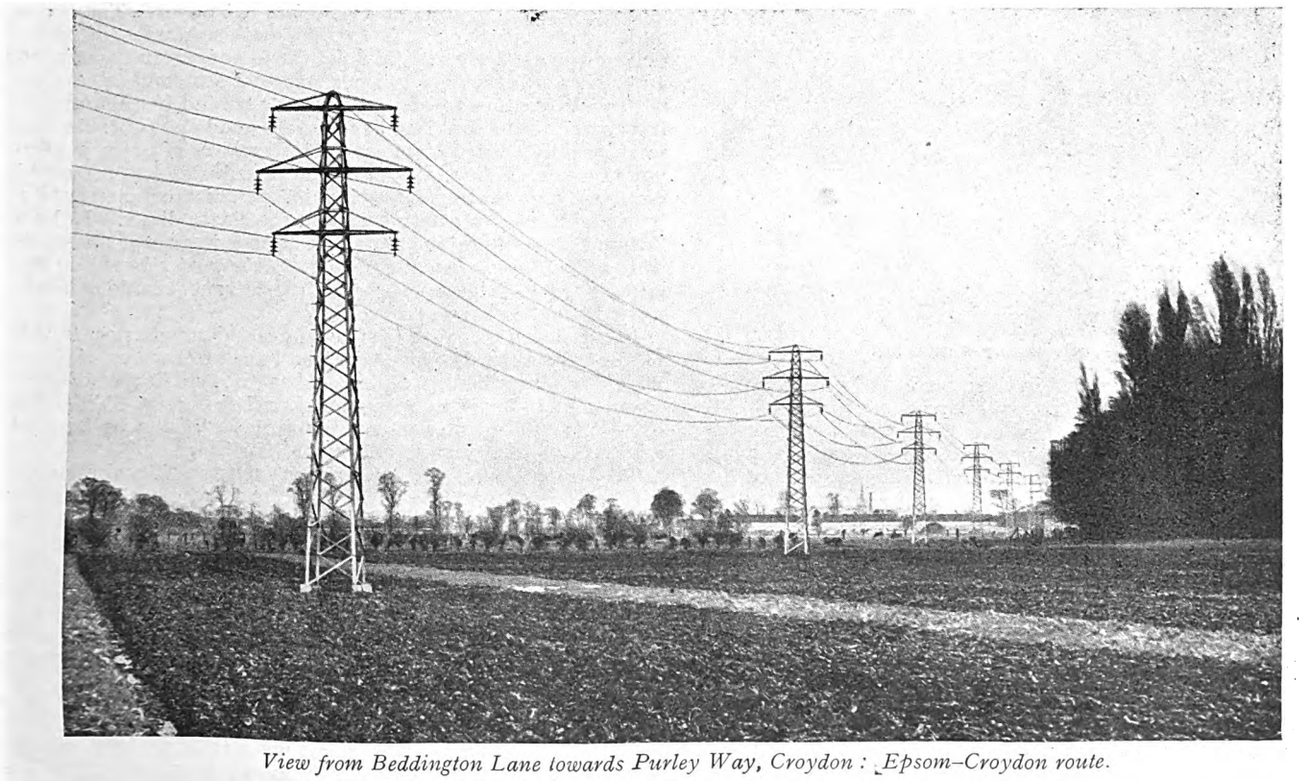
When comparing British, Continental and American H.T. rural distribution lines one must note that most British lines are cross-country and most Continental and many American are roadside. Owing to the necessity for arrangement and payment for wayleaves there is a tendency to use long spans at home, whereas for many roadside lines abroad, as curves may be met with, there is a tendency towards the limitations of spans, especially as in Belgium and France stays are objected to. The effect of ⅜ in. ice loading as a factor of design, as is the case at home, is to discourage the use of small conductors as a material increase in diameter does not so greatly affect the transverse load allowed for.

As a rule, up to lately, distribution and sub-transmission voltages were materially lower at home than abroad; the result being, within the desirable mechanical minimum, a reduction in conductor size in the latter as compared with the former. The average British line with its larger spans is, as a rule, heavier transversely than those abroad, although, with wood posts increased span involves increased height to allow for sag and minimum clearances from the ground, and the cost of poles after a certain point goes up much more rapidly than the length.

As regards voltage at home, 11, 33 and 66 kV seem to be favoured; there is some question, however, whether 33 kV is justified as a sub-transmission voltage; if heavy tower and lattice post construction is used for correspondingly heavy conductors, one may as well jump to 50 or 66 kV and have done with it. There is a possibility, however, that to a certain extent the rôle of semi-bulk distributor may be taken on by the Central Electricity Board, for which 33 kV has certain advantages. A tension of 11 kV has much to commend it for general rural work; it might have been, perhaps, a little higher with advantage; 3 000 V has some advantages for fen-land hamlets and scattered farm areas where only very small transformers are required.



THE GRID IN SURREY.



View from Beddington Lane towards Purley Way, Croydon: Epsom–Croydon route.

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CONCRETE SUPPORTS FOR RURAL AND TRUNK LINES.

Neat Appearance—Extensive Use on the Continent—The Centrifugal Process—Methods of Carriage.

(From a Correspondent.)

MR. J. H. THOMAS, in the House of Commons and elsewhere, has stated his desire to encourage the use of concrete posts for power and communication circuits, as a means by which employment may be increased through the use of home-made steel and cement and the employment of labour at home, as an alternative to the use of imported wood poles.

There has been lately a considerable and not entirely unjustifiable outcry by people of some influence in the country regarding the alleged disfigurement resulting from use of steel "pylons" to support the main grid lines, which are being put up almost from end to end of our little island. Some photographs of concrete posts in use abroad have been shown

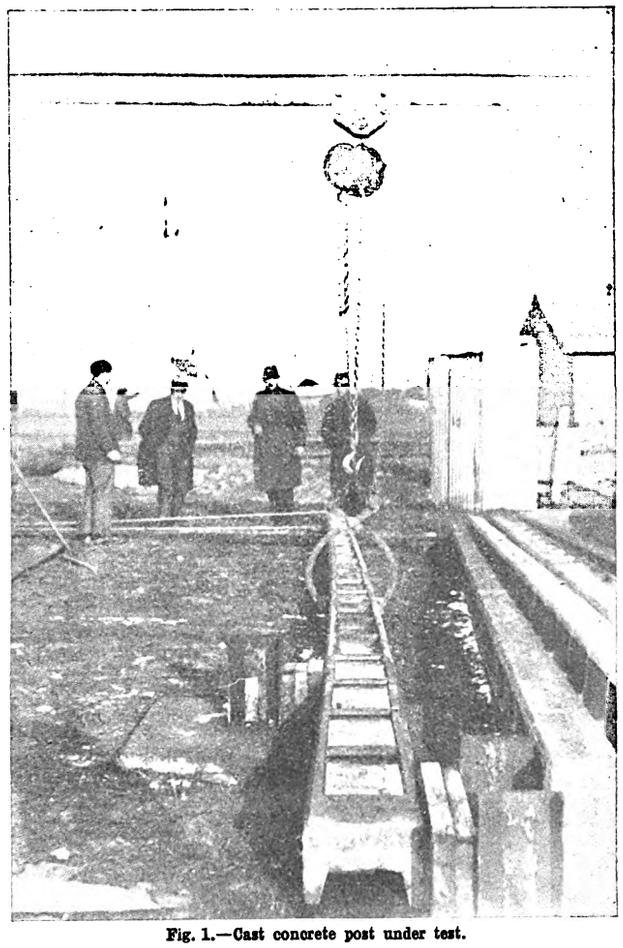

Fig. 1.—Cast concrete post under test.

to several of those interested in the question of rural amenities and considerable interest has resulted.

There is no doubt that, when well-made and properly designed, a post made of concrete can look quite neat and can blend well with rural surroundings. Some of the earliest posts made of concrete were used to support tramway trolley wires; they were somewhat clumsy. Twenty odd years ago the problem was taken up by M. Delamarche, the director of a cement company in central France, as it was evident that, apart from other questions, power posts of concrete form such an obviously good advertisement for the all-round use of cement.

Various patterns of cast concrete post were evolved, in section rectangular, hexagonal, U-shaped, boxed out rectangular and other types; it must be remembered that the French Government department of "Ponts et Chaussées" and its engineering school had much to do with the birth of the art of making armoured concrete; so it is not astonishing that a Frenchman was a pioneer in this direction.

By 1914, some posts, 40 ft. high, scientifically designed, were being made in the north of France for transmission line work. A little later, a system of the centrifugal casting of poles was started in Germany at Dresden, and some results of remarkable interest were obtained.

During the war, owing to the difficulty of getting good power line timber, considerable interest was taken in the use of concrete for such purposes; and later on, the development of higher-grade commercial steel, the manufacture of more rapid-acting and high-resistance cements, and increasing troubles through the rotting of war-time and pre-war poles, still further increased the development of what is in some countries quite an industry.

Systems of Pole Making.

There are various systems of pole making and distributing. As a general rule, posts for distribution voltages are cast, and those for trunk transmission work are made by the centrifugal process. Concrete posts are in use in France, Germany, Italy, Belgium, Spain, Austria, the United States, New Zealand and Brazil. Cast posts may either be made at a central works, or when ordered in some thousands for one area, can be made at some temporary local depot convenient for the supply of gravel, steel bars, and cement, or in some cases each individual post is cast on site alongside the hole into which it is to be placed. This system, naturally, has the most attractions when the aggregate is obtainable almost on site; that is why it has had some vogue in Austria for heavy power transmission and for the single-phase power supplies for railway traction.

A number of power companies are using concrete posts or wood posts with concrete bases for practically all their new work, primarily because the danger of deterioration is so small when made by competent firms. The trade has so much expanded in France, a country with many forests, that a special trade association has been formed to look after its interests.

There must be at present in use in France alone at least 700 000 cast concrete posts for power work, for voltages up to 50 kV. By the use of rapid-acting Portland cement or albuminous cement moulds can be used once every 24 hours, and the cost of manufacture therefore cut down. The art of making concrete posts, as in many other classes of work, depends on good organisation and the use of carefully designed appliances and tackle. It is strange that England, a country with very few forests, should be so far behind in this matter, but among the reasons is to be found the good class of creosoting work usually carried out for the preservation of poles, general ignorance regarding the use and attributes of armoured concrete, and the regulations which penalise concrete posts, by a high factor of safety based on the elastic limit. In New Zealand also, where but little pole timber is grown, and most of it has to be imported, a factor of safety of 2 based on the crippling load is accepted; such regulations enable concrete work to make progress.

Fig. 1 shows 10 metre (32 ft. 9 in.) cast concrete post, under test, of the type developed by the Sanca Company of Paris, which has supplied two-piece posts to the Corporation of Basingstoke, joined by means of a steel fishplate. This type of post is handy for cross-country work, as it can be handled across fields in two parts and bolted together.

The hair cracks, which appear on the tension side when under severe test, do not injure the pole, as they close up again; under a crippling load the work done in crushing the aggregate against the armouring usually makes the test strength somewhat greater than that theoretically obtainable.

The cast posts which are made of aluminous cement are somewhat blue brown in colour.

Owing to the foggy climate in some parts and the existence of white ants and other pests concrete posts are being used to a material extent for power work in Morocco and Algeria.

Centrifugal Posts.

The centrifugal process was first taken in hand in Germany before the war, posts are made up to about 95 feet in length. A squirrel cage of iron bars is wound round with wire in a sort of lathe on a collapsible spider; the wire spiral is tied into the bars in a number of points with fine wire; the

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TYPES OF CONCRETE POLES USED IN ITALY.

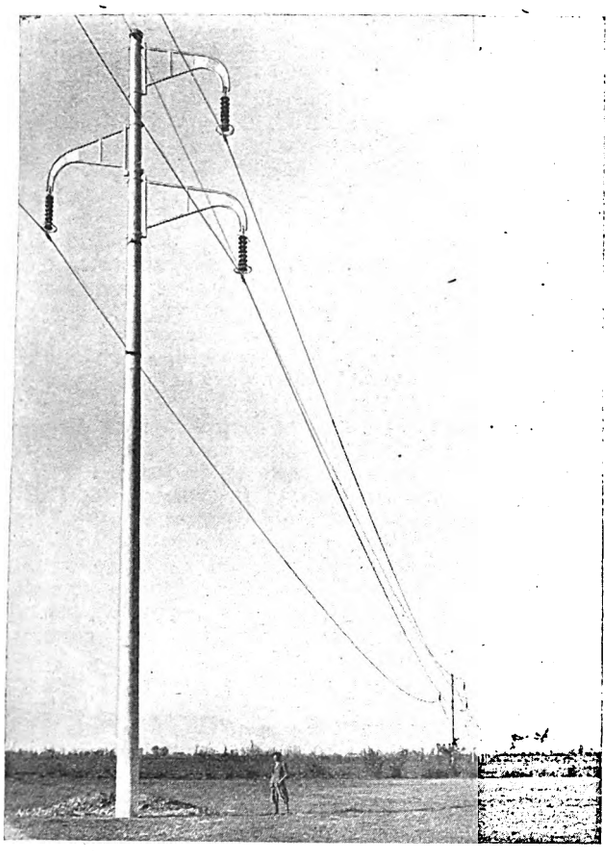

Fig. 2.—135 000 V line, straight section, Cornuda-Mestre.

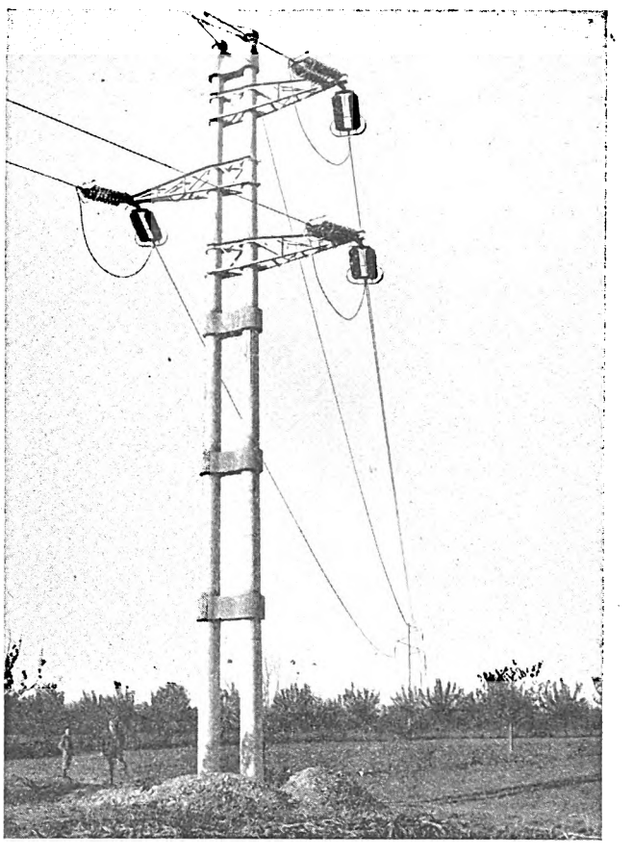

Fig. 3.—135 000 V twin angle pole, Cornuda-Mestre.

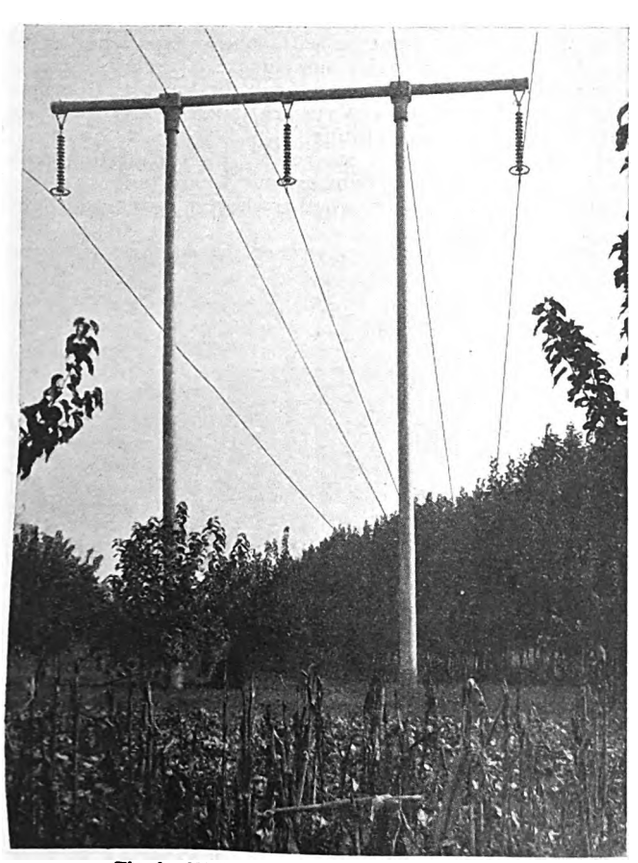

Fig. 4.—220 000 V line, straight section, Fiume-Cislago.

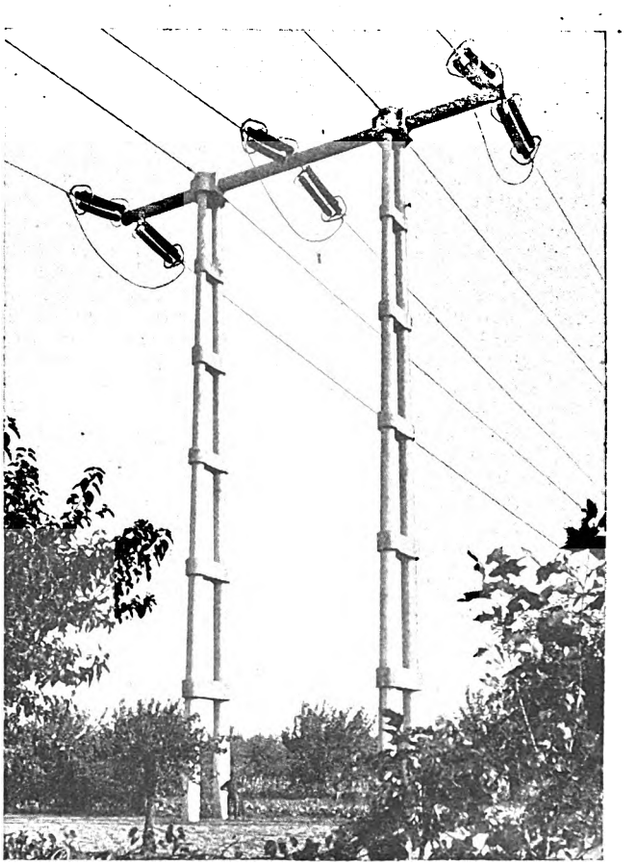

Fig. 5.—220 000 V angle or anchor support poles, Fiume-Cislago.

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skeleton is placed in a steel-reinforced wood mould, the concrete mixture is put inside in the constituency of a pudding, the mould with the skeleton is revolved at high speed inside a series of rings fitted with clamping devices like the iris diaphragm of a camera lens. The centrifugal force drives the cement mixture to the outside and forces it between the bars and binding wires giving a smooth outer surface, the hollow inside being formed without any internal mould.

The moulding arrangement has to be the full length of the pole and therefore the plant is heavy. After casting the green pole is lifted at several points and put in a bed with sand

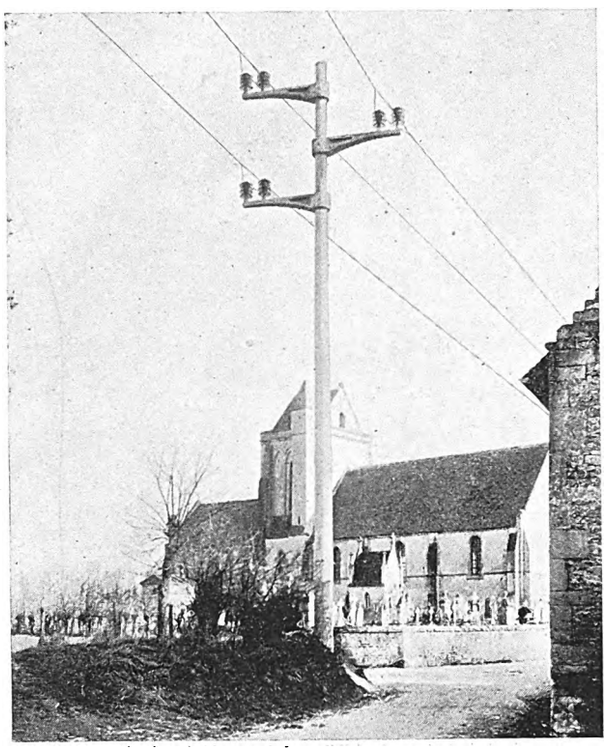

Fig. 6.—Centrifugal concrete post in a French village.

to mature. As centrifugal posts have to be made at a central depot, railway or other transport charges become an item and, therefore, the centrifugal system has developed in the main for lines of a transmission character which can stand heavier freight charges. Such posts have been sent by train ferry from Saxony to Sweden and posts made in France have been sent to Belgium. They are carried along roadways by a modified timber trolley or by turntable motor lorries with trailers.

Some people might think that it was impossible to handle long concrete posts, but experience has shown that with carefully trained gangs of men all sorts of difficulties can be surmounted; motor tractors have proved to be very useful, not merely for hauling poles on to the site, but also for use for operating lifting tackle.

Fig. 2 shows a straight line post in Italy used between Cornuda and Mestre; Fig. 3 is the type used for angle and anchor section. The posts are 22 to 26 metres (about 73 to 86 feet) in height, the conductor is 198 sq. mm.—·36 sq. inches, and the average span 200 metres. Tension 135 kV.

An interesting line runs from Fiume to Cislago; the tension is 220 kV. Fig. 4 shows the normal line structure. The height is 18 metres (about 58 feet) from the ground, and the cross arm is 15 metres long.

The conductor is of a high tensile aluminium alloy known as "Aldrey," 380 sq. mm. in gross section; there are two earth wires of galvanised steel, each 70·5 sq. mm. section. Average span, 260 metres.

Fig. 5 is the type of structure used for angles or anchor points. These posts were made by the Societa Cementi Armati Centrifugati, of Trient, Northern Italy.

Centrifugal posts for over 1 100 miles of H.T. line have been made by this company, it has also made tubular concrete structures for H.T. outdoor sub-stations and numbers of posts for trolley traction on the same system, besides many posts for the telegraph services in Italy.

Fig. 6 is a centrifugal post on a line between Argentan and Caen in France. The pressure is 90 kV, the normal span is 180–190 metres, and the posts are 18 to 23 metres long overall. The insulators are of glass.

As the brackets are of armoured concrete also, with the exception of the insulator pins and V-shaped guards which are only required at road and telegraph crossings, there is nothing to rust.

Concrete Post River Crossing.

An interesting utilisation of centrifugal concrete posts can be seen in Fig. 7, a crossing of the river Seine below Paris by 12 conductors forming four circuits, each conductor having a section of 105 sq. mm. (·166 sq. inches). The situation was such that owing to the existence of a towing chain in the river it was not desirable to lay cables on the river bed. There is a railway bridge alongside which is very old, known as the Pont des Anglais, and it was feared that heavy vibrations might injure any cable and sheathings. It was, therefore, decided to cross the river at a height well above navigation requirements and in order to avoid periodical painting costs armoured concrete was decided on for the supports.

The arrangement is designed to give a clearance of 17 metres (55 ft. 9 in) above the highest navigable flood level. There is a copper earth wire of 50 sq. mm. (·077 in.) above each group of these conductors.

There are two main spans, the central support being placed on an island in the river, it is 26·75 metres (87 ft. 9 in.) high. It is composed of three twin posts and is designed to stand a cross stress due to the angle of the conductors of 9 tons. There are three twin posts, the cross arms are 14 metres 37 ft. 7 in.) long, with spans of 164 metres and 176 metres The posts are cast separately, joined together on the spot with armoured concrete clamps and erected in pairs, each pair weighing 26 tons. Considerable care had to be taken to get the posts on site; they were delivered from the works by rail, then put on to lorries with trailers, put on to barges and taken over very soft ground, in the case of the central support, and then erected on solid bases. These posts were supplied by the Forclum Co. of Paris (Société Francaise des Potaux Electriques), for the Ouest-Lumière Company.

There has been a good deal of opposition to the use of pyramidal lattice steel structures on the Grid system which might have been lessened if concrete had been used.

In the first place our regulations as framed are distinctly hostile to armoured concrete, and, further, by demanding tower strengths and torsion stresses greater than found necessary in other countries with longer experience of pole line construction (although our climate is certainly troublesome), it so happens that it is difficult for concrete to compete despite the fact that supports are much neater than steel work, and require no painting.

If it was a question of 220/300 kV then insulating points should be minimised in number, but where only 132 kV is concerned it is a question whether shorter spans and lighter

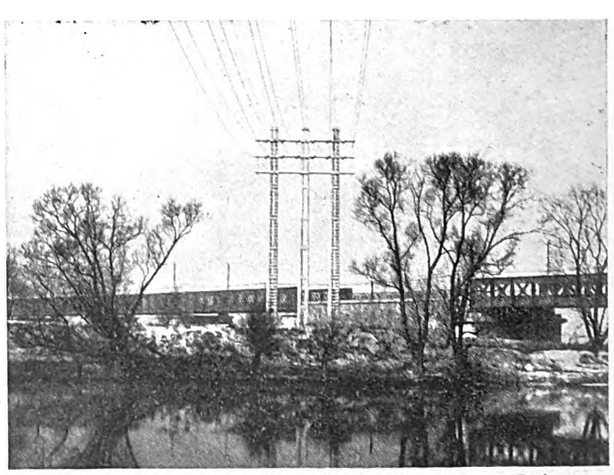

Fig. 7.—Triple concrete post crossing over the Seine, near Paris.

supports are not more economic as a whole than long spans and high towers—they certainly are not so conspicuous.

For trunk and transmission line work centrifugal posts are used very largely in Italy. About 500 miles of line over 30 kV have been erected so far. Centrifugal concrete is being used also for ornamental street lighting standards in Italy, France, Germany and Poland, and these look very neat.

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AERIAL SECTION SWITCHES ON 15 KV RURAL NETWORKS.*

Desiderata for Satisfactory Switches—Use of Strain Insulators—Effect of Wind Gusts.

By Dr. H. OSTEN, Markisches Electricitatswerk A.-G.

IN spite of the already considerable value of section switches on aerial rural networks they would be more useful still if they were not so often liable to get out of order; the problem is troublesome, as most failures are not visible from the ground, especially at night.

The use of oil switches in builder-made cabins is too great an expense for rural areas; operating conditions encourage the use of ring circuits, which are mostly operated open, which

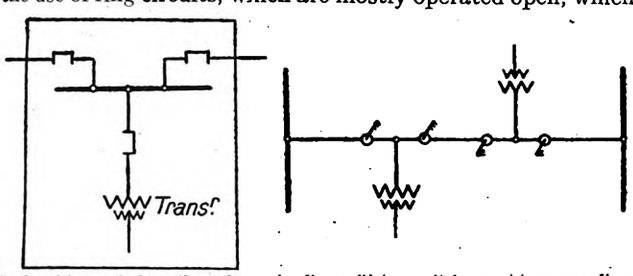

Fig. 1.—(*a*) Supply from through running line; (*b*) two switches on a transverse line.

can be closed or changed over by auxiliary switchmen at all sectioning points. Reliable aerial section switches are therefore required by supply authorities for medium voltages for rural lines, but although there have been many types, and new designs are put on the market each year, yet for a long time a good switch was badly wanted. The author, during 17 years on a 15 kV network, has had experience with 3 200 km. (about 2 000 miles) of line, twelve firms have supplied 654 switches, about one for every three miles. In the year 1928, 34 switches were deranged, in 27 cases concerning insulators. Derangements of such switches involve about six hours' work for replacements, and the cutting off of village networks; rural customers look on all such troubles as being serious. Often with village systems, arrangements are made to supply from a through-running line, to enable current to be obtained from either side; in such cases a built cabin is often used; for such conditions the arrangement shown in Fig. 1(*a*) is useful.

Instead of a cabin with three switches, two post-supported aerial switches can be used. Fig. 1(*b*) shows two such stations on a transverse line; with this arrangement the line can quickly be split up into sections. It is important to note that failure of section switches may result in great danger to linesmen, as, even when a switch is open, the line may be alive; in one such case an insulator cap was broken, making contact with the switch framework.

To prevent such a danger, it is desirable to earth the framework at the support through the neighbouring pole and earth the operating lever at ground level. [German medium tension lines are usually arranged without earth wires.]

The following are the desiderata for a good aerial switch:—

1. It must be possible to operate it under load with at least 50 amps., preferably 100 amps., even during snow or rain.
2. There must be a very large gap between contacts when opened, to prevent danger of leaving the line alive through birds or some entangled object.
3. When opened, it should be constantly earthed.
4. It should be arranged so that it cannot open by itself, for example, under great cold.
5. There must be double support on each side.
6. The use of caps on insulators or insulators with holes for bolts, etc., often leads to operating failures, other means of fastening must be utilised.
7. The position of the switch, "on" or "off," must be visible at the pole at a convenient height for the eye.
8. The rod for operating the switch must be light in weight, but not easily bent.
9. The switch should only require easily replaceable spare parts, taking up but little space.
10. The knife blades must not fall backwards; in other words, gravity should not tend to open the switch.

A.E.G. aerial switch, Fig. 2, has been designed to fulfil these requirements.

The A.E.G. Co. believes that, in order to obtain safety, a strong construction from the mechanical and electrical points of view is necessary to stand up to bad weather and rough handling. The switch has two sets of contacts, opening outwards, mounted on rocking arms. To carry the swinging insulators, perforation-proof insulators are used (made on the same principle as those shown in Fig. 2 on page 134). Strong iron caps are used to carry the contacts which are fitted with short horns. The special pins which carry the insulator cup supports are screwed to heavy castings; the crossbar is supported in bronze bearings. The line strain is taken off the moving insulators by means of strain insulators, and the switch is so constructed that the contactors open outwards, giving a space of 650 mm. (about 26 in.) to prevent bird troubles, etc. The jumper connections between the switch contact and the line are made of flexible copper cable, 50 sq. mm. area, held by means of special spirals so as to maintain their proper distance away from earthed parts. The switch is operated through a rod of bar iron with special springs to minimise mechanical shocks; it is divided into two sections through an insulator and is operated through a lock-up hand lever. The switch is made for 15 and 25 kV, and it is tested under an artificial wind to open under 100 amps. The above particulars and illustrations have been supplied through the courtesy of the A.E.G.

It is of interest to note the improvements which have taken place in the course of 20 years in the details of aerial

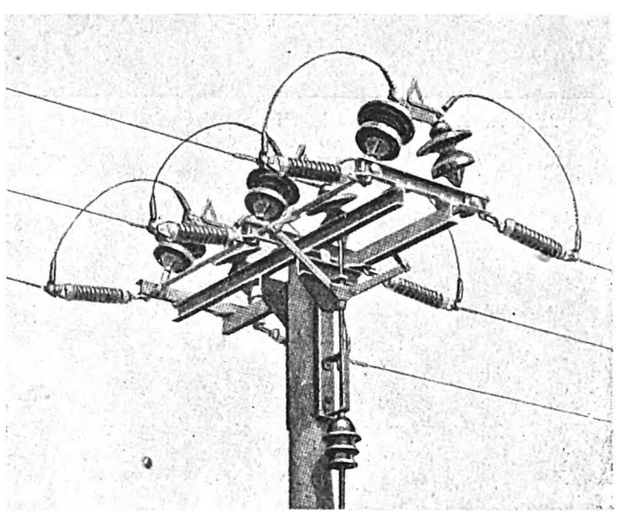

Fig. 2.—A.E.G. aerial switch.

switches, and to see how makers in different countries tackle similar problems.

The firm of Maljournal and Bourron, of Lyons, now absorbed in the French Grammont group of companies, well before the war also made an aerial switch with diverging swing contact on a channel frame; the contacts were carried by caps with somewhat long horns, the strain was taken off the swinging contacts by a second set of pin insulators placed on an extension of the steel frame instead of using strain insulators and jumpers, the latter of course, making a better job. The operating rod was also insulated but the new German pattern has improved guides to the operating rod; it is interesting to note, however, how many of the fundamental points of a switch recently turned out were anticipated 20 years ago.

In England, owing to the effect of wind gusts on jumper connections, the contacts are often connected to the fixed insulators by means of cable passing over hinged arms.

Aerial switches are not opened very frequently, and in some countries ice and sleet give trouble because the contacts may freeze together, so in America special sleet cutters have been fitted, for some time, to aerial switches; in France one make of horn switch has one fixed set of contacts and one that slides back; the latter having a slight upward movement as they begin to move back, the compound motion tending to shear off the ice.

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* From the A.E.G., Mitteilungen.

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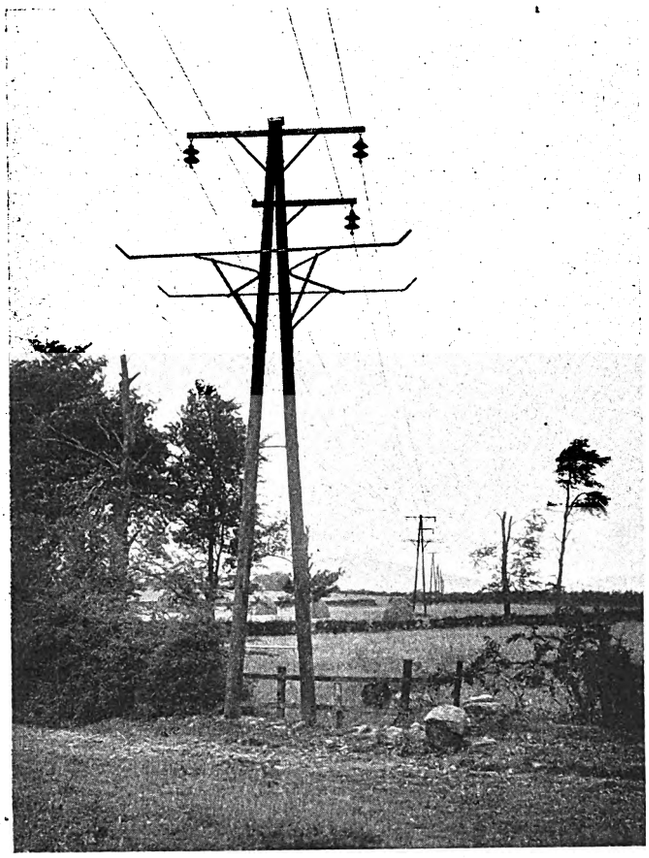
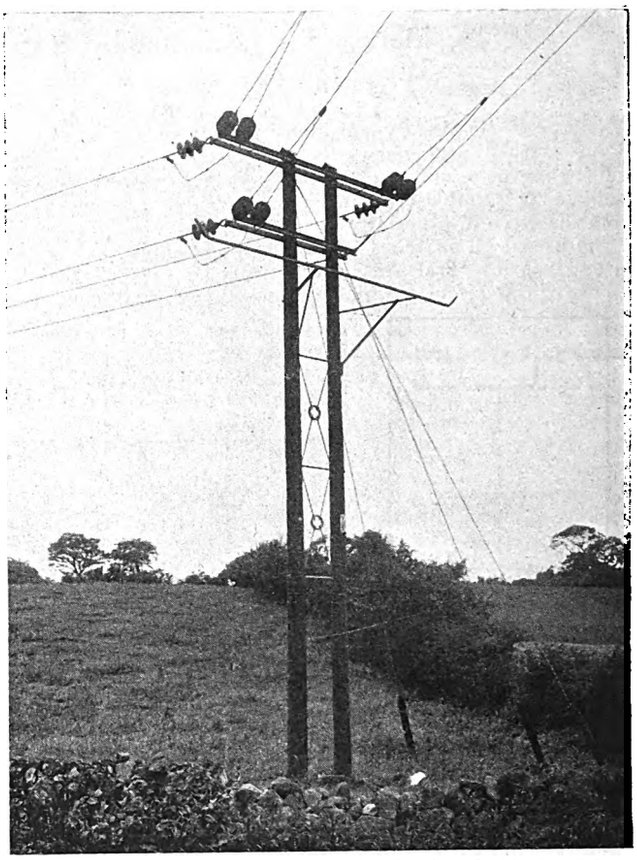
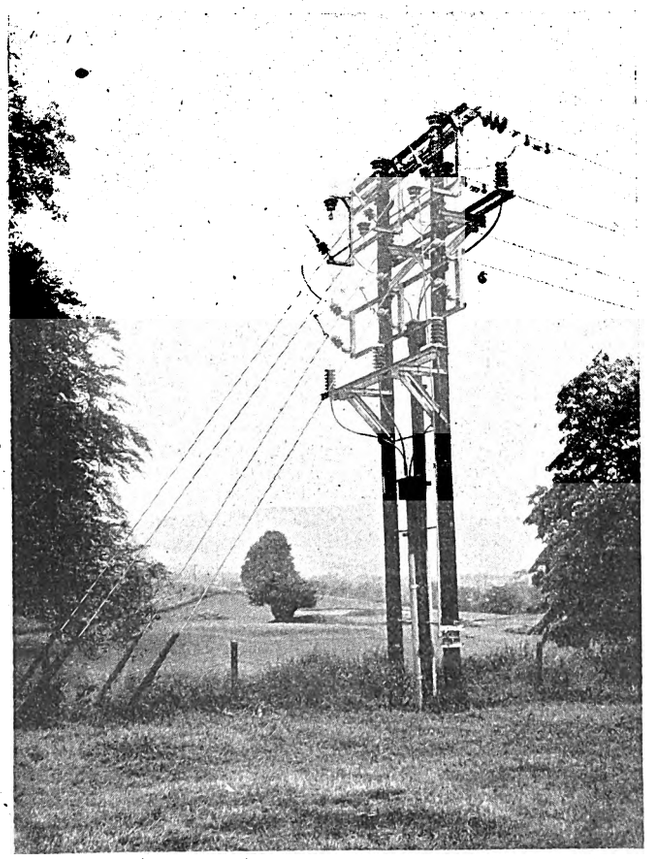
33 kV TRANSMISSION LINES IN NORTHERN IRELAND.



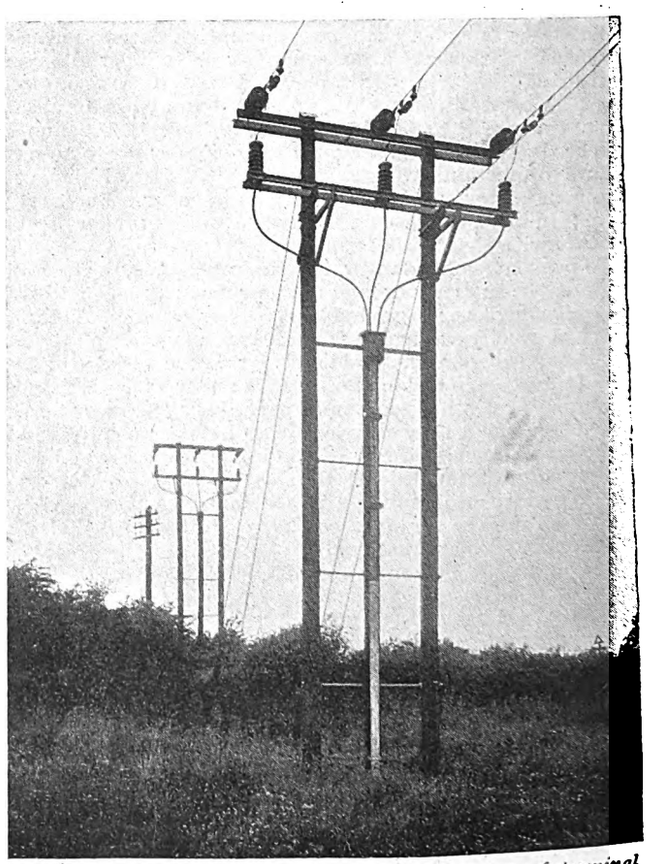
Lisburn E.S. Co., straight line poles with double earth bars.



Angle section and road-crossing pole, showing double insulators and guarding.



Special terminal pole, equipped with double sets of 33 kV switch-gear and fuses.



Road crossing at Derriaghy, showing standard types of terminal pole equipment.

(Photos by courtesy of W. T. Henley's Telegraph Works Co., Ltd., who were responsible for the whole of the line equipment work.)

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PORCELAIN INSULATORS AND INSULATOR PORCELAIN.*

Electrical and Mechanical Stresses—Effect of Salt Storms—Reduction of Electrical Stresses—Improvements in Porcelain—Importance of Cost Factor.

PROFESSOR STEN VELANDER, of the Royal Technical University of Sweden, in 1921, at a time when he was head of the study and consulting section of the South Sweden Power Co., commenced investigations on the subject of factors affecting the useful life of porcelain insulators. The company in question made it a practice to examine insulators every half year, and to eliminate those which were faulty, before they reached the breakdown stage, thereby obtaining satisfactory running condition. Various information and data from home and foreign works were examined, and as a result of investigations new types of insulators were brought out in 1925 and 1926; later the question was studied with the co-operation of the Swedish Engineering Academy. The results of the investigations have been published in German by the Academy, a summary being presented in English and French at the High Tension Conference in Paris last year.

Professor Velander is of the opinion that in proportion to the commercial importance of reliable insulators as affecting the operation of power lines and industries dependent on them, much less is known about insulator porcelain than regarding many materials of comparable commercial importance. After an insulator has broken down, and parts have been broken away owing to the effect of arcing and high temperatures, with the effects of molten copper and various silicates and consequential blackening, it is difficult to find out the cause of the trouble; but experience shows that insulators on examination will show signs of cracks and so on, before they break down, and, therefore, if removed, can be examined and the causes of the damage studied.

Power line insulators are subject to electrical and mechanical stresses, some of the latter being due to thermal action. Study of statistics shows that the height of the voltage has but little noticeable influence on the percentage of failure. Published investigations show that with chains the insulator next to the conductor is not more liable to damage than the others. The insulators which are the highest, and, therefore, the most stressed by atmospheric disturbances, are also not subject to more failures than the rest. Electric stresses are not the primary cause of cracking.

With regular examination it is possible to reduce to a definite percentage the discovery and changing of insulators before they fail; it also becomes clear that the damaged insulators if left in place break down in time; in several cases where insulators have been looked upon as having been broken through electrically, the primary causes have been cracks. On lines which are not systematically inspected, one would, therefore, apparently find many cracked insulators; it is not, then, astonishing that during thunderstorms or such like disturbances, some are broken down. It is also possible, owing to some inner defects that with a steep wave, an insulator can be perforated as well as in a laboratory; this seldom happens with those of a good make.

The conclusion is arrived at that the primary cause of a perforation must be sought in a mechanically created crack, which at first may have only a microscopic character but opens the door to the current; the effect of the subsequent short circuit, with its powerful action, often concealing the original weak point.

The mechanical stresses are those of direct character from the conductor or other mechanical stress inside or outside the insulator itself, and finally there are stresses due to temperature differences. The conductor stresses vary with the conductor dimensions and span; data from makers in different countries show that various factors operate. An insulator carrying a heavy conductor has higher percentages of failure than those with light conductors; in South Sweden, branch conductors, where conductors of 16 sq. mm. (·025 sq. in.) are used in connection with conductors of 70 sq. mm. (·109 sq. in.), other things being equal, the failures on the sections with light conductors are only one half to a third those found with the heavier conductors. Long span and anchor insulators give rise to more trouble, and have a shorter life than those which act as suspenders only.

Mechanical stresses may be due to faulty construction, assembly, or erection. When built up insulators are concerned, the cementing may be a cause of subsequent cracks, one cause being the absorption of water. Difficulties with cemented insulators have been such that designs have been got out to avoid the use of cement altogether. Lack of care in cooling after baking may give rise to internal stresses.

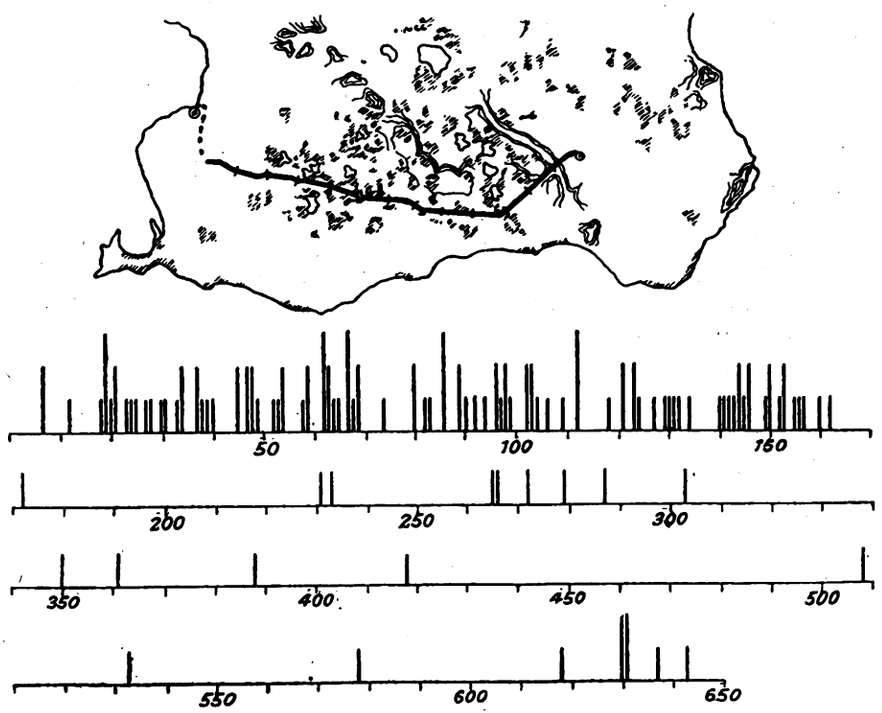

Fig. 1.—Insulator replacements.

Regarding thermal stresses, cement and iron have different expansion coefficients from porcelain; efforts have been made to remedy this difficulty by mixing something with the cement to make its coefficient equal to that of porcelain. It is noticeable, however, that insulators by the sea where the temperature variations are minimised often have more failures than insulators inland subject to higher variations.

Although more insulators fail in summer than in winter, it appears that this is due to the effect of thunderstorms on those already damaged; insulator failures are more frequent in coastal districts, owing to salt-spray storms. Salt winds blowing landwards quickly lose their salinity, especially when they pass over forests or a line of hills, and, therefore, salt-storms operate in a band of from 12 to 30 miles deep.

Fig. 1 shows the insulators replaced over a period of five years on a line about 12 miles from the sea in Sweden, with 650 posts. The country on the western (left) side of the diagram is flat, but on the east (right hand) side it is wooded and hilly; the verticals show 1, 2 or 3 insulators replaced per post, by far the most replacements are on the western side. Experience showed that insulator breakdowns in coastal districts are 3 to 10 times as numerous as those experienced inland.

In one part of South Sweden on the east coast, 3% of breakdowns took place in 12 years with soft gypsum cement; in

* "Ingeniörs Vetenskap| Alnadamien." No. 90. Published: Svenska Bokhandelscentralen, Stockholm. 3 Kr. 25.

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another section, 8% in 10 years normal cement, whereas on the West Coast there were ten times as many failures. There is, of course, a higher direct mechanical stress when the land is open. The loss in a salt storm reaches ·5 kW per insulator, and may exceed 1 kW; in such cases the greatest heat energy loss is to be looked for on the underside of the insulator; the top can be looked upon as the equivalent of a metallic cap. Observation during a salt storm confirms this view; the heat below travels up, meeting the cooled top surface, thus creating great temperature differences and, therefore, stresses inside the insulator. The relationship between salt storms and insulator failures is thus explained. The cement joints of multiple insulators create further troubles under large temperature differences; the use of an elastic plaster as jointing

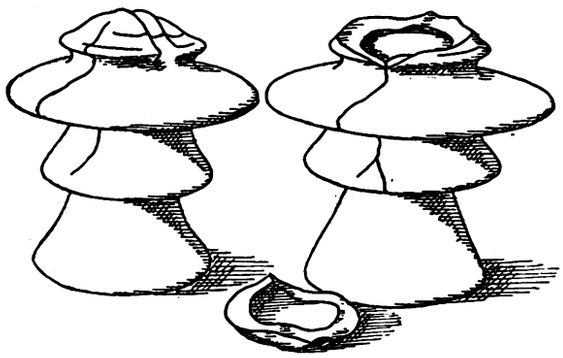

Fig. 2.—Typical cracks in insulators.

material is of great advantage in this direction. In many cases, therefore, cemented up multiple insulators have given more trouble than those made in one piece.

In high mountains, the percentage of insulator failures is increased, and this is obviously due to the rapid change from sunshine to shade, a matter of 20 to 30 deg. C. (36 deg. to 54 deg. F.) or more. Cold rain or snow can increase the difference between the outer and inner parts, as the latter naturally tend to hold the heat. With rapid change, the sunshine side is hotter than the shade side. Line insulators, without doubt, are subject to stresses of many kinds; some are constant, such as conductor weight; others are subject to long period variations, such as heat stresses, and to rapidly varying stresses, such as conductor vibration.

It is difficult to calculate the combined stresses which operate; one can, however, realise that the maximum stresses take place when the cracks are formed. Figs. 2 and 3 show typical insulator cracks; the circular cracks come from head stress, while those which are radial result from internal stress. Silvan ("Tecknisk Tidscrift," 1923, No. 11/12, Electrical Section) classes the stress as: tangential, due to internal expansion, radial in the horizontal parts, axial and bending stresses. He also showed that cracks do not appear all at once, but start as fine microscopic cracks, which gradually increase in length through the porcelain; the process may take months, or even years, before failure of the insulator. Experiences of the South Sweden Power Company show that after a crack has reached the surface an insulator may still hold up for several months.

Life Curves.

The insulator failures are not constant in each year: the first is usually free from them, then the number of failures increases in each year; this action is clearer and more regular when the insulators are well made and uniform in construction, and, therefore, one reaches a normal insulator life for the type under given conditions. It is desirable to make out life curves for different line sections selected with relationship to the climatic conditions, and position, such as open plains, hilly districts or forest, the groups being divided at points where the average life gives a material drop. Fig. 4 shows percentage life curves for a complete line with various conditions.

Fig. 5 shows a life diagram of two sections: Curve I, for insulators in a salt-laden plain with average life of 8·9 years; and II, average life 10·3 years in hilly land with forests.

For satisfactory operation, careful statistics for different climatic sections and insulator types are desirable with the aid of such curves, with also year to year percentage failure curves based on the years of life of the type considered. There is the problem as to whether porcelain is subject to special fatigue effects; it is not certain that the fatigue and elastic limits begin at the same point. Herr Draeger, of the Rosenthal Porcelain Works, considers that porcelain is not subject to fatigue and that insulators which have been in operation show no greater conductivity or liability to breakdown than those subject to similar temperatures in store. It has been found that small loads applied during long periods produce a permanent set in glass test pieces.

Reduction of Electrical Stresses.

The electrical stresses have no, or but little, influence on the life of an insulator; it is a mistake to demand too high a resistance to perforation, especially as it can be only attained at the expense of other characteristics, as a rule, that of the mechanical soundness and tenacity. The result is a weak and brittle porcelain, with added possibility of increased crack formation and an increase in the number of so-called (electrically) broken-down insulators. It is a rooted idea in certain circles that high resistance to puncture is an indicator of reliability. As an example, it was desired to modernise a switching station; the operating voltage was 6 kV. A type was asked for which would give 120 kV as break-down voltage; as the short-circuit stress was very high, the mechanical resistance never reached a factor of safety of 2. The insulator maker put forward an insulator with a break-down test of 80 kV; it was difficult to get this alteration carried into practice as the operating engineer preferred a 20 fold electrical test with 1½ mechanical factor of safety to a 12 fold electrical and 3 times mechanical factor.

With regard to a series of newer, so-called extra electrical-perforation-resistance, constructions of insulators, one can say that instead of being improvements they have led to a lowering in value.

The mechanical stresses can be diminished either by the reduction of the forces or the alteration of the form or dimensions of the insulator; the insulator must be designed with regard to sufficient flash-over resistance and mechanical solidity; the construction problem is very complicated. The forces acting can be lowered by altering the mechanical arrangement; for example, by the use of shortened spans or doubled insulators, or by altering the insulator dimensions, but one must guard against a consequent increase in thermal stresses and liability to breakdowns, which is the case with a series of thicker perforation insulators which have been placed on the market. Lack of care in manufacture and erection can give trouble; for instance, the screwing up of

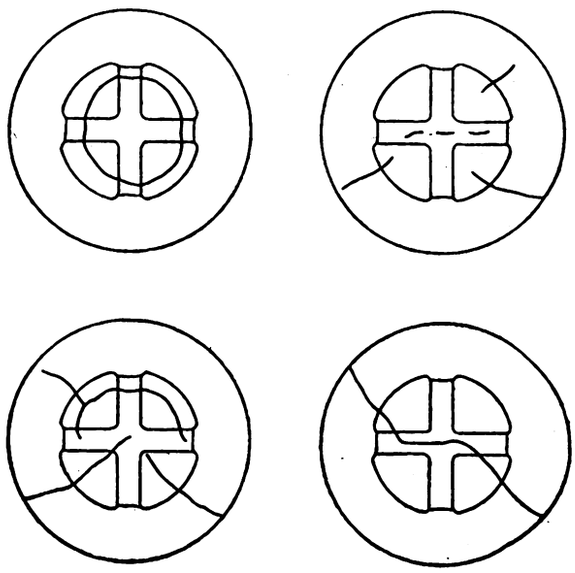

Fig. 3.—Cracks in insulators (sectional view).

the insulator too hard on the stalk, when the American construction is used, thereby damaging the thread. The form exerts great influence on the life; sharp angles are points of weakness and form centres for the starting of cracks. The thermal stressing owing to current creep can be diminished by the use of more units with chain insulation, but it is more advantageous to make small ribs on the underside of the petticoats which leave gaps on which the salt does not collect.

The use of an elastic layer on the difficult cementing surfaces can reduce the depreciation as each section can then expand on its own and there are only temperature differences within each section; the Ohio Brass Company uses such layers. As an example of this action, an old type insulator was

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strengthened by fitting with a porcelain cap; when the cap was fixed with cement many failures resulted; later the parts to be cemented were painted with an elastic skin and the failures were greatly diminished. In Germany, where cement was first discovered as a source of insulator cracking, the use of it is greatly diminishing, and in that country for the building up of pillar insulators, hemp or impregnated cement are adopted. In America the so-called sanding system is favoured.

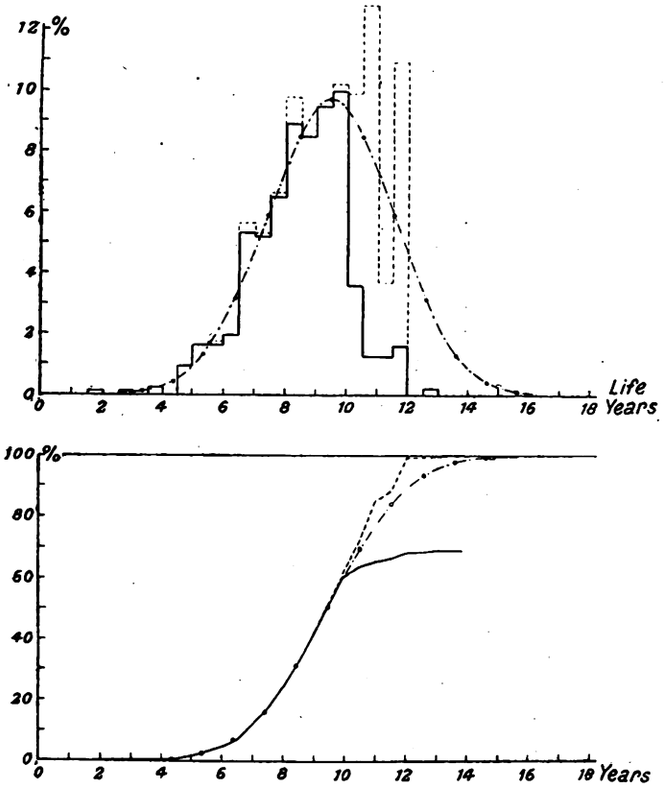

Fig. 4.—Insulator life curves (complete line).

A sort of porcelain granular material is glazed into the surfaces to be joined and then filled in with a bituminous substance, so that only the granular points touch the cement.

The question of the improvement of the porcelain substance is of interest, such efforts have resulted in many insulator troubles and failures. When an engineer finds himself beyond the operating limits of cast iron, he uses some other material, such as high tensile steel for his purposes; the question regarding insulators is—in which direction should the improvement take place?

The purely electrical considerations have perhaps gone too far; insulators are tested in stages and ultimately in high-tension laboratories, but the mechanical attributes have not received the same attention or control. Apart from the porosity, questions regarding tenacity, elasticity, heat-expansions coefficients, are in general not subject to research. The dye test is usual for porosity. The development of the chain insulator led to the arrangement of tensile tests which have not been carried far enough; temperature or temperature change tests in their forms up to date do not give any guarantee, usually the main point considered is a good glaze and white and even fracture.

It is only recently that the importance of mechanical factors has begun to be realised. In general, especially earlier, one hardly knew anything about the porcelain used in insulators. Variable results have been met with from insulators of the same type produced at different times. Four to five years of researches regarding the properties of porcelain show that very little has been done and published on the matter. Experts of insulator works can hardly explain matters regarding the mechanical attributes of porcelain, beyond the range of text-books; on the contrary, at the State testing laboratories at Stockholm, a series of impact tests of great interest have been made with household porcelain which bring out the great differences in the mechanical work of breakage of different types and show that makers can supply uniform and unusually strong material.

A section of these tests was devoted to the impact testing of various types of insulators in use which had shown different life factors; in some cases long life attributes corresponded with high test figures, although there were some great variations, while one cannot arrive at absolute tenacity values by this method one cannot get consistent results when comparing insulators of different types. As a result definite rectangular test pieces 20 mm. broad were sawn out of insulators; the test pieces were gripped on two sides and bending tests made so that the stress at the point of breakage could be measured; the variations of bending with load were observed; the results showing that apparently Hooke's law holds good. Each test was carried out twice so that both the glazed and unglazed side could be bent inwards. The tests showed, although experts from porcelain works said the contrary, a remarkably good agreement between the test results on the glazed and unglazed sides from one and the same insulator delivery. The limits lay between those given in handbooks but in some cases differed materially from the figure of 5 to 6 kg. per sq. mm. given usually by maker's experts. The modulus of elasticity of 3 000 to 6 000 kg. per sq. mm. was materially lower than that given in other published data. Analysis of the South Sweden company's experiences tends to show a distinct relationship between good mechanical properties and long effective life of insulators, it is remarkable that most of the insulators, whether giving good or bad results, have come out well in porosity tests, which tests only have value when some definite mishap has taken place in manufacturing. The researches tend to show that the mechanical properties of a good porcelain are improved by glaze and of a poor one the reverse; glaze affects the modulus of elasticity, the resistance to bending and impact tests.

Regarding temperature tests the resistance to breakage owing to differences in temperature in different parts of an insulator is inversely as the expansion coefficient, so that this should be as low as possible. It is remarkable that while materials such as cast iron and steel are subject to the strictest mechanical tests, in the past such tests for porcelain have not received the same attention, very great variations existing in mechanical test results. This question is now being taken up by makers and knowledge of the subject is increasing; there must be, however, alterations in standards and acceptance specifications.

The question is, why is it that, in view of the possibilities of control, constructors and operators have not demanded high mechanical strength? The fact is that up to recently nobody realised the value of strength as a factor; in many cases specifications were such as to enforce a low mechanical strength. The properties of porcelain cannot be altered at will, they must often be a compromise on one side for manufacturing reasons and the other to meet operating requirements; for instance, if the strength is raised the shape problem is made more difficult and so is also the baking problem. As a rule when the perforation resistance is increased so is the

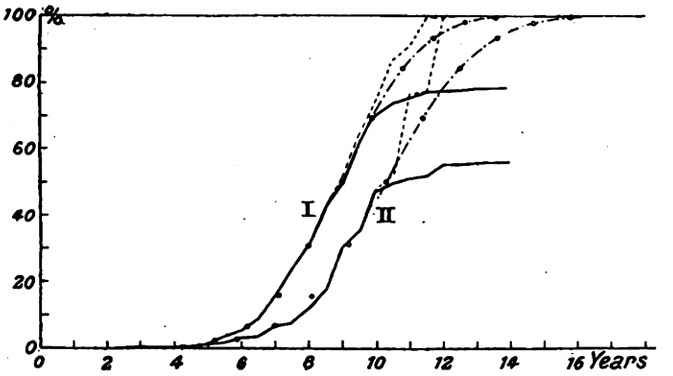

Fig. 5.—Insulator life curves. I.—On salt-laden plain; II.—In hilly, forested land.

tensile strength, it is probable that the tendency to lay stress too much on perforation tests has led to the delivery of weaker porcelains, which has indirectly led to increase in breakdowns in service; high tensile porcelain is as a rule more expensive and more difficult to make than weaker porcelain. So long as buyers fail to demand high strength and often demand the lowest prices, so long will high mechanical features fail to be dealt with.

Microscopic examination shows that strong porcelain has compacter and finer grain consistency and also a higher proportion of quartz. In none of the tests were quantities of

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sellimanite or " mullit-crystals " found which some investigators claim as signs of high class porcelain.

The most appropriate test methods for control of the mechanical properties should be adopted, test pieces should be sawn out and the bending, ductility and temperature coefficients investigated. To carry out such tests would only be doing for porcelain what is done already for other materials. To get improvements, the results of researches of recent years must be embodied in porcelain technology, such problems being for the ceramic worker and not for the user. In the last ten years great progress has taken place through research regarding iron and steel and similar policy should be adopted regarding porcelain.

The whole question is of importance, the value of the whole of the insulators in our Swedish lines, including erection costs, is from half a million to a million sterling. When the useful life is short, as is the case to-day, there becomes necessity for changing insulators during operating times, which on account of Sunday work, travelling expenses and so on becomes an expensive matter. A complete change of the insulators of our latest constructed lines would cost a million sterling. With 10 years' life the average annual cost would be £100 000, with 20 years, £50 000, a great economy therefore. There are also the indirect advantages of diminished working interruptions, matters which must have even more influence than insulator replacement costs.

The value of an interruption of a power line measured by its results can be reckoned as a shilling per kWh out of service, together with output and wages loses and overhead costs. The total energy for Sweden is about 4 000 million kWh, with a maximum output of one million kW, therefore a stoppage of Sweden's power for only one hour costs £50 000. The question of trustworthy insulators is of the utmost importance.

One must have, therefore, for porcelain a clear and systematic plan of research with the assistance of all modern test methods, so that one can know which result to anticipate from a mixture of Raolin, felspar and quartz in given quantities, burnt under given and controlled temperature conditions.

The earlier and hitherto groping and subjective manufacturing methods are carried out in such a way that the mechanical properties of the porcelain produced vary between wide limits, far greater relatively than those for iron and steel; the situation makes the reduction of these limits an absolute necessity to enable better porcelain to be used on electrical networks.

T. R.

EXPERIENCE IN GREAT BRITAIN.

Failures not due to Electric Stresses—Mountain Mists and Coast Salt Deposits—Exacting Requirements of Modern Specifications.

(FROM A CORRESPONDENT.)

THE article entitled " Porcelain Insulators and Insulator Porcelain," calls for certain comments when considered in the light of experience in Great Britain.

From a general survey of the conditions reported from Sweden one would imagine that to erect a transmission line is equivalent to taking the responsibility for endless replacing of insulators, beginning within two years of putting the line in commission and steadily increasing until a happy time arrives when all the imperfect insulators have been eliminated. Presumably the same process goes on with the replacements until such a time as the percentage of these is small enough to cause an insignificant amount of interruption.

It is difficult to believe that this is a true picture of the troubles of transmission line engineers in Sweden, for under such conditions continuous service would be impossible.

Without fear of contradiction it may be stated that in Great Britain there has been a larger measure of freedom from trouble, for one can think of many transmission lines which have been in service for upwards of twenty years on which scarcely an insulator has been replaced. It might be argued that in these old transmission lines of ours the voltage is very low—in most cases below 20 kV—but the answer to this is supplied in the article under discussion, for the statement is made definitely that working voltage has no effect on the percentage of failures. We must look further for an explanation of the different results, and it would appear that a critical examination of the possible causes does not reflect unfavourably upon the English insulator manufacturers.

It will generally be agreed that electric stresses are not the cause of insulator failure. In the early days of overhead transmission, when porosity was a real trouble, failures may have occurred from this cause and the history of failure would be obscured in precisely the way which the author describes. Minute cracks are a different matter and their origin is to be expected in mechanical stresses, set up through various causes. When once small cracks have started their growth may be rapid owing to the freezing of moisture, changing temperature, and conductor vibrations

The fact that more failures are encountered with large conductors than with those of smaller sectional area is in the nature of a contradiction. When a high wind blows upon an ice-coated conductor conditions will be most severe for the insulator. Assuming a constant thickness of ice, then the smaller the wire the higher the relative increase in weight, and consequently one would expect greater risk of insulator failure. This, however, is stated not to be the case, and no satisfactory reason is given for the higher ratio of insulator replacements with larger wire.

Failures are shown to be more frequent in exposed localities either in mountainous districts or by the sea coast, which is generally to be anticipated. In positions of high altitude the air is less dense than in the lowlands and the factor of safety against spark-over consequently less. Mountain mists will coat all surfaces of insulators with moisture, which, though of high resistance, will demand insulators of larger size if ample safety factors are to be retained.

Near the sea coast the conditions are even more adverse, for salt deposits are highly conducting and necessitate insulators of special design if continuous service is to be expected. In localities where salt deposits are heavy, frequent cleaning of insulators is the only known means of preventing discharge and, ultimately, spark-over. Unless these difficult conditions have been taken into account when choosing the insulators, it is likely that surface discharges have caused local heating and led to the formation of the small cracks described by the author. In this instance, also, the cracks are of mechanical origin, though the explanation of their presence is the low safety factor against electric discharge.

In this country it is difficult to obtain statistics for comparison with those given for insulator life. The long service generally obtained and the small percentage of failures, owing to ample safety factors and perhaps in some degree to good insulators, add to the difficulty. Any consideration of comparative life must take into account conditions before the insulators were put into commission. The care exercised in selection of raw materials, the relative severity of routine tests and the grade of cement are, to mention a few factors only, of such critical importance that any one of them may explain wide differences in length of life.

The statement that insulators which have been in operation show no deterioration is borne out by experience in this country. Recently tests were conducted on some insulators taken from a transmission line on the East Coast, where they had been in service for seventeen years. The electrical and mechanical characteristics of these insulators proved to be similar to those of new insulators which had not left the factory.

In years gone by rule of thumb methods were responsible for haphazard designs, but those days are past. The exacting requirements of modern specifications demand accurate knowledge of the properties of the materials at the disposal of the designer and manufacturer of insulators. Only through organised research comes such knowledge, and the fact that insulators are available to meet the demand speaks for the progress which has been achieved.

Stress has been laid upon the apparent difference between the experiences of those responsible for transmission lines in Sweden and in Great Britain. Clearly they have their problems and we have ours. A wide knowledge of the conditions under which insulators are reguired to give service is of inestimable value to the insulator manufacturer, and close co-operation with the transmission line engineers leads to the elimination of trouble.

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There is a risk that insulators will be damaged in transit. A blow received on the railway or during unpacking may produce the small cracks which will grow as time advances. The voltage applied as a test on the line is unlikely to reveal a small fault of this nature, for the remaining sound sheds of a pin insulator or the undamaged units of a suspension string will sustain the test voltage. The safety factor, however, has been reduced, thus sowing the seeds of trouble in the future.

The author lays stress upon the fallacy of increasing one essential property of an insulator at the expense of others. An adequate margin of safety against puncture is most necessary, and it is at least equally requisite that care be taken of all possible mechanical stresses. The means of obtaining the desired mechanical and electrical strengths are, to an extent, in conflict; so the best design is a compromise. It would appear that as most of the failures are of mechanical origin it is right to seek by exhaustive research and observation a full understanding of the mechanical and thermal stresses to which insulators are subjected. It is not a difficult matter to obtain a reasonable factor of safety against puncture and, by correct design, provision of arcing rings and other means, to avoid undue electric stresses in any locality.

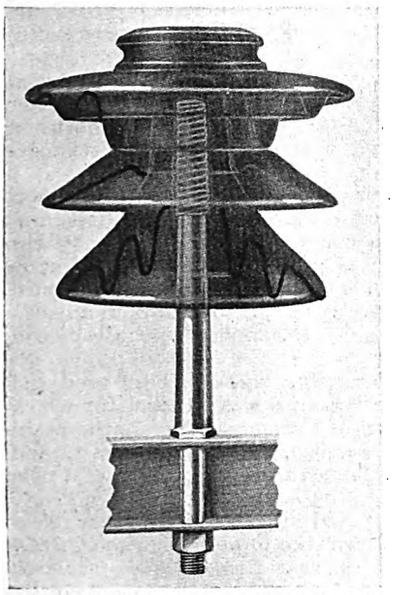
The price of insulators represents only a fraction of the total cost of a transmission system, but on them depends the continuity of supply. A generous factor of safety and the purchase of good insulators may add to the initial cost of transmission lines, but the relief provided by freedom from trouble amply justifies this long-sighted policy.

INSULATOR DESIGN.

British Pattern to Resist Salt Fogs.

DURING the last year or so on several occasions, owing to peculiar local atmospheric conditions, quantities of salt water have been drawn up and swept inland in the form of salt fog, which has settled on insulators, forming something in the nature of a conducting cap leading to considerable trouble.

Prof. Vellander in his notes on insulator characteristics and tests has discussed this question and recommends the use of ridges underneath the petticoats to concentrate the salt collecting and leave insulating ridges.



Special (Bullers) pattern insulator, for use in places exposed to salt fogs.

As pointed out nearly three years ago at the Paris High Tension Conference, where it is a question of a conducting deposit on an insulator, increasing the diameter alone simply increases the area of the path over the edge.

In view of the importance of the problem Messrs. Bullers, at their works at Milton, have arranged a special chamber with observation windows in which insulators can be tested while subject to saline mists, chemical fumes and so on.

Where an insulator has to face heavy snow, ordinary mist or a lower air density a larger insulator of normal type suffices to give an increased leakage path to comply with normal specifications regarding discharge.

The ordinary insulator is designed to stand flashover rain tests, which tends to search out those weaknesses which might give way to stresses met with under operating conditions, but a rain test does not, like a conducting fog, search out the underneath of the sheds.

As a result of experimental work Messrs. Bullers have brought out a special insulator for positions subject to salt fogs. The insulator is arranged so that the drippings from the sheds tend to fall clear of the sheds below, the top shed is therefore the largest in diameter and the bottom one the smallest.

The outside surfaces are kept smooth to encourage the running off of the concentrated brine, the top and middle sheds are arranged with small corrugations the lowest with deep corrugations. These corrugations slope outwards to minimise the distance to the spindle. The lip under the top shed is kept well out to keep the high voltage surface clear.

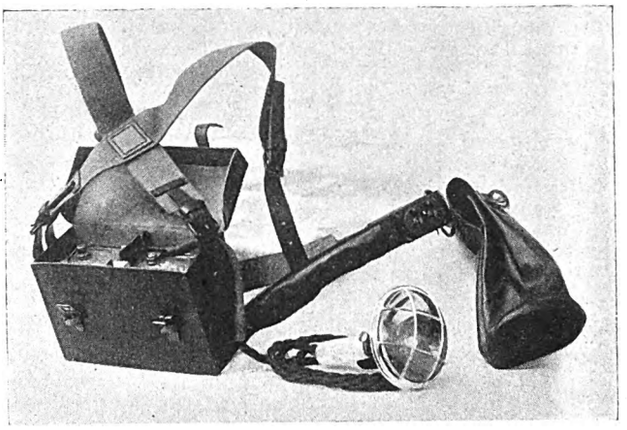
People have been heard to say that British manufacturers do not pay sufficient attention to research work, but the production of this new insulator shows that such a charge cannot be made against this old-established firm. It is interesting also to note that, acting independently, they have utilised corrugations under the sheds as recommended by Prof. Vellander.

INSPECTION OF LINES.

Tripping and Switch Batteries.

EFFICIENT and portable inspection sets are a necessity for linemen engaged in the maintenance of overhead lines. We illustrate a set of this type produced by Batteries, Ltd., Redditch.

The projector consists of a brilliant reflector, 100 m/m. in diameter, mounted on an aluminium carrying handle, so that the direction of the beam is easily controlled. It is fitted



Lineman's inspection set fitted with "Nife" cells.

with a high candle power 5 V double filament bulb with a double switch to allow of one filament being switched off when the full light is not required. Bulb and reflector are proportioned to give an intense concentrated beam, so that small objects are clearly visible at considerable distances. The battery consists of two "Nife" double cells of 18 ampere hour capacity, connected in series and having the foolproof and long life characteristics of these cells.

The battery is housed in a strong handsewn leather case, looped on to a thick leather body belt. This is provided with strong webbing shoulder cross straps so that the outfit can be carried without inconvenience and leaving both hands free.

"Nife" nickel-cadmium-iron-alkaline cells have proved themselves very satisfactory in the protection of h.t. switchgear. A large number of power companies have now standardised them for use in substations where they can remain for long periods without inspection. It is common practice for cells of this type to be charged only once every six or twelve months. A typical example is afforded by one instance where a 4-ampere hour cell gives a discharge of 12 amperes every time the switch is tripped.

Another interesting application of batteries in the service of the power substation is that of switch closing. For this work considerable power is required, and it is quite common practice to demand a current of 270 amperes for two or three seconds when a switch is being electrically closed. For the national grid scheme a lead-acid battery of 240 ampere hours capacity had been specified to provide this heavy current, but Batteries, Ltd., state that a "Nife" cell of the latest low resistance type, having a capacity of only 140 ampere hours, has proved to be quite capable of the work. To quote figures from actual test sheets after 129·6 ampere hours had been taken out of a "Nife" cell of 140 ampere hours capacity, it still gave six discharges of 261 amperes in quick succession, the voltage only dropping to 0·95 V, which is equivalent to a 110 V battery only dropping to 87·4 V.

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INSULATOR DESIGN IN GERMANY.

Some Interesting Types.

THERE have been some interesting developments regarding pin-type insulators in Germany. In Fig. 1 the first insulator shown is of the old telegraph type; the Delta type is similar in pattern to types still in use in many countries. As the pin goes up to the side groove at the top the mechanical strain is mainly compression; this type is also used in the built-up pattern. The wide petticoat type gives a better electrical

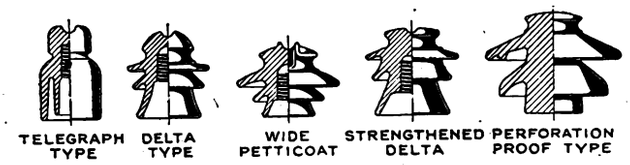

Fig. 1.—German types of pin insulators.

distribution, the insulator of the strengthened type has better electrical security but is not so resistant at cross strain. The last on the right is of the puncture-proof type, so called because of the long internal path necessary to reach the metal cup-shaped base. For cross strains it depends for security on the resistance of the porcelain to bending. The cup can either be

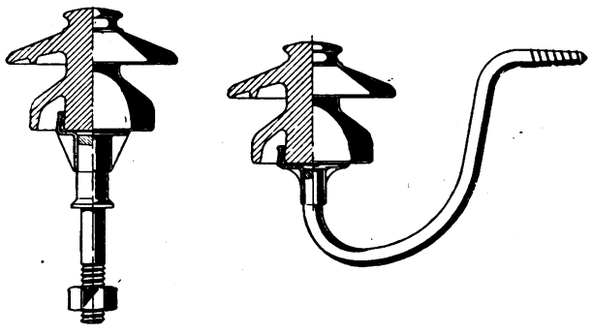

Fig. 2.—Puncture proof insulator:
a **(left) with straight stalk; *b* (right) with swan necked stalk.**

fitted on to a straight stalk Fig. 2(*a*) or else be fixed to a swan-neck Fig. 2(*b*).

Fig. 3(*a*) shows one type of cap and pin insulator designed by the A.E.G., used on this line. The bolt is made with dumbbell-shaped ends, the upper part is supported on a ring of balls kept in place with cast lead, a split porcelain collar is placed below and a lead ring cast to keep it in place.

Fig. 3(*b*) shows another type of insulator fitted with a ninepin-headed pin, the head is slit at the top and made to expand

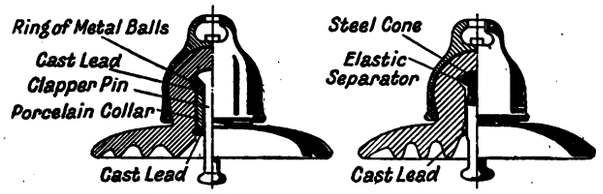

Fig. 3.—A.E.G. cap and pin insulator:
a **(left) with dumbbell-shaped bolt; *b* (right) with ninepin-headed bolt.**

into the internal spherical seat, after heating, by being pressed on to an internal cone.

In England one often makes a great fuss about mechanical strength without investigating as to whether it is necessary in practice. The stalk shown in Fig. 2(*b*) is circular in section, made of 1 in. bar with a coach screw and such a type of swan-neck, which is not attractive to birds, is listed for use on lines up to 35kV. If they did not give satisfactory service Continental engineers would not list them, although some people at home think them to be far too weak. As a rule bolted stalks for use with cross arms are not so stout as often called for by us, the fact that porcelain can be made to resist some bending moment as in Fig. 1, and the use of swan-neck stalks in many cases, tend to show that side strains on lines are not as great as are often allowed for, but also that the mechanical resistance of porcelain has been materially improved. Insulators of the pin or cup and pin type are used in Germany for tensions up to 35 000 V beyond which the chain type suspension is usually adopted. For a number of years it was considered that porcelain could not b erelied on in tension but only in compression, as in the case of a double petticoat insulator with the top of the steel pin level with the side groove. Fig. 4, showing a strain insulator, proves that under certain conditions it is possible to use porcelain in direct tension; it is of the A.E.G. type and several can be used

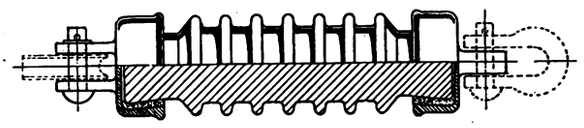

Fig. 4—Strain insulator.

in a string in series as desired for higher voltages. In the illustration of the aerial switch. Fig. 2 on page 127 this style of strain insulator is shown in use with jumper connections The Verband Deutsche Ingenieure has done valuable work regarding the standardisation of insulator pins and stalks. The illustrations and most of the remarks made are based on a list K.5/11 of the A.E.G. Co. of Berlin to whom thanks are due for the information supplied.

PORCELAIN FOR ELECTRICAL INSULATORS.

Highly Specialised Industry.

IN the course of a lecture before the Stoke-on-Trent Association of Engineers, on the subject of "Ceramic Engineering, with Special Reference to Electrical Porcelain Practice," Mr. H. S. Newman, a member of the staff of Bullers, Ltd., said that with the growth of the high tension transmission of electrical energy, the specifications had progressively become more and more rigorous, until at the present time it was only with the greatest difficulty that the pottery manufacturers could comply with them.

The tests to which the materials had to be subjected included tension, torsion, cantilever, combined tension and cantilever shock, porosity and heat resistance, together with the usual electrical characteristics and the certainty of interchangeability.

A typical modern insulator support for high tension switchgear, such as will be installed in the 132 kV grid stations now being erected all over the country, was described by the lecturer. The height of it was 42 in., and it was called upon to meet a torsion load of about 24,000 in. pounds, applied clockwise and anti-clockwise, as well as to withstand a cantilever load of anything up to 600 lb. applied at the top, and a tension of 10–15 000 lb.

Amongst the heaviest pieces that had ever been produced in vitreous porcelain in the Potteries was an insulator which was originally made for wireless transmission before the beam system came into use. It weighed, fitted, about 7 cwt., and it was the intention to instal nine of these at the top of a pole about 800 ft. high.

An alternative now being used in connection with wireless transmission was an insulator at the top of one of the G.P.O. wireless masts at Hillmorton, near Rugby. This insulator combination was proofed to 20 tons before despatch. Another massive combination was also in evidence at Hillmorton, and in this case the insulators supported high tension meters working at 1 500 V. for the production of high frequency current for the wireless gear. It was nothing unusual nowadays for the electrical engineers to call for articles in vitreous electrical porcelain standing 5 ft. 6 in. high and weighing approximately 400 lb.

The strenuous conditions with which some of the insulators had to comply could be gathered from the statement that at the Metropolitan-Vickers Laboratory, Manchester, the high tension flashover test under wet conditions was something in the order of 250 000 to 300 000 V.

The up-to-date electrical porcelain manufacturer had long since found it necessary to supply himself with efficient testing machines and high tension electrical plant, and in every way the production of porcelain for electrical purposes must now be regarded as a highly technical and specialised industry.

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BULK TRANSMISSION IN GERMANY.

Efforts to Replace British Coal—Conveyance of Power to Markets—The Corona Problem—Use of Hollow Conductors—Eddy Current Dangers.

By THEODORE RICH.

SINCE 1914 the position in Germany regarding heat energy and power has been distinctly interesting. During the war, in order to save railway transport as much as possible, coke oven gas from the Ruhr area was pumped long distances for industrial heating and general gas supply purposes. About the same time great developments took place regarding the utilisation of lignite, a low-grade fuel that lies in age somewhere between peat on the one hand and pit coal on the other. This fuel is won from open pits with the aid of ladder, dredgers or grabs, the overburden is first removed and then the lignite bed which may be as much as 90 ft. in depth, is excavated; the lignite is shot into waggons, some of it is delivered in railway trucks in the neighbourhood; some goes for comparatively long distances; some is briquetted, which process reduces the bulk and drives off some of the water; and some, after preliminary flue drying, is shot over the bars of low temperature boilers to give steam for the generation of power in large bulk.

In Baden, Wurtemburg, and Bavaria there are considerable developments and possibilities regarding water power, with a certain amount under operation in The Eiffel, with new constructions in the Central plateau and on the Moselle river.

The lignite beds exist near Cologne on the western side of the Central Rhine and in the central plain on the borders of Saxony. The lignite contains a material percentage of water, and a high ash content so that transport costs tend seriously to limit the economic radius of distribution by rail. The demands of railway workers, aided by their massed political pull, and the charges on transport for Reparations account, have forced up rail transport costs; the destruction of the currency and repudiation of civil indebtedness organised by irresponsible politicians and financiers, during the landslide, forced up general labour costs which have not proportionately come down again, and owing to the nervousness resulting from such a policy, the theoretical industrial advantages from debt repudiation are being offset by the cost of accommodation for business. It becomes very necessary, therefore, to utilise to the utmost the natural resources which exist in the country. The lignite, although of a low grade from the point of view of

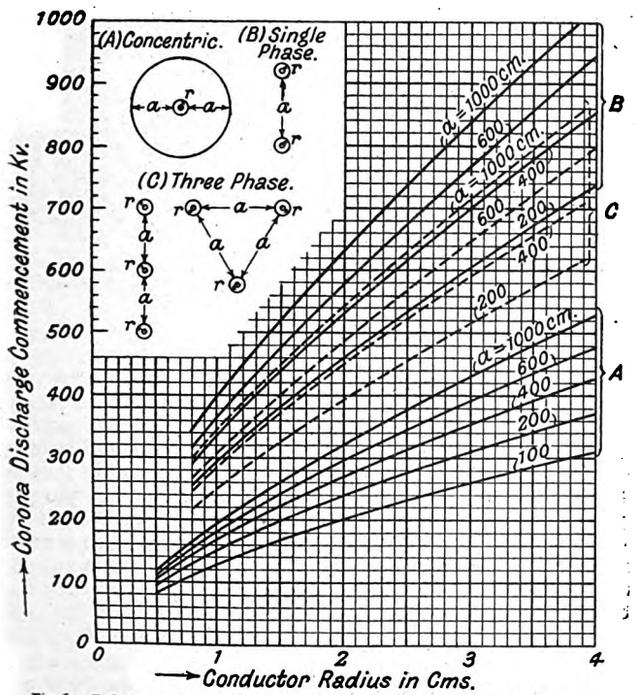

Fig. 1.—Relations between voltage at which corona begins, ; conductor spacing and conductor diameter.

thermal units per pound, is, on the spot, high grade from the point of view of man hours required for a given number of heat units available; digging fuel with a bucket dredger involving only pence per ton, the thermal units per unit of labour and stored labour being nearly double that obtainable from pit coal, with its deep mining, expensive pumping, timbering, gas risks and so on. After the war a certain proportion of the Silesian coal mines were placed in Polish territory, and a few years ago, as a result of German Government policy towards that country, supplies of coal from many such pits were cut off.

At the same time efforts have been made to minimise the dependence of North Germany on British coal by special

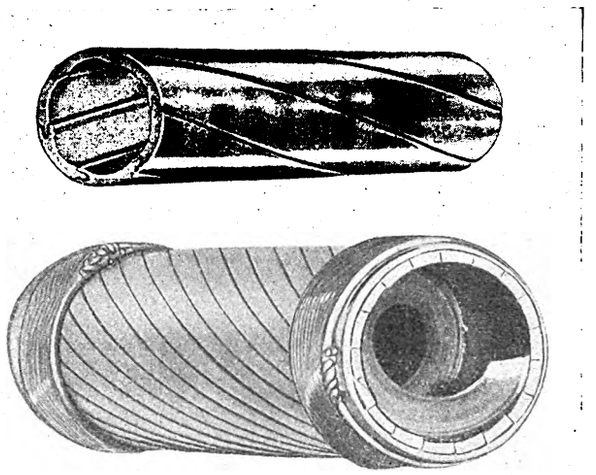

Fig. 2.—(*a*) Hollow conductor with tongue and groove sections. (*b*) Conductor built up of spiral strip-on edge.

water transport rates and so on, and to encourage the use of process coke in lieu of British anthracite for the tiled "pylons" which serve as stores in so many German households.

The development therefore of an easily won fuel, difficult of transport, and the utilisation of seasonal water power in the south, made the transmission of power in bulk a matter of national importance; there being definite points of supply and definite districts for consumption. The ordinary idea of a colliery power station for public supply is one which utilises duff and other coal of the lowest grade, the problem often being to secure sufficient cheap coal from the pit or pits alongside. The lignite problem is quite different; there fuel is taken in bulk from the open pits and utilised in huge power stations, not because the super-station is the best under all circumstances, but because most of the power produced has to be transmitted long distances before it can find a market. A certain amount of power has been used near the Central Germany lignite beds for the making of synthetic nitrates, but regarding such matters it is usually difficult to draw a clear line between strategic desirability and raw economics.

About four years ago, at home, some professional politicians and industrial reformers proclaimed that Germany had a wonderful grid system that we lacked primarily because the engineers and power authorities of that country were up to date while in Great Britain this was hardly the case. In actual fact, Germany either had to transport power from the lignite beds and waterfalls, or leave the lignite where it was or let the water go on running to waste; such bulk transmission was necessary if these national assets were to be utilised at all.

Power Transmitted to Find Markets.

The more one examines the bulk power situation in Germany, as in Italy, Scandinavia, Southern France and elsewhere, the more one realises that apart from mass electrochemical work such as the making of aluminium, cyanamide, and so on, while electric power is an important factor in industry, modern transport costs are of far greater importance; in other words, contrary to what we have been told by some doctrinaires, power has to go to industry to find markets and most industries will not go out of their way for power: they can nearly always make their own if required.

During the dawn of the manufacturing age industries had to go to Yorkshire dales, border townships, Thuringian valleys, and Catalonian gorges in order to utilise the water power

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without which they could not operate their machinery, and even when the steam engine came into being, until canals and railways were made, industries still had to go to the neighbourhood of coal pits to get power. It is a great pity, therefore, that four years ago the members of the then Government at home did not have the courage of their convictions, that is to say, if they had any convictions, and throw open the power problem to a public inquiry, as then many matters relating to such affairs in our own and other countries could have been thrashed out, and much misconception and disappointment avoided.

"If the mountain will not go to Mahommed, Mahommed must go to the mountain." That is why, so often, where water power or lignite power is involved, mass transmission becomes essential; and then to avoid excessive copper costs, the highest commercial voltages become necessary even for comparatively short distances. When overhead lines are used it is possible to approach the Kelvin law that for minimum

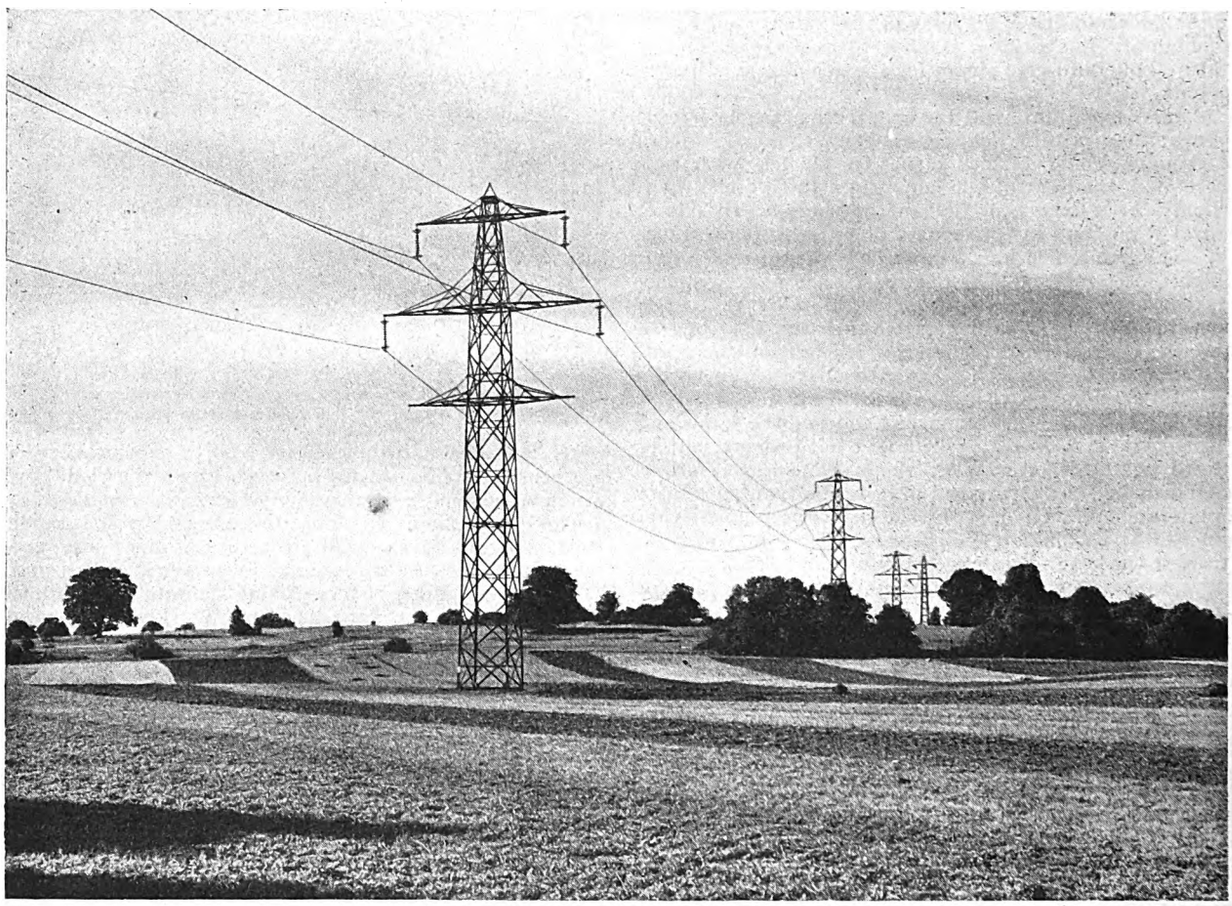

Fig. 3.—Cross country three-phase double trunk line in Germany.

total costs energy loss, values must equal transmission standing charges, and for equal percentage losses the power transmittable for a given conductor goes up as the square of the voltage, any heat being dissipated; with cables bad conductors of electricity are bad conductors of heat, so the carrying capacity, is limited.*

Contrary to popular ideas, the voltage which can be used for transmission is limited not so much by the insulators used as by the break-down attributes of the air that acts as a dielectric; the break-down limits being influenced to a certain extent by moisture and barometic pressure, but to a much greater extent by conductor diameter and distance apart, the initial stage being indicated by the corona. The total losses of a line are due to conductor heating, insulation losses surface leakage and corona; in lines up to 110 kV conductor heat losses predominate; the perforation insulation of porcelain is much greater than the flash over, dielectric losses can therefore be neglected. Fog is not of much influence owing to self-cleaning action; the leakage losses with three conductors come to about ·16 kW per mile of line; under rain or snow, at the above voltage, this is increased to about 1 kW. At the highest voltages corona losses become the main consideration, an important factor for any given conductor diameter and spacing being the voltage at which corona discharge commences; the distance apart and diameter must be chosen to obtain the most economic results to reduce these losses to a minimum; increased spacing means increased tower costs, and increased diameter involves wind pressures and ice loading; with certain limits, the latter had relatively more influence than the former.

Fig. 1 shows a table due to Professor Schwaiger (Elektrische Festigkeitslehre-Springer, Berlin) showing the relationship between the voltage at which corona discharge begins, conductor spacing, and conductor diameter obtained with A, central and radial conductors, B, single-phase, and C, three-phase conductors. As an example with 600 cm. spacing, 1·25 cm. conductor radius, the corona commencement voltage is 360 kV, with 100 cm. spacing the commencement is only, 400 kV but with 65% increase in conductor radius for the same spacing the commencement is at 495 kV. At 380 kV the choice of the correct diameter and spacing becomes of the greatest importance. Where two circuits are used in a more or less vertical arrangement, the sudden falling of masses of sleet or the unequal formation of ice can give rise to great trouble.

In order to obtain a large-diameter conductor without the excessive weight and cost of one built on the solid various designs have been devised. The conductor when built up must keep its shape, there must be no residuary torsion strains, it must be sufficiently flexible to go on to cable drums of reasonable size, and it must resist deformation during erection. The profile wires must pack so as to form a tight layer, so that under mechanical strains there will be no gaps, and will not spring out of place before being strained up; further, the surface should be cylindrical and as smooth as possible.

*The technical points given below are based on a paper by Dr. Rudolf Schien, of Essen, furnished to the writer by the courtesy of the A.E.G. Co. of Berlin.

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The following systems of Ante-Corona large diameter cable have been developed.

An interesting design is on the tubular system, without internal support, made of hard copper drawn profile sections with tongue at one end and groove the other, bent into a radius so that each section fits in and interlocks, this can be seen in Fig. 2(*a*), many miles of it are used on the German grid system. This patented type of hollow cable was got out by the Metallbank A.-G., of Frankfort, with the co-operation of Messrs. Brown Boveri, of Baden. It is claimed by the makers that owing to its construction, no central support is necessary, and therefore there is no part which does not perform the direct functions of carrying the current and taking the mechanical strain, the weight is therefore reduced to a minimum.

The method of making the cable is simple ; it is built up on modified cabling machines. Owing to the fact that the conductors are in one layer, the line sections can be joined with simple screwed-up clamps. Particulars of this cable have been furnished by the Mannheim branch of the firm of Brown Boveri. This type of cable is made from diameters of 25 mm. to 50 with sections from 185 to 600 sq. mm. It is used on a line 220/300 kV that joins Cologne with the Vorarlberg and on a line, Hanover–Borkum.

About 250 miles of line for 220/380 kV have been put up with this class of conductor, 28 mm. (about 1·1 in.), external diameter 210 sq. mm. (.326 sq. inches).

The Felten Guillaume Co. has made a hollow two-layer conductor built up on a spiral made of bronze wire ; the A.E.G.

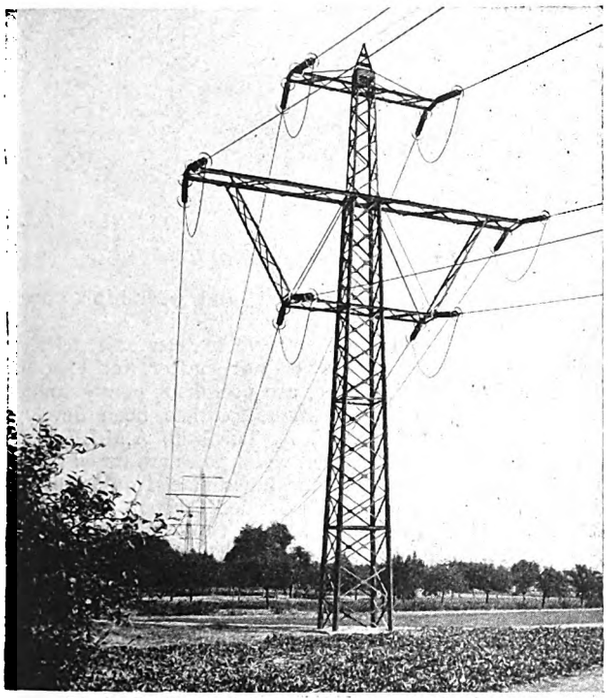

Fig. 4.—Double circuit tower with three conductors and one spare—earth wire above.

Co. built up a conductor with a central cable and a strip on edge wound round it like an archimedian screw with the outer profile wires laid in a spiral. The Siemens-Schuckert Company uses a strip twisted about its axis with zigzag corrugations on the edge to give a bearing to the two concentric outer layers. The Anaconda Copper Co. of the U.S.A. adopts a somewhat similar strip as a framework but of drawn metal in the form of an H, with narrow flanges also twisted round its own axis. Messrs. Thomas Bolton, a British firm, has developed a cable made up with a number of tubular conductors as spacers with alloy conductors where required to increase the tensile strength of the whole.

The Rheinishe-Westphalia Power Company, with the co-operation of the A.E.G., has developed a conductor within one or two outer layers built up on a spiral strip on edge, without central core, the strip being of T form with the top of the T radially outwards, thus making a sound job. This is shown in Fig. 2(*b*).

Dr. Rudolf Schien is of the opinion that with large-diameter aluminium-steel conductors there is danger of eddy current losses in the interior.

Fig. 3 shows a cross-country three-phase double trunk line in Germany with an angle tower in the foreground, span about 300 metres, conductors 40 mm. diameter, double-layer type 400 sq. mm. (·62 sq. in.) section ; as can be seen the insulator chains are fitted with arc rings at each end. The conductor is of the type shown in Fig. 2(*b*).

Fig. 4 shows a double-circuit tower equipped with 3 conductors and one spare with earth-wire above. Both these lines are for 220/380 kV. and were erected and equipped by the A.E.G. Co.

ALUMINIUM CONDUCTORS AND CORONA.

Lighter, Stronger and Cheaper than Hollow Copper.

By EDGAR PAINTON.

THE modern tendency to employ higher and yet higher voltages for power transmission makes the prevention of corona discharge one of the most serious problems which has to be tackled, and much ingenuity has been expended in

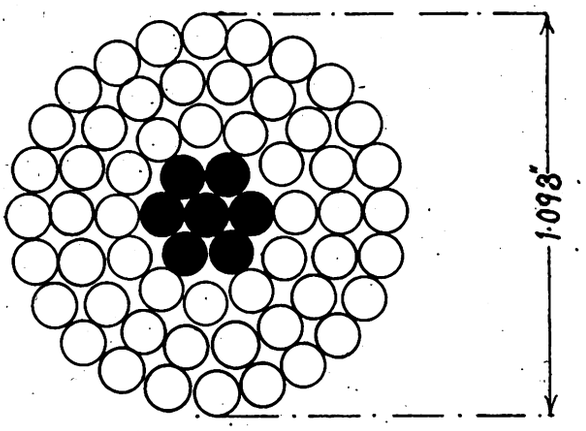

Fig. 1.—Steel cored aluminium conductor for 220 000 V.

devising special cable forms designed to increase the corona limit. The aim has been first to obtain the largest possible diameter with any given conductor section, and secondly to provide a smooth surface. Both of these are provided by the hollow conductor, made up of special shaped wires which interlock in such a way as to form what practically amounts to a tube. The conductor may be entirely hollow or some extra support may be provided for the interlocked annular ring of wires in the form of twisted strip of " I " section.

Though the construction is not essentially confined to copper conductors in practice, it becomes so, because for the highest

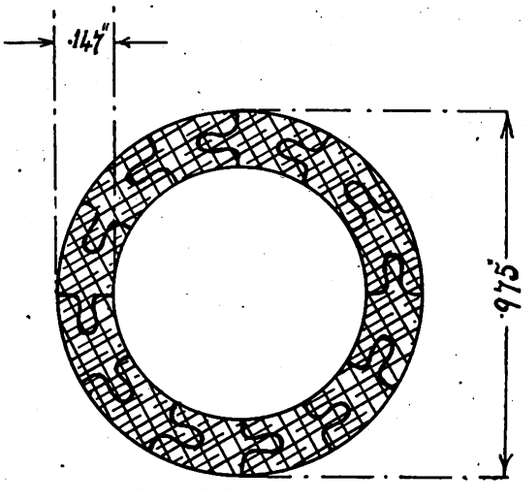

Fig. 2.—Hollow copper conductor.

voltages as yet commercially used the standard construction of steel-cored aluminium provides an equivalent corona limit at a decidedly smaller cost. Fig. 1 shows the construction of the steel-cored aluminium conductors used on the 220 000 V Conowingo and Wallenpaupack lines in Pennsylvania, and also on the 220 000 V Gatineau lines in Ontario. Fig. 2 shows a hollow copper conductor equivalent as regards electrical resistance and corona voltage. It will be observed that owing to the smoother surface of the hollow conductor the diameter can be made slightly less than with the steel-cored aluminium conductor. On the other hand, the copper

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conductor weighs 3·46 tons per mile, as compared with 2·41 tons for the steel-cored aluminium conductor; the copper conductor would have a tensile strength of 10·0 tons, while the steel-cored aluminium conductor has a strength of 12·6 tons. Above all, however, the steel-cored aluminium conductor scores in the matter of cost. This conductor can be manufactured and sold with a reasonable profit at £235 per mile; but the 3·46 tons of copper in the hollow conductor would cost £290 *for wirebars alone*. Add to this the cost of rolling and drawing the special shaped wires, the cost of the assembling and closing down the sections to form a sound conductor, the cost of scrap, the profit and the patent royalties, and it is evident that the economic balance is strongly in favour of steel-cored aluminium.

Should it appear economical in any particular case to transmit at still higher voltages than 220 000, with very small conductor sections, it may still be possible with steel-cored aluminium to avoid the complication of the hollow conductor. Any required overall diameter can be obtained by increasing the core section. Steel wire is comparatively cheap, and owing to its strength is of immense value for an overhead line conductor if protected from corrosion by outer layers of aluminium. Instead, therefore, of using a hollow aluminium conductor it would probably be preferable to fill the hollow with steel wires and thus obtain the benefit of the long spans obtainable with high strength conductors.

It should be realised that the use of a large sectional area of steel, does not, as has sometimes been suggested, give rise to excessive inductance or magnetisation losses. It is necessary if the core section is large that the aluminium should not be in a single layer round the core, but should be in two or more layers stranded in opposite directions. With two layers of aluminium so stranded it is found that the inductance is identical with that of a coreless conductor, because the magnetising effect of one layer is counteracted by the other layer.

INSULATOR PRACTICE.

Porcelain, Glass and Moulded Materials.

FOR high tension work in Great Britain, and the Dominions, the United States, Scandinavia, Germany and Switzerland, porcelain is the rule. British makers have the advantage of having the finest China Clay (Kaolin) in the world at hand in Cornwall. Such is its virtue from the point of view of insulator manufacture that the largest makers of insulators in the United States have to send for it to get the best results.

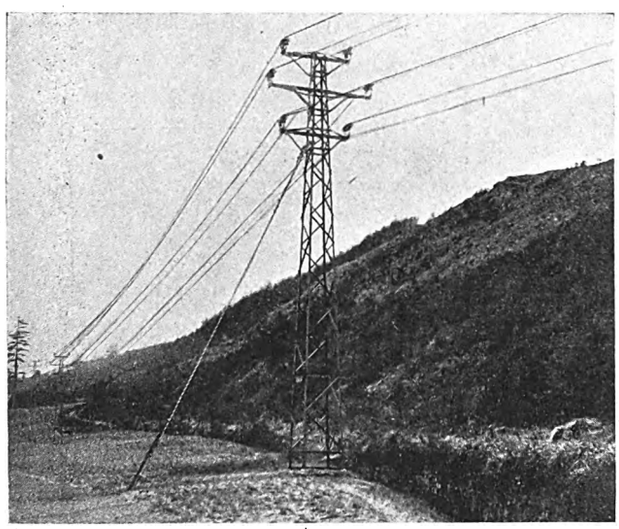

Fig. 1—.Lattice steel angle post and stay with double glass insulators (Estler Bros.) on line of the Ayrshire Electricity Board.

English makers claim that while labour costs, high taxation and social burdens make it difficult for them to compete with some makers abroad on cost alone, when life and reliability are concerned they are second to none.

In France, and to some extent in Italy, for pin insulators especially, glass has made great progress of recent years. They had a bad name in the United States at one time, because it was thought that inferior glass could be used, whereas to be successful, great care must be taken regarding raw materials, everything possible must be done to avoid or eliminate cooling internal stresses, and the insulator must be fixed on the pin so as to minimise stresses in that quarter. The use of polarised light, to detect internal stresses, has proved to be a step in the right direction.

The ideal insulator is one that is not easily broken, even by the stone of the small boy, and some people may wonder why insulators moulded under pressure made up of some of these special powders, should not be used for h.t. work generally. Up to date, nearly all materials having a measure of elasticity

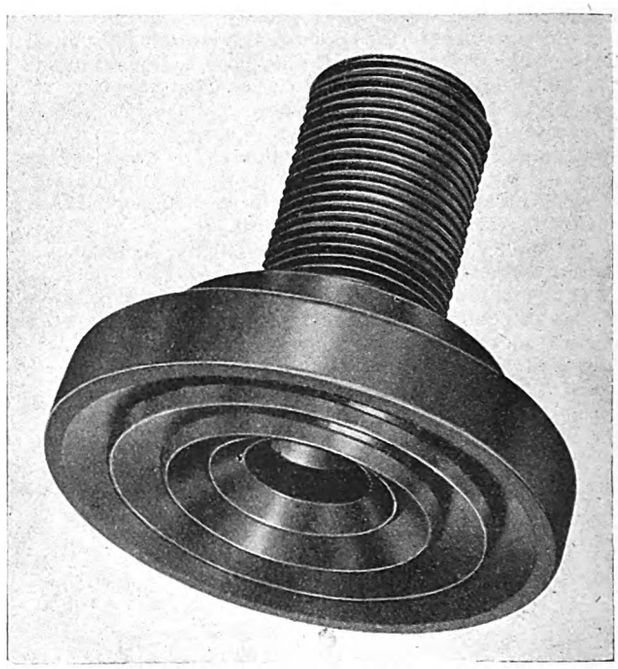

Fig. 2.—Moulded insulator made of Telenduron.

have been organic in composition, and with high pressure in the open there is danger of carbonisation.

Moulded insulators have their field in telegraph, telephone and low pressure work. They do not shatter, and look neat, and when of the spindle type, are useful for heavy stranded cables. A system of l.t. distribution has been developed around Aylesbury by Mr. W. A. Turnbull, A.M.I.E.E., the Borough Engineer, under which wood poles are bored through in the direction of the line, the holes placed one above the other, and the l.t. conductors threaded through; it makes a neat looking job. Fig. 2 shows the type of insulator used. It is screwed into the post, the ribs on the face keeping up the insulation during rain. It is made of Telenduron substance, a speciality of Thomas De La Rue and Co., of Walthamstow.

Under some special atmospheric conditions Telenduron insulators have been used for h.t. work, although l.t. is its special sphere of usefulness.

BOOK REVIEW.

Selektivschutzeinrichtungen für Hochspannungsaulagen. By M. WALTER. (Munich and Berlin: R. Oldenbourg.) Pp. vi+128. Paper covers. 7 marks.

The author presents, in a concise form, a comparative survey of modern methods of protective gear for high-voltage lines, and gives an introduction to the arrangement of such gear for new lines, with the necessary calculations of short-circuit and earth-fault currents. Few details of the actual equipment and relays are given, the reader being referred to technical periodicals and the publications of manufacturing firms; rather the application and calculation of protective gear are more particularly stressed, as filling a gap in existing treatises. The treatment deals largely with the "impedance relay" principle—a principle possibly less widely known to readers here than on the Continent, to judge from ephemeral literature. The calculation of fault currents follows the usual lines. The book contains an example showing how the impedance (or distance) relay system would be applied to a specimen network. The author writes from his own experience, and, as one of the first volumes on the subject, his book should attract attention. It should not be long before more is heard of the impedance relay system of protection in this country.

S. PARKER SMITH.

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BRITISH WOOD PRESERVING ASSOCIATION.

Co-operation for Study of Problems—Encouragement of Use of Home Grown Timber—Need of Fundamental Research—Improved Methods Required.

IN view of the increasing scarcity of wood, the rapid deterioration which affects certain wooden structures and so on, an influential committee has been formed by Sir Harold Boulton, Sir James Calder, Lord Clinton, Mr. Leslie S. Wood and others to start an association for co-operation and research in the matter of wood preservation. Temporary offices have been secured at 166, Piccadilly, W.1.

An inaugural meeting was held in December last, at which the reasons for the formation of such an association were explained and ideas for the future discussed.

Mr. Leslie Wood said it is intended to study preservation in general, and not to boost any particular branch, to draw together those interested, to exchange views, and develop the better and more widespread use of methods likely to benefit the whole country. In America, there is a very useful and energetic society with a large membership already at work. At present, in many country districts, one has to go so far to get preserved timber, or timber has to go so far to be preserved, that the whole subject is almost banished from many parts.

The public should be educated regarding the advantages of the use of wood preservatives, and the large amount of timber in use which is rapidly rotting away.

It is probable that the Association will encourage the use of English-grown timber, which, in the absence of preservation facilities, cannot be used for outdoor work; there is excellent spruce which might thus be used for posts and rails, and so on.

Sir Harold Boulton said that originally the Association of Tar Distillers had been formed, but it was considered that the subject went beyond the scope of some particular trade section.

National Importance.

The national importance of the subject made it desirable to invite representatives of the Admiralty, the Post Office, the Association of British Chemical Manufacturers, the Timber Trade Federation, and lastly, the Institution of Civil Engineers, which body has taken a great interest in the subject for 70 years. The objects of the Association were given, namely: (*a*) To spread knowledge of wood preservation, to prevent waste, and standardise specifications for wood preservatives and their application; (*b*) To investigate *all possible* methods of wood preservation, and discussion of ideas on the subject.

As a means to these ends, it was decided, *inter alia*, to hold meetings at various places, to co-operate with other organisations, to encourage the use of treated wood, to publish information, and to carry out and promote research. The Association does not wish to limit itself to creosote. Only 20 years ago he (Sir Harold Boulton) had persuaded the Canadian Railways to prevent appalling loss by creosoting timber sleepers; a way had been found of treating Douglas Fir.

Sir James Calder said that in America the Wood Preservers' Association had been very active; timber is increasing in price, and the need for the preservation of timber increases *pro rata* as the price of raw material increases. It is interesting that wood used 40 or 50 years ago seems, without preservation, to last much better than the wood used to-day; there is much wood rot going on.

Lord Clinton, formerly of the Forestry Commission, said that in his view what was wanted was fundamental research, in which the Forestry Products Board was also interested. Preservation of timber will not prevent the cutting of young trees for fencing and other such purposes, as to promote the health of plantations thinning is necessary, but treatment of such young timber, without rehandling, would increase marketability. Treatment should make certain unpopular wood available for commerce. At present, treatment has the effect of weakening timber; that result may be due to wrong methods, which research may obviate.

Mr. Herbert Fergusson said that in his early days he was struck by the enormous waste that was going on for want of knowledge regarding preservation. Soft wood could take the place of valuable hard wood for sleepers in some countries.

Mr. Ward, of the Post Office, said his department was distributing millions of poles round the country; it would be difficult for it to join such an association. The creosoting process had given good results for 40 to 50 years, the Rüping method of application being now used. Other methods tried had not been so satisfactory; either the acids or poisons used got into wells or ponds used by cattle, or ironwork, was attacked.

Mr. C. J. Brown (L.N.E.R., Engineers' Dept.), said the larger railway companies would welcome anything which would open additional sources of supplies or lengthen the life of sleepers. The railways were about the largest users of timber in the country.

Mr. C. Le Maistre, of the British Engineering Standards Association, was glad to see from the formation of the Association a spirit of co-operation in industry, without which standardisation cannot go forward. By means of standardisation, consumers can give orders and compare tenders with confidence, waste can be minimised, and work done for stock during slack times.

Sir Peter Clutterbuck said that in view of the coming shortage of soft wood supplies, increasing the life of wood by preservation was equivalent to increasing the supplies. The Forestry Commission is planting large areas; later on, quantities of thinnings wood will be available, and it was desirable to find some means of local treatment by which it could become marketable; such a result would have great effect on the financial results of the Forestry Commission. Power companies say they cannot have cheap distribution of power unless they can have some cheap system of supply of poles. They cannot afford the imported redwood pole properly creosoted, as used for telegraph poles. If the new association can bring together the demand for cheaper rural electricity and a marketable use for poles and thinnings, the Association will have done good work.

A great deal of research is required; for example, preservation methods suitable for poles or outdoor work are not good for work to be painted. Kiln drying has a preservative effect, the taking out of the sap removes the food for fungi.

Mr. Bryan mentioned the work being done at the Forest Products Research Laboratory at Princes Risborough.

Sir G. Courthorpe, Bart., M.P., said one of the chief handicaps to the use of home-grown timber, as compared with that imported, was the readier access of the latter to preserving plants; improved methods would, therefore, be of great service. It was decided to invite the co-operation of allied bodies.

At a meeting held on January 15th a draft constitution of the new association was discussed, and it was decided, *inter alia*, to make the question of wood fireproofing—a matter of interest to electrical engineers—one of the questions for investigation.

LIFE OF CEDAR POLES.

Experience in Eastern United States.

By A. C. SIMPSON.

RECENTLY an electric company in the Eastern United States desired to ascertain the experience it was having with cedar poles installed on its system. An estimate was made based on the inspection of a representative sample. The sample was taken from the original cedar poles which were placed in service during 1918 and 1919. Of 324 poles set in this period, 190 or 58·7% were inspected, an excellent sample in respect to adequacy. These poles were located in a territory comprising 110 sq. miles, with a great diversity of soil conditions—such as wet, sandy, rocky, loam and clay; combinations of each were also encountered.

It is believed that the results obtained are accurate because—

1. The sampling employed is representative to a high degree in respect to randomness and adequacy.

2. The poles inspected have actually been in service nine years, which approximates 33% of the average life, confining the operation of the law of probability to 66% of the total estimate.

3. The accuracy of the estimate of the remaining 66% is dependent upon the experience of an employee who has been with the company for fifteen years as a lineman and pole inspector. In this connection, it is suggested that the estimate might lean toward conservatism due to the nature of

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this man's training, a training which tends to make him feel personally responsible for the safe condition of the poles.

An inspection and chemical analysis of ten samples of soil taken from as many diversified pole locations indicated various quantities of silica, iron oxide and organic matter, none of which should have a detrimental effect upon the life of poles. Each pole had received " AA " butt treatment.

Tables 1 and 2 show the results of the inspection and life under various soil conditions, according to pole classifications.

TABLE 1.

All Heights—Class " C."

	Dry Sand.	Wet Sand.	Dry Soil.	Wet Soil.	Rocky Soil.	Side-Walk.	All Conditions.
No. of Poles ..	11	111	15	23	2	6	168
Total Pole-Years ..	272	2 645	365	517	42	129	3 971
Average Life, Years	24·7	23·8	24·3	22·5	21	21·5	23·6
Maximum Life, Years	26	29	26	29	21	26	29
Minimum Life, Years	20	17	23	9	21	14	9

TABLE 2.

All Heights—Class " B "

	Dry Sand.	Wet Sand.	Wet Soil.	Side-Walk.	All Conditions.
No. of Poles..	1	14	2	5	22
Total Pole-Years	19	358	50	122	541
Average Pole-Years ..	19	25·3	25	24·4	24·6
Maximum Life, Years ..	19	29	26	26	29
Minimum Life, Years ..	19	23	24	23	19

Tables 3 and 4 show results of inspection and life under various soil conditions according to pole classifications and height.

TABLE 3.

Class " C "—35 ft.

	Dry Soil.	Wet Soil.	Dry Soil.	Wet Soil.	Rocky Soil.	Side-Walk.	All Conditions.
No. of Poles.. ..	11	103	15	16	2	6	153
Total Pole-Years ..	272	2 446	365	342	42	129	3 597
Average Life, Years	24·7	23·7	24·3	21·5	21	21·5	23·5
Maximum Life, Years	26	29	26	29	21	26	29
Minimum Life, Years	20	17	23	9	21	14	9

TABLE 4.

Class " B "—40 ft.

	Dry Sand.	Wet Sand.	Wet Soil.	Side-Walk	All Conditions.
No. of Poles..	1	10	2	5	18
Total Pole-Years	19	258	50	122	441
Average Life, Years ..	19	25·8	25	24·4	24·5
Maximum Life, Years ..	19	29	26	26	29
Minimum Life, Years ..	19	24	24	23	19

Of the 190 poles inspected, 106 or 55·8% showed no signs of decay; 49 or 25·8% showed various stages of decay from 1% to 10% reduction of pole in area at ground line. The remaining 35 or 18·4% showed a reduction in area at the ground line in excess of 10%.

From the foregoing material, it may be said that the results obtained are an indication of satisfactory experience.

ADVANTAGES OF CEDAR POLES.

Price the Drawback in Great Britain.

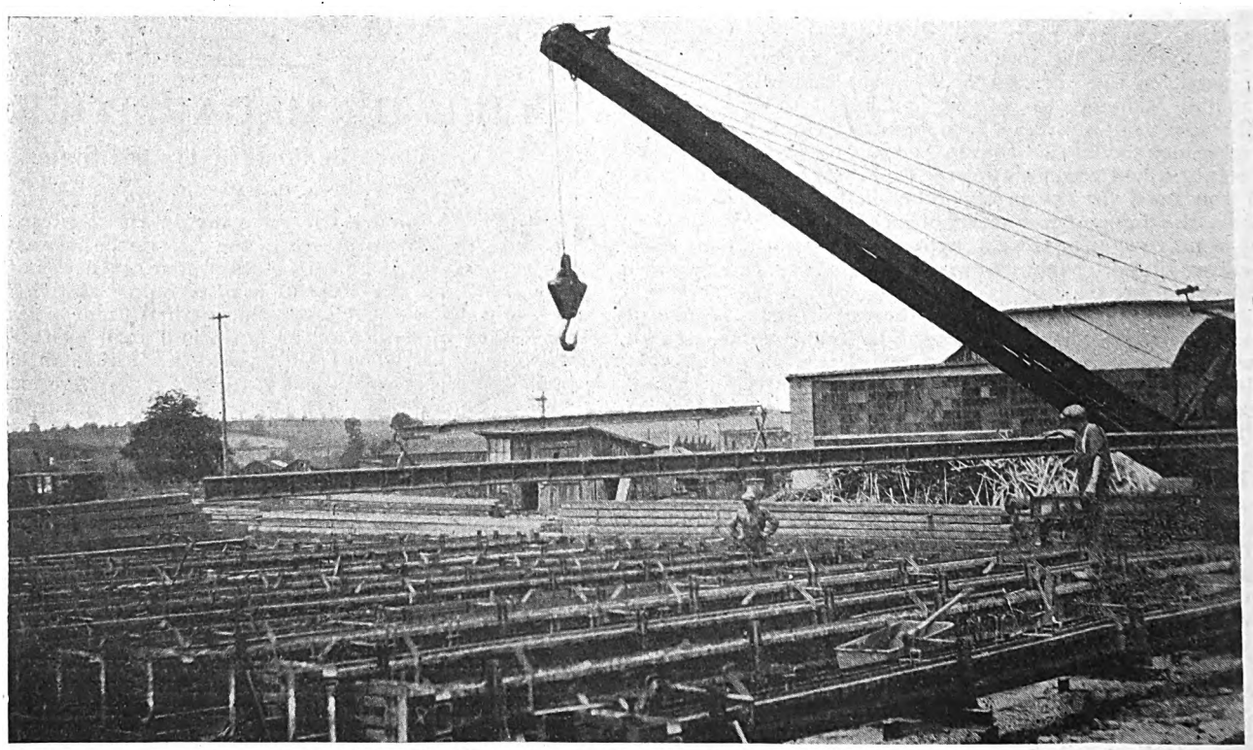
MR. G. W. Molle, of Messrs. A. Hugh Seabrook and Partners, who has interested himself in the possibility of using cedar poles in this country, informs us that the supply of Western Red Cedar is confined to a belt of country running roughly along the eastern side of the Rockies and divided roughly half on the Canadian side and half on the American side of the border. An American overhead line engineer, who was over here recently, said that this class of timber is rapidly replacing all others for use as wooden poles for overhead line construction in the United States. This also applies to Canada.

Mr. Molle adds :—" The remarkable characteristics of the Red Cedar pole, which make it most suitable for overhead line work are that it can be obtained in lengths even exceeding those usually required for this work, being as straight and clean as a lead pencil, and it is practically unaffected by conditions of soil or weather. Western Red Cedar trees have been known to lie on the ground for centuries without rotting.

" In regard to the price at which it is would be possible to obtain these poles in this country there unfortunately appears to be no possibility of obtaining them at less than twice the price of Scandinavian timber. The chief reason for this is, of course, the cost of transport from Vancouver to this country. Scandinavian timber is now being supplied to the eastern States of America for overhead line construction purposes. The only apparent reason for this is the very high cost of transporting cedar poles from the Western areas to the Eastern. It is, in fact, the practice to ship timber from Western Canada through the Panama Canal for delivery to Europe or to the eastern States of the American Continent, rather than send it across country by rail owing to the very high rail freight charges.

" For anybody seriously interested in Canadian timber a vast amount of information is available at the Imperial Institute, whose experts are only too pleased to assist in any way."

A CONCRETE POST WORKS IN FRANCE.



Concrete post being lifted from the mould at one of the Sanca Company's depots.

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GYRO COMPASS FOR GUN-FIRE CONTROL.*

"North Steaming" and "Damping" Errors—Firing During Obscurations of Target—Tests of the "Static" Compass—Errors on Cargo Vessels—Gyro Compass for Aeroplanes.

GYRO compasses for ordinary navigational purposes are now fairly reliable and can be relied upon when in good order to give a reading, say, within 1° of True North. On the other hand gyro compasses for ships of war are not so satisfactory from the fact that the compass is required not so much for navigating the vessel as for supplying a datum line for gun fire and for launching torpedoes, particularly as the ships may be surrounded by a smoke screen, when the only means of determining direction is from the instruments that can be carried on board. Moreover, the warship would most likely be manœuvring when firing is taking place and this would put the greatest strain upon the accuracy of the compass, particularly at a time when it is required to be the least disturbed.

Oscillating Period.

The "North Steaming Error" is the worst error that a gyro compass has to contend against. This error is due to the angular motion impressed upon the gyro when the ship is steaming over the curved surface of the ocean; it does not exist when sailing east to west, because this angular motion simply adds to or subtracts from the angular motion of the earth, but when the ship sails north or south the ship's motion is at 90° to that of the earth and the gyro compass moves to indicate the resultant of these two angular velocities. The compass can be made to execute this movement only by giving it an undamped oscillating period of 88 minutes in this latitude, and as the error must obviously be corrected the real speed of the ship over the floor of the ocean must be accurately known. We have no instruments at present that will tell the true speed of the ship, and therefore, the correction can only be approximate.

As every gyro compass is damped in its oscillations a further disturbance will arise called the "Damping Error" unless there is some means provided to allow the compass to make the turn in an undamped condition. The "Brown" gyro compass is alone supplied with a device which when the ship turns automatically obstructs the flow of oil in the damping bottles until the turn is completed, when the pipe is reopened by hand or by automatic means.

A gyro compass for gun fire control must have an accuracy far in excess of that which is needed for purely navigational purposes. The sighting telescope of the gun fire control apparatus is directed towards the target, and this direction is telegraphed to the gun positions. The gun layer has only to direct his weapon in the direction given on the repeater. This is most conveniently secured by a special form of repeater whereby gun and telescope are both made to point to the same reading on the repeater dial. If the target is always visible the dial can be a fixed one, but if the target is occasionally obscured the guns can continue to fire during obscuration provided the dial of the repeater is coupled so as to be moved by a gyro compass on board, in order that its direction could be unalterably maintained during the times when visibility failed; this, I understand, is roughly the arrangement that is employed on British ships at the present time.

If the procedure just outlined was the only requirement for gun fire the navigational gyro compass would be fairly satisfactory, but the present gyro compass would fail if the time of obscuration of the target lasted over much longer intervals of time. The problem thus becomes still more difficult and to meet it the gyroscopic direction apparatus on board should possess the following characteristics: (1) It should maintain a fixed direction in space, or if it should wander, it should wander very slowly, say, not over 1° per hour, and at a known constant rate. (2) Its departure from the True North direction should be accurately known (say, within 10 ft.) (3) The motion of the ship should have no action whatsoever upon the compass. These requirements cannot be supplied by the present day North Seeking (navigational) Compass, which is most certainly affected by the motion of the ship. I have developed gyroscopic direction apparatus in an attempt to meet the requirements of gun fire in an instrument that is called a "Static" gyro compass. This "Static" has a gyro wheel and case in strict neutral balance. The wheel weighs some 5 lb. and runs at 15,000 r.p.m. As this instrument is in strict neutral equilibrium it cannot be acted upon by the rotation of the earth. It is, therefore, not "North Seeking." It is also unaffected by any motion whatsoever of the ship.

Under trial the "Static" compass has given remarkable results. Some two and a half years ago on H.M.S. "Thisbe," a destroyer, during a week's trial, the "Static" did not wander more than about 1° for the whole of the ten hours run day, and this wander was always in the same direction and could have been cut down if an opportunity had occurred, but it was a condition of the trials that no adjustments whatsoever should be made during the time that the compass was under test. Although the "Static" did not wander more than 1° per ten hours the rate of wander as the ship altered its course varied slightly and this variation was at first a little puzzling. In our latitude of 50° a suitable weight has to be placed upon the north end of the gyroscope to cause it to precess into the meridian at about 12° an hour; the compass then remains stationary as viewed from the earth.

If the ship sails towards the east or west the apparent speed of the earth is increased or decreased accordingly and the weight on the north end is thus too light or too heavy to keep the gyroscope stationary, and the compass would appear to wander accordingly. For instance, if the ship sails 20 knots towards the east the compass will wander towards the east at about 0·4° per hour. To overcome this defect I employ a repeater that moves a slider over a resistance so that an electrical current can be sent and varied to move a suitable weight on the compass. When the ship has an easterly or westerly component the movement of the weight attempts to precess the gyroscope in the opposite direction, and thus balances out the error.

On some cargo carrying steamers permanent errors from 1° to 2° have occurred when shortly before no error existed in the gyro compass. This has been proved in some cases to have been due to the discharge of cargo which has given a combined tilt and list to the ship and to the compass mounting. If after such a discharge of cargo the fore and aft gimbal mountings were tested for horizontality and if out of level, put right, the error would be eliminated. This permanent error that can be brought in by an unsymmetrical discharge of cargo, would also affect the readings of the standard magnetic compass and could be corrected in a similar manner.

It is fairly safe to say that in the future the eyes of the fleet will be the aeroplanes, but to allow these aeroplanes to direct the gun fire a "Static" gyro compass must be carried. I have developed such a device which has given remarkably good results. The gyro wheel is 4¼ in. in diameter and runs on a flexible spindle at 11 000 r.p.m., by means of a 12 V direct current motor spinning the wheel by means of direct current saves the weight of the usual 3-phase motor generator. The total weight of the instrument is some 15 lb.

Both in the aeroplane and in the torpedo the gyro must of necessity be a "Static" and thus subject to the laws of the "Static" compass, because the direction of gravity as a means of control cannot be brought in.

Small Deviation.

For accurate gun fire the guns must be elevated to a known amount above the horizontal at the moment of firing. Usually the horizon is taken as the datum line, but as this may very easily be obscured during an action an artificial horizon must take its place. For this purpose I have invented an instrument which has given good results. Under stationary conditions the mirror has been proved to be strictly horizontal and under extreme disturbance of rolling and pitching on a rolling table normally used for testing gyro compasses, its deviation has been shown to be no greater than, say, 4 minutes of arc. It has already been stated the gyro apparatus for giving direction for gun fire must of necessity give extreme accuracy of direction if the instruments are to be of any practical value; this we believe can be secured by the present design of apparatus where extreme freedom of movement is maintained in the vertical and horizontal axis of support and when the instruments are of superlative workmanship. The solution does not rest, I am assured, in any further alteration of design.

* From a lecture given by Mr. S. G. Brown, M.I.E.E., F.R.S., at the Imperial College of Science and Technology, South Kensington, before the Physical and Optical Societies, on January 8th.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Government Policy and British Trade.

[To the Editor.]

Sir,—It is impossible not to be seriously concerned at the effect on industry of current or projected legislation and of our continually increasing national and municipal expenditure. The root cause of our present difficulties lies in our inability to produce important classes of manufactured goods at competitive prices.

For the explanation of this, we have to look to three main causes: (*a*) our unparalleled burden of taxation (municipal expenditure is double the 1913-14 total, and, at the present rate of increase, we are well on the way to the £1 000 000 000 Budget); (*b*) our rivals' vantage ground of secured home markets from which they compete with us for export trade; and (*c*) the greater freedom of our competitors from Government interference in their businesses.

Instead of practising economy, our Government is indulging in a riot of spending. We are promised the extension of the school age, with maintenance allowance, to children over 14, at a total extra cost in 1930 of £5 500 000; non-contributory pensions for about half-a-million widows, at a cost of £5 000 000, and an Unemployment Insurance Bill, which places on the Labour Exchanges the impossible task of proving that applicants are not genuinely seeking work (extra cost, £3 500 000).

On the fiscal side, the Government threatens to scrap our few equalising import duties and is endeavouring to bring about a two years' tariff holiday, which will prevent us from doing anything to reduce our competitive disadvantages or to develop our trade by an extension of Empire preference.

By way of interference in our factories, we are promised the ratification of the Washington Eight Hours Convention (with liberty to our competitors to admit all manner of exceptions), a Coal Mines Bill which will increase the cost of coal for our manufacturers, and—to add to the expenses and difficulties of factory managers—a new and more stringent Factories Bill.

The Government spokesmen even claim it as a merit that there is no finality in these measures, so that the only limit to the continued extension of so-called social services is the amount which can be extracted from the taxpayers.

If, on balance, all this was to benefit the workers, there would be something to set off on the credit side, but there is already evidence of the harm it is doing them. Since the Government came into office the cost of living index has been steadily going up, and the unemployed register shows 1 500 000 workers walking the streets as against 1 100 000 in June. Our staple industries are declining, our manufacturers are losing that confidence in the future which can alone justify them in undertaking new enterprises; numbers of skilled artisans—who, even when in work are not able to command the wages or the steady employment of unskilled men in sheltered industries—are losing their skill for want of practice.

The nation is at the parting of the ways, and unless we can retrace our steps and foster enterprise and independence on the part of employers and workers, and encourage thrift—in other words, unless we can get away from the mentality of the Minister of Health, who, like all spendthrifts, is of opinion that "whether a nation can afford a thing depends on how much it wants it"—this country, with all its great traditions, will sink financially, industrially and politically to the level of a second-rate power.—Yours faithfully,

J. A. Corcoran,
Director National Union of Manufacturers.

6, Holborn Viaduct, E.C.1.
January 24th.

Coal Mines Bill.

[To the Editor.]

Sir,—Some amendment of the provisions of the Coal Mines Bill, to secure equitable treatment of electricity supply undertakings, seems necessary. The Bill in its present form would establish a monopoly in the sale of coal without adequate safeguards against undue preference.

The various uses of coal in this country are in many respects alternatives to one another, and those engaged in the sale of coal and of other forms of energy produced from it are competitors. For example, domestic requirements for lighting, heating and cooking may be supplied by the burning of coal or by the use of coal gas or of electricity. The colliery owners are concerned directly with the sale of domestic coal in competition with electricity supply undertakings, and it will be open to colliery owners (indeed, an intention to do so has already been indicated) to offer domestic coal at a preferential price so as to encourage its greater use in place of gas and electricity. Similarly, it has been suggested that the colliery owners might assist depressed industries by giving a preferential price and reimburse themselves by charging an extra price to prosperous ones.

It is submitted that, in the public interest, the regulation of this proposed monopoly should be subject to the usual safeguards as to limitation of profits, prescription of maximum prices and prevention of undue preference to any class of consumer. Provisions of this nature are contained in the legislation regulating the supply of water, gas and electricity under statutory powers, and there would seem to be the fullest justification for amending the Bill to make similar provisions in respect of the sale of coal in this country.

Statutory electricity supply undertakings are already seriously handicapped in relation to private power plants by the preference given to the latter in respect of rating; if they are also to be required to pay an extra price for coal there is no doubt that their development would be seriously hindered and the objects of the national electricity scheme made more difficult, if not impossible, of attainment.

The Bill should be amended to make clear that the pithead price of any class of coal for home consumption shall be fixed without regard to the purpose of use, and on a basis which does not discriminate unfairly between statutory public utility undertakings and other users.—I am, etc.,

W. B. Woodhouse.

Leeds,
January 28th.

Technical Abbreviations.

[To the Editor.]

Sir,—I recently came across a criticism of a new technical dictionary in regard to the abbreviations therein employed.

The dictionary gives k.w.h, whereas the standard practice is kWh. I should be inclined to use KWH as being neater, simpler, more uniform, and less liable to cause confusion. When writing kWh, the standard way, a certain amount of reflection is generally necessary.

Now what advantages can the standardisers put forward to justify the above disadvantages? Even if "kilo" is regarded as of secondary importance as compared with "Watt" (which is debatable), surely Hour is worth as much as Watt. The Germans have adopted the same hair-splitting tactics, but they have even less "leg to stand on," since hour is a noun and should be written by them with a capital H.

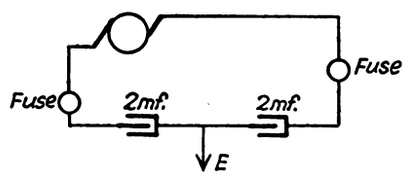
Let us change our standards.—I am, etc.,

H. H.

Generator Interference with Wireless.

[To the Editor.]

Sir,—In reply to "Q's" letter in your issue of January 10th regarding generator interference with wireless, a method I have used with success on many occasions is to put condensers



across the brushes as you suggested, but putting two in series and earthing the middle point. Insertion of fuses in the circuit for safety is advisable.—I am, etc.,

R.

Sheffield,
January 24th.

BOOKS RECEIVED.

"Pioneers of Electrical Communication." By Rollo Appleyard. (London: Macmillan and Co.) Pp. ix+347. 21s. net.

"Photoelectric Cells." By Dr. Norman R. Campbell and Dorothy Ritchie. (London: Sir Isaac Pitman and Sons.) Pp. vii+209. 15s. net.

Science Abstracts. Secs. A and B. Vol. 32, part 12, No. 384. (December 25th.) Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single Numbers, 3s.; annual subscription, 30s., or 50s. for both sections.

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NEWS IN BRIEF.

Electrical Contractors' Conference—Electricity on American Farms—Electric Power in Northumberland Coal Mines—New Chili Telephone Concession.

SANDBACH U.D.C. has decided to adopt electric lighting at the Town Hall.

Owing to the success of the Manchester police telephone boxes, 11 police stations have been closed.

Hired electric cookers connected to the Manchester Corporation mains in November last numbered 73, making the total 5 774.

Alterations and extensions to Chester Corporation's electricity showrooms in Northgate Street, are proposed. Mr. F. C. Saxon, F.R.I.B.A., is to be asked to prepare plans.

H.M. Office of Works, etc., invites tenders for the erection of a telephone exchange at Purley, Surrey.

This year's annual conference of the Electrical Contractors' Association will be held at Llandudno on June 25th, 26th and 27th.

New showrooms in West Street in connection with Bromley Corporation's electricity department, were opened on January 23rd. Cooker demonstrations are given daily.

The dinner of the Finsbury Technical College Old Students' Association will take place at the "Trocadero," London, on March 29th. Mr. F. R. C. Rouse, Venner Time Switches, Ltd., London, will supply any further particulars.

Members of the North Midland Students' Section of the Institution of Electrical Engineers will visit the works of Karrier Motors, St. Thomas' Road, Huddersfield, tomorrow (February 1st). Members will meet outside the works between 2.30 and 2.45 p.m.

Poplar (London) Board of Guardians is to take h.t. supply for the High Street institution. The work of connecting will be carried out by the B.C. at an estimated cost of between £1 200 and £1 500.

The South African Railways Administration has decided to call for tenders for an 80-ton heavy lift crane, a 25-ton floating crane and such additional electric cranes as may be necessary to deal with the traffic at the Point, Durban.

At a meeting of the Institution of Electrical Engineers, Western Centre, in the Abbey Hall, Catherine Street, Plymouth, on February 3rd, at 7 p.m., Captain P. Eckersley will deliver his Faraday Lecture on "Broadcasting by Electric Waves."

The power bill for making 120 tons of silage has been reduced about $35 by the use of electricity on an Oklahoma farm, according to "Capper's Farmer." Last year the electricity for cutting the silage cost between five and six dollars. Previously a steam engine hired to pull the cutter cost $40.

At a recent meeting of the Leeds Radio Society it was resolved to form a branch of the Television Society, to work in conjunction with the Leeds Radio Society. It was stated that if a strong society were formed, the Baird Television Co. would loan a televisor. The next meeting of the Leeds Radio Society will be held at the University to-day (January 31st).

The Electroplaters' and Depositors' Technical Society will hold a convention to-day (Friday), at 2 p.m., when Dr. W. Rosenhain will give an address entitled "Research and Practice," and a discussion entitled "The Present Position of Chromium Plating" will be opened. An exhibition has also been arranged.

Mr. R. Pryce-Jones, stated in a recent address to the North-Western Students' Section of the Institution of Electrical Engineers, that most of the improvements in industry during the last few years had been due to the extended use of cranes. There were many industries where a suitably designed electric crane would be an improvement on steam cranes.

Cyclists and drivers of vehicles have been fined at Edinburgh for ignoring automatic road-traffic signals.

Brighton Hospital Committee is about to have electricity installed at the Beechmont hospital at a cost of £460.

Schemes have been submitted by several firms of Glasgow architects for the reconstruction of the premises of Glasgow electricity department.

"The Art of Stage Lighting" was the title of a paper read before the Illuminating Engineering Society on January 21st, by Mr. C. Harold Ridge.

LOOKING BACKWARD.

FIFTY years ago, THE ELECTRICIAN *of January 31st, 1880, quoted a lecturer's estimate that there were then 40 000 telephones in use in America and only about 800 in England.*

Tenders were invited for the electrical lighting of the London and St. Katherine Docks.

Much scepticism was still current as to the success of Edison's lamp as a commercially practical means of illumination.

* * *

FIFTEEN years ago, in THE ELECTRICIAN *of January 29th, 1915, the issue of the first number of the B.E.A.M.A. house journal was recorded.*

Owing to difficulty in obtaining a supply of carbons, the Willesden Electricity Committee proposed to convert as many as possible of the arc lamps in use to metal filament lamps.

* * *

TEN years ago, THE ELECTRICIAN *of January 30th, 1920, was calling attention to the harm done to the industry by unsuitable and inferior wiring and apparatus.*

Registration of the British Electrical Development Association as a company limited by guarantee, but not working for profit, was recorded.

A radio exhibition will be held at Tokyo from March 20th to April 18th. The Department of Overseas Trade, London, will supply further details.

The annual dinner of the Birmingham Electric Club will take place on March 14th. The hon. secretary is Mr. J. H. Asdell, 134, Grove Road, King's Heath.

The N.J.C. for the Electrical Contracting Industry has conceded advances of wages from 1s. 10½d. to 1s. 11d. in London (grade A), 1s. 7½d. to 1s. 7¾d. in provinces (grade B), 1s. 5¾d. to 1s. 6½d. in urban areas (grade C), and 1s. 4½d. to 1s. 4¾d. in rural areas (grade D).

A conversazione with exhibits, supper and dance will be given by the Overhead Lines Association on February 24th, at the Georgian Restaurant, Harrods, Ltd., Knightsbridge, London. Tickets (12s. 6d. each) can be obtained from Mr. W. T. Andrews, 14, Violet Road, London, E.3.

In a recent lecture at the Mechanics' Institute, Wakefield, Lt.-Col. V. A. Haddick said an important factor in the increase of Ireland's agricultural productivity would be the Shannon electricity scheme.

The Cowpen Coal Co. is to substitute electricity for steam power and compressed air at its pit in the Blyth area. Electric machines have already been introduced at Crofton Mill, Cambois and Isabella pits; electrically driven ventilating plant has been put into operation at Cowpen colliery and the steam driven plant at South Newsham is to be abolished.

The "American Agriculturist" contains an interesting story about a device for electrocuting flies. A special screen is connected with the lighting circuit through a special transformer, the screen is charged with electricity, and contact with it by flies and other insects "starts them on the long, long trail." During the summer months the equipment destroys as high as 2 500 flies per day.

Sir Felix Pole, chairman of Associated Electrical Industries, stated in the course of an address at the monthly luncheon of the American Chamber of Commerce in London, last week, that, in his opinion, American capital could prove of value if invested in British undertakings, provided it were clearly laid down that British trade and commerce should be benefited and not damaged by the influence which such investments were bound to possess.

The Chilian Senate has approved the new 50-year concession permitting the Chili Telephone Co., associated with the International Telephone and Telegraph Corporation, to penetrate throughout the country with its own lines and to connect the system with all other national operating systems. International service with the neighbouring republics of Argentina and Uruguay has been established, and a definite prospect now is opened for an extension to other territories served by the International System via the Buenos Ayres-Madrid radio link of the Compania Internacional de Radio (Chili). This new concession brings Chili within speaking distance of Europe.

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ELECTRICAL CONTRACTORS' DINNER.

Problem of Loading the Grid—What a 5 Per Cent. Annual Increase in Houses Wired Would Mean—Need of Educating the Public—No Salvation from Politicians—Charges for Current and Cost of Apparatus—All-in Rates Required.

THERE was a record attendance at the annual dinner of the allied Electrical Contractors' Associations (E.C.A.I., N.E.C.T.A., Ltd., and N.F.E.A.) at the Savoy Hotel, on January 22nd, well over 300 members and guests being present. The president, Mr. H. Willoughby Ellis, was in the chair. Among the company were Sir John Brooke, Sir Andrew Duncan, Mr. V. Watlington, Mr. Ll. B. Atkinson, Mr. E. S. New, Mr. J. J. Foggo, Mr. P. Rosling, Mr. N. G. Gedye, Capt. J. M. Donaldson, Mr. F. W. Purse, Sir G. W. Humphrey, Mr. J. L. Brydges, Mr. H. Marryat, Mr. S. H. Callow, Mr. J. Wilson, Dr. J. W. T. Walsh, Mr. B. C. Garman, Miss C. Haslett, Mr. E. A. Reynolds, Mr. T. E. Alger, Mr. W. H. Walton, Mr. W. R. Rawlings, Mr. Walter Riggs, Lt.-Col. Cortez-Leigh, Lord Bective and Col. G. E. Adamson.

Progress of the Industry.

Sir John Brooke, proposing the toast of the "Allied Associations and Honorary Officials," said that it ought to be realised that the progress that was being made was not the inevitable march of events, but the result of hard work by everybody in the industry. They were all looking to great development of electrical supply and industry. Without such development the great national scheme which the Central Electricity Board was carrying to such a brilliant success would not be justified. That progress could not be made without an enormous effort, particularly on the part of members of these associations; the task was perhaps bigger than was generally realised. The estimated increase in the sale of electricity during the first five years upon which they were working was no less than 3 000 000 000 units. For the first two years of the period the estimated growth had been reached, indeed, they had done a little better, but there was still a long road to follow. Only 25 per cent. of our houses were electrified, In America the percentage was 66. An increase of only 5 per cent. each year meant 500 000 houses to be wired. Much more propaganda than was being carried on at present would be required to attain this rate of growth. He urged members of their associations to put a real push into the sale of electricity and stressed the need of educating the public. There was still much ignorance, but less than a year ago, particularly in regard to the necessity for the use of good materials and workmanship. The Commissioners were accused of making too stringent regulations. The only criticism that was useful was that which was directed to exact points, on which the regulations could be made better, and of that there was an extraordinary absence. In Sweden for various reasons they had started their wiring on an insufficient scale, and were now engaged in re-wiring to a much higher standard with the result that fire risks had been very much reduced. He hoped that the book which they had published for the benefit of architects was only a beginning, and that they were going on so that everyone could go to his contractor and get the best advice.

Mr. H. Willoughby Ellis, replying, said that the time had more than arrived when the parochial outlook must be compelled to recede farther and farther into the background. On the applied side the science and art of electricity had assumed the dimensions of a national problem, requiring the united attention of all practical electrical men. Since the matter had assumed national dimensions it was inevitable that they would have to endure the attention of the politicians, but he trusted that the business men of the industry would take charge in their own house and organise their industry on sound, enduring and non-political lines.

Owing to the exertions of the Electricity Board and the Electricity Commissioners (in this connection he was delighted to welcome Sir Andrew Duncan as chairman of the former and Sir John Brooke as representing the latter), they were fast approaching a national system of supply covering the greater bulk of the country. Their immediate problem was to see that the national supply scheme was provided with the necessary load to ensure its success. In reading the reports of the recent debate in the House of Commons on this matter, he failed utterly to discover any practical or helpful suggestions towards attaining the end in view. They did not nowadays look to politics for business. Appropriate and workable business suggestions must come from the practical men *within the industry itself*; these suggestions must be framed on considered business lines and not built upon some phantasy of proletarian social benefit.

These considerations were not local in character. They were the care of every section working together with one common end in view, and the common problem before them was to load the grid. They would see, of course, a gradual migration of industry from crowded centres of population into rural or semi-rural areas where it could be carried on under better and more healthful conditions. It was not difficult to visualise a fundamental change in their national habits and a reversal of the flow of the tide, whereby the towns might return to the status of residential areas, while the surrounding urban areas were given up on an ever-increasing scale to the requirements of manufacturing and general industry. Such a swing of the pendulum was something, perhaps, that they were doing on behalf of posterity, and their immediate concern was to know what they were doing on behalf of themselves. If they were to build up an immediate load for the national supply system, the immediate need was to tackle the domestic situation in *existing* supply areas, by arranging not only reasonably uniform charges up and down the country, but also genuinely economic charges calculated to attract and connect that vast domestic demand to the mains. The industrial power demand in this country was already substantially connected up. Future industrial demands would come on to the public mains practically automatically, but the possible and colossal domestic demand had been no more than scratched on the surface. In this matter nothing was more important than truly economic rates of supply. Given such rates, the immense advantages of electric heating and cooking would provide an irresistible appeal to the public, which they would find ways and means to gratify.

Let them avoid loading the price per unit with heavy charges calculated to ease the cost of equipment. The acquisition of electrical equipment must be made as reasonably easy as possible, but he claimed that it was wholly erroneous to suppose that apparatus must be given away, as it were, in order to persuade the public to use the service.

Such an attitude was to hitch up the horse by the side of the cart in "combination" style.

They heard talk from time to time of "decorating and furnishing with electric lighting," but they must go a step farther and talk of "decorating and furnishing with electricity." Let them remember the immense sums expended annually on ordinary domestic furniture and hangings. What would the industry give to secure the national expenditure of one-half of this sum on electrical apparatus? Was ordinary furniture "given away"? On so-called "attractive hire-purchase terms," was it not a fact that ordinary domestic furniture carried a manufacturer's and dealer's profit beyond the wildest dreams of any electrical trader? Why were other trades permitted to earn these profits, while electrical traders—manufacturers, wholesalers and contractors alike—were expected to work for next to nothing?

Domestic Equipment.

The electrical point of view was inclined to be far too timorous. Some of them had been much too anxious to boost the domestic use of electricity at a time when general supply rates were not low enough to give the proposal a sound economic basis. They tried to put the cart before the horse, and in some electrical minds, even to-day, the same eccentric process was busily at work. He was prepared to take this matter a step farther. Much of the flimsy electrical apparatus of to-day would not do and they must get back to solid, enduring and trouble-free equipment, and this type of equipment could not be given away with the proverbial pound of tea. The domestic installation of the future must also be much more solid and comprehensive than it had been in the past. The plug outlet question was of vital importance. It was not enough to have one 15 ampere outlet to each room for large apparatus; simple ways and means must be found to provide alternative and lightly fused sockets for all the small apparatus that might be required in each principal room.

All-in rates must be provided and the higher charges generally applicable for lighting only must be abolished. These

Continued on page 146.)

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rates, originally adopted to enable suppliers to deal adequately with a peak load, were becoming less and less applicable owing to the vast increase of industrial requirements during the daytime. Naturally supply authorities were not inclined to reduce these high rates, but the time was not far distant when this would have to be done. It muddled and confused the whole proposition to have some sockets supplying current at one rate for one purpose and other sockets supplying current at a different rate for other purposes. From the point of view of the public the whole thing savoured of a stupid and pointless wangle.

Need of Education.

In the electrical education of the public he saw room for the very fruitful expenditure of all the electrical money they could spare. Tens of thousands of houses were using their 60 units per quarter for lighting, when, with adequate development, they would be consuming 600 units as a minimum requirement. But impressive results would never be attained without economic rates followed up by an immense educational effort. In the schools—the higher girls' schools and training colleges, every other scheme of domestic heating and cooking was handsomely represented, electrical equipment alone, in the majority of cases, being conspicuous by its absence.

Was it not vitally necessary for the best brains in the industry, not outsiders, to pool their experience and ability in order to achieve a substantial measure of immediate reform? The need for all sections of the electrical industry to come more closely together in some central "Council of the Industry" was daily becoming increasingly apparent. The man or organisation that succeeded in welding their great industry into one coherent and co-operative whole would deserve uncommonly well, both of his contemporaries and of posterity.

Mr. H. J. Miles, proposing the toast of "The Guests," said that he took the presence of representatives of nearly everybody connected with the industry to mean that they intended to work together for the good of the industry as a whole. In Brighton they had very nearly achieved the percentage of houses wired that had been reached in America.

Mr. F. W. Purse (London and Home Counties Joint Electricity Authority, which he paraphrased as Light, Heat and Cooking Juice Advocates) and Mr. V. Watlington (chairman of B.E.A.M.A.) responded. Mr. Purse referred to Section 48 of the 1926 Act, and said that it was suggested when it was included in the Act that it sounded the death-knell of electrical contractors. This had proved to be entirely wrong. It had brought many thousands of pounds' worth of work to contractors, and had added many thousands of new consumers to the supply undertakings. It was now recognised that municipal and private undertakings could go on together and that good would result.

Co-operative Effort.

Mr. Watlington said that they were beginning to achieve co-operation in the electrical industry, and this was an object to be pursued with all their energies. They had reached a point when individualism alone would no longer serve as the only means of carrying on their industrial undertakings. If they were to reap the full benefit of the facilities for the sale of electricity, there must be no division in the electrical industry. Each part had its functions but they would make a great mistake if they thought they could stand alone. Industrial electrification was bound to come from necessity, but when it came to the ordinary man and woman, they had done very little to increase the use of electricity which was suffering from being dealt with too much from the engineering point of view. Women could play a large part in developing this field.

Mr. C. H. Flower proposed the toast of "Our Chairman," saying that the Associations had been very fortunate in their presidents and never more so than this year. The position involved attendance at an endless series of committees and meetings, and much travelling to all parts of the country, so that it imposed a great strain on a busy man's time. The toast was musically honoured.

REDUCTION OF CHARGES.

Many Reductions in Industrial and Domestic Tariffs for Electricity Supply.

THE following reduced charges for electricity have recently been adopted. Figures in parentheses represent the former rates:—*Seaham Harbour*, lighting, 6d. maximum to 4d. per kWh for 500 kWh and upwards per month; power, 3½d. and 3d., with special rates for over 100 kWh per month; heating and cooking, minimum 120 kWh per annum, 2d.; domestic, from 5s. to 10s. per month, according to rateable value, plus 1d. per kWh, for all purposes; shop-window lighting after hours, 15 kWh per week 5s.; increased quantities *pro rata*. *Dublin* (*Electricity Supply Board*), industrial power, first 3 000 kWh quarter, 2d. per kWh; next 2 000, 1½d.; further quantity 1d. *Taunton*, power, up to 4 000 kWh per quarter, 1¼d. per kWh; exceeding 4 000, 1d.; exceeding 32 000, ¾d. *Sutton Coldfield*, lighting, separately metered, under 750 kWh per quarter, 5d. per kWh; 751 to 2 000, 4½d. 2 001 and upwards, 4d.; contract rate, lighting and heating or cooking, 12½% of rateable value, plus 1d. per kWh; heating and cooking, up to 2 000 kWh per quarter, 1½d. per kWh, over 2 000, 1d.; industrial power from 1¾d. per kWh for under 500 kWh per quarter to 1d. per kWh for over 10 000. *Douglas*, late shop window lighting, 3d. (4d.) *Turton*, power for industrial purposes, first 300 kWh per quarter, 3d. per kWh; next 200, 2d.; all over 500, 1½d. (minimum £1 per annum); lighting 5½d. (minimum £1 per annum); heating, cooking, domestic motors, etc., first 25 kWh per quarter, 2d. per kWh, all over 25, 1d. per kWh. *Luton*, tramways supply, 15s. per quarter per kW of the plant reserved for tramway purposes, plus charge per kWh equal to the cost of fuel used per kWh generated, with an addition of 25% *Islington* (*London*), lighting, flat rate, 3¼d.; places of worship, public institutions, theatres, schools, etc., 2¾d.; power, heating and cooking, ⅞d., if consumption exceeds 50 000 kWh per quarter, discount of 10%. Special rate, with meter rent for restricted hour use, factory and industrial lighting. Advertisement sign lighting and shop window and garage lighting, 2d. *Hornsey*, lighting, 3¾d. (4d.) per kWh for first 500; *Sevenoaks and District Electricity Co.*, private lighting, 9d. (8d.), business premises, hotels, schools, etc., 7½d. net (9d. less 5%); hospitals, 8d., less 25% for payment within a month; heating, 1¾d. (2½d.); power 3¼d. per kWh for first 100 kWh per quarter, decreasing in stages to 1¼d. per kWh for all in excess of 2 200; domestic tariff, 1½d. (1¾d. and 2d.). *Heckmondwike*, lighting, 4d. (3d.). *Mirfield*, lighting 5d., domestic use 1¾d. *Yorkshire* (*West Riding*) *Electric Tramways Co.*, lighting, first 250 kWh per quarter, 6½d. per kWh, second, 250, 6d., beyond, 5½d.; heating, cooking and other domestic uses in conjunction with lighting, first 250 kWh per quarter, 1½d. per kWh, beyond, 1¼d. per kWh; small power, up to 15 H.P., first 250 kWh per quarter, 3½d. per kWh; beyond, 3d.; shop window advertising after closing hours, outside shop-window lighting, and outside signs, 2d., plus meter and time-switch rental. *Grays*, lighting, 6d. per kWh up to 100 kWh per quarter (up to 1 000), 5½d. per kWh for next 1 000, and 5d. beyond; power, up to 500 kWh per quarter, 2d. kWh (2½d.), next 3 500, 1¾d. (2d.); running charges in alternative two-part tariffs, 1¼d. (1½d.); cooking, through separate prepayment meter, 2d., rebate 2d. in shilling collected over the first 10s. *Bury St. Edmunds*, domestic rate where heating and cooking is installed, 1½d. less ½d. kWh discount for prompt payment. *Tunbridge Wells*, electricity for hot water boilers of 4½ gallons and upwards on separate meters, ¾d. in Tunbridge Wells and Southborough, and 1d. in other parts of area. *Bredbury and Romiley*, domestic power 1¼d. *Swanscombe and Stone* (*Kent Electric Power Co.*), lighting 6½d., power, heating and cooking, 2d. *Stratford-on-Avon Electricity Co.*, residential, inclusive rate 1d. per kWh, with fixed charges up to three rooms, summer quarters, 7s. 6d., winter quarters, 10s. 6d.; each additional room, 2s. 6d. and 3s. 6d. respectively alternative rates, heating and cooking, 1¼d.; lighting, 7d. for first 500 kWh per quarter, beyond, 6½d. per kWh; prepayment lighting, 8d., with rebate of 1d. per kWh in excess of 100 kWh per annum; business premises, first 90 kWh per quarter, 8d. per kWh, beyond, 2d.; power, 2d. per kWh for first 10 000 kWh per quarter, beyond, 1½d.; sign lighting, 3d. (minimum £5 per annum); lighting flat rate, 6½d.; prepayment meter supplies 7½d. with rebate of 1d. per kWh after first 100 kWh per annum. *Hastings*, general lighting, 4d., from 4 001 to 10 000 kWh per annum, 3¾d.; from 10 001 to 15 000, 3½d.; from 15 001 to 20 000, 3¼d.; beyond, 3d.; general lighting with slot meter, 5d., rental lighting with slot meter, 7d., including 2d. towards cost of installation; exterior lighting, 3d., shop window lighting after hours, 2d., outside decorative lighting, 2½d., arc or high c.p. lighting for professional photographic purposes, 2½d., cinema arc lighting, 1½d.; power, other than domestic, 1d.

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THE "BLUE BOOK."

New Edition of Electrical Trades' Directory and Handbook.

ERNEST BENN, LTD., of Bouverie House, Fleet Street, London, have just issued the 48th (1930) edition of this unique work of reference for those engaged in the electrical and allied industries and for those requiring information relating to such industries. The book has again increased in size, no effort has been spared in making the lists of names complete and accurate, and the handbook section has been rearranged for the greater convenience of users. The British alphabetical section alone contains about 22 000 names and addresses which are of great utility for circularising purposes, and the volume also comprises an extensive British classified trades' division, which is extremely useful as a buyers' guide, and alphabetical and classified trades' sections relating to British dominions and colonies, the European continent, Asia and Africa, Central and South America and the United States of America, and is the only work giving such information regarding firms and persons engaged in electrical work throughout the world.

The geographical section, introduced two years ago, has been found of great service, and has again been considerably amplified. The list of telegraphic addresses also continues to be much appreciated. Other interesting features in the book are a complete list of electrical contractors, in which are specially indicated the entries of the names and addresses of firms who are on the National Register of Electrical Installation Contractors and/or members of the Electrical Contractors' Association and/or the Electrical Contractors' Association of Scotland.

The contents of the book also include a three-years' calendar, a revised digest of the law and procedure relating to patents, designs and trade marks, a conversion table to simplify calculations regarding weights, measures and electrical quantities, tables dealing with electrical equivalents of heat units, a comparison of British and metrical measurements of wires, resistances of wires of various diameters and resistances of various materials, the Imperial standard wire gauge, copper wire gauges, current-carrying capacities, resistances, etc., of cables of various sizes, characteristics of aluminium and steel cored aluminium conductors, electro-chemical equivalents, etc.

Other handbook features are the B.E.A.M.A. standardisation rules for electrical machinery, interest and sinking fund tables, abstracts of Colonial and foreign import tariffs, particulars of international telegraphs, including lengths, etc., of land lines and submarine cables, wireless developments, colleges and schools, Government departments, and electrical and engineering associations.

The book (which is published at 25s. net) continues to merit its reputation as an indispensable work of reference for those engaged in or associated with the electrical industry.

BUSINESS ITEMS.

THE L. N. Ericsson Telephone Co. in Stockholm has issued a report which shows that 70 Ericsson telephone exchanges are in operation or in course of construction in 16 different countries. The number of lines connected to these exchanges is 164 290, while 237 820 are in course of construction. The final capacity of these exchanges is 1 658 700 lines.

An order for complete boiler plant comprising boilers, air pre-heating equipment, pulverising plant and auxiliary machinery for the B'wana M'Kuba Copper Mines, South Africa, has been received by INTERNATIONAL COMBUSTION, LTD., Africa House, Kingsway, London, W.C.2. Most of the equipment will be manufactured at the Derby works. Another order is for a complete stoker-fired boiler plant for the Ryde pumping station of the Sydney Water Board, Australia.

In view of the recent fusion of merchandising interests between the Edison Swan Electric Co., Ltd., and the British Thomson-Houston Co., Ltd., the former announces that it has been found necessary to augment its organisation in the Liverpool district. For this reason on and from February 10th the present Liverpool branch office will be removed from 33/35, School Lane (the present address) to 16, South Castle Street, where large stocks of Royal Ediswan lamps, wiring accessories, Ediswan radio apparatus and Mazda valves will be held. A well-equipped showroom will display samples of B.T.H. lighting equipment, refrigerators, and Ediswan radio apparatus. The telephone number is Royal 5052, and the branch will be under the management of Mr. A. S. Wilson.

PERSONAL.

MRS. C. T. ALLAN, chairman of the South Wales and Monmouthshire branch of the Electrical Association for Women, is making good progress after her recent severe operation in a Cardiff nursing home.

The Council of the Institution of Electrical Engineers has made the ninth award of the Faraday Medal to Sir Ernest Rutherford, F.R.S.

Sir Ernest Rutherford who has been awarded the Faraday medal of the I.E.E.

At a meeting of the Southend-on-Sea Town Council on January 21st, Mr. Robert Birkett, late borough electrical engineer, was presented with an illuminated address in appreciation of his 24 years' service.

Mr. H. E. Blackiston, deputy borough electrical engineer of Bermondsey, has been appointed borough electrical engineer and transport manager at West Hartlepool at a total salary of £1 275 per annum. See page 153.

Mr. T. H. U. Aldridge is giving up his office of vice-president and general manager of the Shanghai Power Co., and is returning to England, where he will be associated with the American and Foreign Power Co.

Following on the taking over of the Dublin electricity undertaking by the Electricity Supply Board, Mr. Laurence J. Kettle, city electrical engineer, has retired, and Mr. W. Hahn has been appointed chief operation engineer, eastern district.

The following are the new officers of the Faraday House Old Students' Association for the current year :—PRESIDENT : Mr. S. B. Haslam ; VICE-PRESIDENT : J. A. Taylor ; MEMBERS OF COUNCIL : Messrs. W. R. C. Coode-Adams, G. W. Gray, G. A. B. Leishman, C. E. Prince, H. S. Selves, H. E. Webb.

A long-standing association between seafarers and the wireless service was acknowledged at the Candlemas Court of the Worshipful Company of Shipwrights when Mr. F. S. Hayburn, deputy managing director of the Marconi International Marine Communication Co., Ltd., was admitted a Freeman and Liveryman of the Shipwrights' Company, whose foundation dates back to 1260.

Mr. R. M. Longman was the recipient of a presentation made at the Leeds and County Liberal Club on Monday, at a complimentary concert and dance given in his honour. Mr. Longman is leaving the staff of the Yorkshire Electric Power Co., where for nearly nine years he has held the position of technical superintendent. He has been appointed chief assistant to Mr. S. E. Fedden, engineer of the Mid-East England Area of the Central Electricity Board. Mr. W. B. Woodhouse (engineer and manager) made the presentation on behalf of the staff, the gifts being a stop-watch and a large canteen of cutlery. Mr. Woodhouse was supported by Mr. J. J. H. Stansfield (secretary) and Mr. H. C. Fraser (superintendent of organisation).

Obituary.

MR. E. H. HORSTMANN, on January 27th, at Weston-super-Mare, where he had been spending the week-end with relations. Mr. Horstmann was secretary and joint managing director of the Horstmann Gear Co., Ltd., was well known throughout the electrical industry, was a Fellow of the Royal Society of Arts, and a Member of the British Horological Institute and also the Institution of Public Lighting Engineers.

PROFESSOR HUGH LONGBOURNE CALLENDAR, Professor of Physics, Imperial College of Science, South Kensington, on January 21st. aged 66 years. In 1893 he was appointed Professor of Physics at the McGill University, Montreal, and in the year following was elected a Fellow of the Royal Society, which awarded him the Rumford Medal in 1906. He returned to London in 1898 on his election to the Professorship of Physics at University College and was in 1901 appointed Professor of Physics at the Royal College of Science. Professor Callendar invented several forms of platinum thermometers and pyrometers for various heat researches and for standardising these instruments devised a special compensating resistance box. He also constructed an electrical apparatus which recorded variations of p.d., resistance, etc., to one part in ten thousand.

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PLANT FOR EGYPT.

Important Contract Awarded to British Manufacturers.

THE Egyptian State Railway has placed with the Metropolitan-Vickers Electrical Co., Ltd., a contract for the complete equipment of a 5 000 kW generating station which is to be constructed at Gabbary, about a mile from Alexandria. The power house is to supply power for the railway workshops and also for public distribution in the district, including Alexandria. The equipment which is covered by the contract includes three turbo-alternator sets, boilers, superheaters and economisers, coal-handling plant, fans, pumps, pipework, etc., and also the necessary switchgear and transformers for linking up to an existing 3 300 V distribution system and for supply to the station auxiliaries. The turbo-alternator sets will be one of 2 500 kW and two of 1 250 kW capacity, generating at 6 600 V, the turbines operating with steam at 240 lb. per sq. in. gauge pressure superheated 250 deg. F. at the turbine stop valve. The steam-raising plant will consist of four Babcock and Wilcox water tube boilers with mechanical stokers, each boiler having a heating surface of 4 305 sq. ft.

It is of interest to note that the turbo-alternator sets are to be of the self-contained type developed by the Metropolitan Vickers Company, in which the turbine and condenser of each set are built as a combined unit and all the auxiliaries are driven from the set itself. These sets, the manufacturers state, have notable features of advantage over previously existing arrangements of power plant of small and medium capacity. They are remarkably compact and, requiring no basement or elaborate foundations, they make possible important savings in power-house construction. Running costs and attendance charges are also low due to high operative efficiency and extreme simplicity of control.

This type of power plant is one of the developments of recent years and has already achieved marked success, more than 80 sets having already been supplied by the Metropolitan-Vickers Company for municipal and industrial power houses at home and abroad and for installations on board ship.

LOADED SUBMARINE CABLES.

Their Importance in International Communications.

SUBMARINE cables already play an invaluable part in international communications, but until the advent in recent years of "loaded" cables the service was restricted. as far as telephone traffic is concerned, to short distances. "Loading," i.e., the artificial introduction of inductance in the cable, has not only enabled the speed of telegraphic transmission to be greatly increased, but has achieved a result even more far reaching and significant, viz., the transmission of the human voice over far greater distances than was possible with "unloaded" cables. Already, the distances spanned by submarine telephone cables are quite considerable. As development proceeds and experience accumulates the distances will assuredly grow, and it requires but little imagination to foresee the time when all the continents will be interlinked by a submarine telephone network.

Amongst the recent literature we have received is a volume which gives an account of the "loaded" submarine telephone and telegraph cables manufactured, and in most cases also laid, by SIEMENS BROTHERS AND CO., LTD., of Woolwich. The opening chapter deals with "loading" in a general way while successive chapters contain illustrated descriptions, supplemented by copious tabular matter, of coil-loaded and continuously-loaded telephone cables insulated with gutta-percha and paper respectively, and continuously-loaded gutta-percha insulated telegraph cables. A brief mathematical treatise on telephonic and telegraphic transmission is given in an appendix.

ARCHITECTURAL LIGHTING.

The intimate relationship between artificial light and architecture cannot be denied, since lighting undoubtedly assists in the expression of architecture. The E.L.M.A. Lighting Service Bureau has fully appreciated this fact, and to give architects the opportunity of becoming familiar with modern electric lighting, has inaugurated an architectural lighting department, of which Mr. R. Waldo Maitland, architect, is in charge. This department has collected much data in Great Britain, as well as in France and Germany, and this is presented from the architect's point of view in the latest handbook entitled "Architectural Lighting."

ISOLATING SWITCHES.

Oil-Immersed Switches and Circuit-Breakers for A.C. Circuits.

THE British Engineering Standards Association has just issued a revision of B.S.S. No. 116, which deals with oil-immersed isolating switches, oil-immersed switches, and oil-immersed circuit-breakers, the distinction between these classes of apparatus being defined by a statement to the effect that an isolating switch is intended only for interrupting a circuit when there is no load-current, a switch being suitable for breaking a load current, and a circuit-breaker being suitable for interrupting abnormal conditions such as that of short-circuit. In the preparation of this revision due regard has been given to similar work done in other countries, with a view to co-operation in international standardisation. The specification is intended to cover indoor circuit-breakers up to 33 000 V, and outdoor types up to 220 000 V. Useful appendices are included, giving notes on the care and maintenance of circuit-breakers, and also on the measurement of voltage and sphere-gaps.

Copies of the specification (No. 116–1929) may be obtained from the Publications Dept., British Engineering Standards Association, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

TRADE PROTECTION.

Annual Meeting of the British Electrical Trade Protection Association.

AT the annual general meeting of the British Electrical Trade Protection Association, at Sentinel House, London, Major Hogan, of Messrs. Hogan and Wardrop, and Mr. Orgel, of Messrs. Superlamp, Ltd., were unanimously re-elected chairman and vice-chairman respectively.

The members of the Executive Committee were re-elected, with the addition of Mr. W. J. Miles, of Messrs. Beacon Electrical Co., and Mr. J. P. McKenzie, of Messrs. Sifam Electrical Instrument Co., Ltd., the former in place of Mr. T. Beadle, who had resigned. The Executive Committee now consists of Mr. A. Hunstone (Electrical Conduits, Ltd.), Mr. P. L. Dwyer (P. L. Dwyer and Co.), Mr. F. W. Evans (The National Electrical Supplies Co., Ltd.), Mr. F. J. Godden (J. Godden and Co.), Mr. W. J. Miles (Beacon Electrical Co.), Mr. J. P. McKenzie (Sifam Electrical Instrument Co., Ltd.).

The secretaries' report was most encouraging and the success of the Association is now beyond doubt. The Debt Recovery Department shows over 97% recovered of the gross accounts handed in to the Association for collection. The secretaries were congratulated at having achieved such an exceptionally high percentage, and members expressed great satisfaction with the service given and results obtained by the Association.

THE E.D.A. AND THE B.I.F.

Colour Scheme for the Electrical Section.

THE British Electrical Development Association is erecting a handsome octagonal kiosk in the centre of the Electrical Section, Stand No. 20 H/1, of the British Industries Fair, Castle Bromwich. At this kiosk visitors will be able to obtain full up-to-date information concerning the electrical facilities available at any part of the United Kingdom, and a staff will be in attendance continuously throughout the period of the Fair to deal with all electrical inquiries. In co-operation with the Electrical Section Advisory Committee and the Fair Management Committee, the Association has introduced a uniform colour scheme which has been adopted by practically all the firms exhibiting in the Electrical Section, and it is confidently anticipated that this colour scheme, consisting of red and buff, will give distinctiveness to, and add to the attractiveness of, the Electrical Section. In the course of the next week or two the E.D.A. will issue a "Guide to the Electrical Section."

The Committee of University College (London) has recently increased the annual value of the Goldsmid Engineering Entrance Scholarship from £40 to £50. The Scholarship is tenable for the three years required for a full course of study for the Engineering degree or diploma, both of which may be taken concurrently. The next award will be made on the results of an examination for which candidates must enter by March 12th. The Secretary will supply fuller particulars.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

INVERNESS CORPORATION.—Electric lighting work in connection with erection of public baths. Schedules, etc., from Mr. A. F. MacKenzie, town architect, Inverness.

ARMAGH COUNTY EDUCATION COMMITTEE, February 1st.—Electric lighting installation at Armagh New Public Elementary School. Plan and specification can be seen at the office of Mr. J. St. J. Phillips, 16, Donegall Square South, Belfast, or at the Education Offices, Armagh. Tender forms will be supplied.

Overhead Transmission Lines.

CENTRAL ELECTRICITY BOARD, February 1st.—Supply and erection of 33 000 V overhead transmission lines in South-East England. Specification (No. S.E.E.—S.L. 3) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CLUTTON GUARDIANS, February 1st–February 14th.—Installation of electrically-driven forehole pump at the Institution, Temple Cloud, near Bristol. Specification, etc., from Mr. J. Wayne-Morgan, 6, Church Road, Whitchurch, Cardiff, until February 1st; deposit £1.

ECCLES CORPORATION, February 3rd.—Electric light and power wiring at sewage disposal works, Patricroft. Specifications, etc., from the Borough Electrical Engineer; deposit £1 1s.

CARNARVON COUNTY COUNCIL, February 4th.—Electric light installations in Llandudno Junction C. School, Deniolen C. School, Deniolen Technical Centre, Glanwydden C. School, Llanaelhaiarn Schoolhouse and Penygroes Schoolhouse. Specifications can be seen at the schools.

COWES URBAN DISTRICT COUNCIL, February 4th.—Electrical equipment, including wiring, provision of fittings, etc.; and supply and erection of private generating plant at Northwood House, Cowes, Isle of Wight. Plan of building can be seen at the office of Mr. J. W. Webster, engineer and surveyor, Northwood House, Cowes.

BOOTLE CORPORATION, February 5th.—Twelve months' supply of electric lamps, etc. Forms of tender from the Borough Engineer.

ISLINGTON (LONDON) BOROUGH COUNCIL, February 5th.—Supply of steel tube street lamp columns, with c.i. bases and swan-neck fittings; also supply of lanterns each suitable for containing three 300 W or three 500 W gasfilled lamps. Specifications and tender forms from the Borough Electrical Engineer, 60, Eden Grove, Holloway, London, N.7.

KENSINGTON (LONDON) BOROUGH COUNCIL, February 6th.—Twelve months' supply of street lanterns, lamp fittings, glass and electrical goods, lamp columns, etc. Forms of tender from the town clerk, Mr. Horace Rapson, Town Hall, Kensington, W.8.

INVERNESS DISTRICT BOARD OF CONTROL, February 7th.—Rewiring of electrical installation at Inverness District Asylum. Specification from Mr. C. A. Grut, Electricity Offices, Waterloo Place, Inverness; deposit £2.

BASINGSTOKE CORPORATION, February 8th.—Supply and erection of two heavy oil engines, each coupled to 800 kW three-phase 50 cycle alternator; one set to be ready by September 15th, 1930, and the other by September 15th, 1931. Tenders may be for either set or both sets. Specifications, etc., from Mr. F. Swarbrick, borough electrical engineer, Electricity Works, Brook Street, Basingstoke; deposit £1 1s.

DARWEN EDUCATION COMMITTEE, February 8th.—Electric light installation in Avondale School. Specifications from the Borough Engineer.

SALFORD CORPORATION, February 8th.—Low tension, paper insulated, lead covered and armoured cable. Form of tender from the City Electrical Engineer, Electricity Department, Frederick Road, Salford.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, February 10th.—Six or 12 months' supply of electric lamps, lanterns, etc. Specifications, etc., from Mr. A. E. Darby, borough engineer, Town Hall, Cambridge Road, London, E.2.

LONDON MIDLAND AND SCOTTISH RAILWAY, NORTHERN COUNTIES COMMITTEE (IRELAND), February 10th.—Twelve months' supply of telegraph ironwork, wire, electric lamps and porous pots. Tender form (No. 26) from Mr. F. J. Martin, stores superintendent, York Road Station, Belfast, on prepayment of 6d.

PORTSMOUTH CORPORATION, February 10th.—Twelve months' supplies to the tramways department, including insulating materials, lamps and motor windings (section Q); overhead line materials (section R), etc. Specification and form of tender from Mr. B. Hall, general manager and engineer, Tramways Department, Guildhall, Portsmouth.

RUGBY RURAL DISTRICT COUNCIL, February 10th.—Electric lighting installations in connection with housing schemes: Wolston, 26 houses; Brandon, 12; London Road, Dunchurch, 16; Newton, 8; and Churchover, 12. Plans, etc., from the surveyor, Mr. J. E. Weeks, Temple Street, Rugby.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, February 11th.—Twelve months' supply of cables for street mains and services (tender form E.S.1); lamps (E.S.2), meters (E.S.3), creosoted cable protection boards (E.S.4); plywood meter boards and insulators (E.S.5); ironclad service cutouts (E.S.6); street lighting standards and electric fittings (E.S.7); and creosoted wood service tee boxes (E.S.8). Forms of tender from the Electrical Engineer, 37, High Street, Cheadle, Cheshire.

STOKE-ON-TRENT CORPORATION, February 12th.—Twelve months' supply of mains and cables (contract No. 3 002) and static transformers (contract No. 3 003). Specifications and forms of tender from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2 for each.

STOKE-ON-TRENT CORPORATION, February 12th.—Supply of an electric mail van (contract No. 3 001). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

TORQUAY CORPORATION, February 15th.—Two water tube boilers, economisers, etc., for the electricity works. Specifications, etc., from the Borough Electrical Engineer and Manager; deposit £3 3s.

BLACKPOOL CORPORATION, February 17th.—Supply of electrical sundries, etc. Forms of tender and specifications from the Borough Treasurer, Town Hall, Blackpool. Stamped, addressed envelope to be sent.

EDMONTON GUARDIANS, February 17th.—Six months' supply of electric lamps, X-ray, light and massage requisites, etc. Forms of tender, etc., from the clerk, Mr. E. Ridley, Board Room, 77, Bridport Road, Edmonton, London, N.18. Stamped, addressed envelope to be sent.

HOLBORN (LONDON) BOROUGH COUNCIL, February 18th.—Twelve months' supply of electric lamps, etc. Specification, etc., from the Borough Engineer, Town Hall, High Holborn, London, W.C.1.

LEEDS CORPORATION, February 18th.—One year's supply of stores to the electricity department, including i.r. covered cables, mains boxes and fittings, jointing and insulating materials, fittings and sundries (section N). Forms of tender, etc., from Mr. C. Nelson Hefford, Electricity Department, 1, Whitehall Road, Leeds.

HULL CORPORATION, February 19th.—Supply of electricians' material, etc. Forms of tender from the City Engineer.

HAMMERSMITH (LONDON) BOROUGH COUNCIL, February 26th.—Twelve months' supply of electric lighting sundries, insulated wires, ordinary and prepayment meters, insulating compound; h.t. and l.t., concentric, paper insulated cables, etc. Forms of tender, etc., from the Borough Electrical Engineer, 85, Fulham Palace Road, London, W.6.

Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1, *Note.—An asterisk denotes that local representation is, in practice, essential.*

DUNEDIN DRAINAGE AND SEWERAGE BOARD, February 1st.—Supply of two centrifugal or propeller pumps, with electric motors and accessories (contract No. 737). (Reference A.X. 8 961.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct-coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

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MELBOURNE CITY COUNCIL, February 3rd.—Supply of paper insulated cables (specification No. 1 016). (Reference B.X. 6 077.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 3rd.—Supply of protector blocks (carbon and porcelain). (Reference B.X. 5 948.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 4th.—Friction disc saw, with electric motor, for cutting steel joists and rails (tender No. P.W. 3/46). (Reference A.X. 8 998.)

Fuses for New Zealand Government.

NEW ZEALAND POSTS AND TELEGRAPHS, February 5th.—Supply and delivery of indication alarm fuses. (Reference B.X. 5 947.)

INDIA STORE DEPARTMENT, February 5th.—Supply of 30 000 wood separators for train lighting cells. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

SOUTH INDIAN RAILWAY CO., LTD., February 7th.—Supply of overhead electric travelling crane for car shed, in connection with Madras improvements. Specifications and forms of tender (5s.) from the Company's offices, 91, Petty France, Westminster, S.W.1.

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844).

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T., 151/2 025.) (Reference B.X. 5 955.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, February 13th.—Supply of electric tube butt welding set. (Reference B.X. 6 005.)

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, February 15th.—Supply of 1 771 metric tons of telegraph wire. (Reference A.X. 9 047.)

LOUIS TREICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of distribution system (poles, conductors, transformers, meters, sub-station equipment, etc.). (Reference B.X. 6 003.)

LOUIS TREICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of two 60 kW sets, comprising two boilers, one economiser, a steel chimney, two engines, two alternators, and accessories, or, alternatively, two 100 kW sets. (Reference A.X. 8 997.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (schedule C. 541). (Reference B.X. 5 940.)

CHILEAN STATE RAILWAYS, February 19th.—Supply of apparatus and material for a signalling service between Maipu and Cartagena stations and between San Fernando and Talca stations. (Reference A.X. 9 008.)

JOHANNESBURG MUNICIPALITY, February 20th.—Supply of transformers. (Reference B.X. 6 043.)

JOHANNESBURG MUNICIPALITY, February 20th.—Supply of switchgear (contract 322). (Reference B.X. 6 044.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of telephone switches. (Reference B.X. 6 018.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Reference B.X. 5 941.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of switchboard plugs (schedule C. 548). (Reference B.X. 5 998.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of magneto and common battery telephones and automatic dials (schedule C. 544). (Reference B.X. 5 999.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 4th.—Supply of automatic exchange power boards (schedule C. 562). (Reference B.X. 6 072.)

NEW ZEALAND POSTS AND TELEGRAPHS, March 5th.—Supply of v.i.r. wire (specification No. P. and T. 151/2 096). (Reference B.X. 6 089.)

VICTORIAN ELECTRICITY COMMISSION, March 10th (extension of time).—Two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th. Supply of 66 kV switchgear and protective system for Lyttleton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 11th.—Supply of bells and buzzers (schedule C. 552). (Reference B.X. 6 043.)

EGYPTIAN MINISTRY OF THE INTERIOR, March 20th.—Steel water tank, on steel tower, with piping and fittings; and electric water level indicator. (Reference A.X. 9 073.)

POSTMASTER-GENERAL'S DEPARTMENT, March 24th.—Supply of dial parts (schedule C. 555). (Reference B.X. 6 047.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 25th.—Supply of cordless telephone switchboards (schedule C. 566). (Reference B.X. 6 071.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays, for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, April 1st.—Supply of submarine cable (schedule C. 561). (Reference B.X. 6 070.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o International Construction Co., Ltd., 56, Kingsway, London, W.C.2.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, April 30th.—Supply and erection of h.t. overhead transmission lines in isolated basins of Upper Egypt. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1; £10 5s., not returnable.

Tenders Accepted.

BARNES URBAN DISTRICT COUNCIL.—Hewittic Electric Co., Ltd., supply of Hewittic rectifier equipment, £3 395.

DUBLIN CITY COMMISSIONERS.—Hadens Engineering Co., Ltd., electrical installation at city abattoir, £1 997.

LONDON COUNTY COUNCIL.—Dorman, Long and Co., Ltd., supply of track rails and fishplates to tramways department, £53 896.

NEW SOUTH WALES GOVERNMENT RAILWAYS.—Australian General Electric Co., 1 500 V switchgear for Argyle sub-station, £5 832; A. Reyrolle and Co., Ltd., ironclad switchgear for Ultimo, £14 576.

READING TRAMWAYS COMMITTEE.—Equipment and Engineering Co., Ltd., supply of a re-conditioned, one-standard, E.L.I., single-operator, electric welding plant, mounted on type B covered in truck, £99 15s.

GLASGOW CORPORATION.—Alex. Robertson, electrical installations at 354 houses on Ashfield estate, £1 403 13s. 3d., and 102 houses on Braidfauld Street estate, £410 15s. 3d. Contracts in connection with change of frequency: Lancashire Dynamo and Motor Co., Ltd., one motor, reconstructed, £425; Sir William Arrol and Co., Ltd., six crane motors, £589; J. Bennie, Ltd., three lift motors, £327 6s.; C. A. Parsons and Co., Ltd., one alternator, reconditioned, £9 800. (All recommended).

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WORK IN PROSPECT.

ACCRINGTON.—Additional 100 houses. Particulars, the Borough Surveyor.—Houses (48). Particulars, Prickett and Son.

BEDWORTH.—School (500 places). Particulars, the Director of Education, Warwick.

BILLINGHAM.—Bank, for Lloyd's Bank, Ltd.

BLACKBURN.—Extensions, Mental Defective Institution, Brockhall, Langho, to cost £90 000. Particulars, the Clerk, Preston

BOLLINGTON.—Housing scheme (36). Particulars, the Surveyor.

BRISTOL.—School. Particulars, Mr. A. R. Gough, 24, Bridge Street.—Housing seheme (58). Particulars, the City Engineer.

BURNLEY.—Casual ward extensions to cost £3 943. Particulars, the Clerk.—Additional 102 houses. Particulars from the Borough Surveyor.

CLITHEROE.—Additional 22 houses. Particulars, the Borough Surveyor.

CRANBROOK.—Housing scheme (54). Particulars, the Surveyor.

DENTON.—School (200 places). Particulars, the Director of Education, Northampton.

DUSTON.—School (325 places). Particulars, the Director of Education, Northampton.

EAST MOLESEY.—Talking film studio to cost £350 000. Particulars, Col. W. M. Power, Windsor House, Victoria Street, London, S.W.

ECCLES.—Fire station and quarters. Particulars, the Borough Surveyor.—Business stores, Regent Street, for the Co-operative Society.—Bank, for the Manchester and Salford Trustee Savings Bank.

FARINGDON.—Housing scheme (58). Particulars, Mr. A. B. West, Abingdon.

FINEDON.—Schools to cost £9 250. Particulars, Childs and Co., Finedon.

FOLKESTONE.—Catholic schools to cost £10 000. Particulars. Mr. Walters, Kearnsey, Dover.

GILLINGHAM (KENT).—School clinic and infant welfare centre. Particulars, the Borough Surveyor.

GRAPPENHALL.—Housing scheme (50). Particulars, the Surveyor.

HIGH WYCOMBE.—Housing scheme (150). Particulars, the Surveyor.

KINGSWINFORD.—Housing scheme (42). Particulars, the Surveyor.

BENN BROTHERS' DINNER.

Symbolical Costumes which will be a Feature of the Gathering.

AN important feature of the reception preceding Messrs. Benn Brothers' jubilee dinner at the Wharncliffe Rooms, Marylebone, to-morrow (Saturday) evening will be the attendance of fourteen members of the staff attired in attractive costumes symbolical of the publishing activities of the Benn organisation. The thirteen journals published by the firm of Benn Brothers Limited will be represented as follows:—"The Cabinet Maker," represented by a carpenter; "The Hardware Trade Journal," a blacksmith; "The Gas World," an overalled gasfitter; THE ELECTRICIAN, symbolical fancy costume; "The Timber Trades Journal," a lumberman; "The Fruit Grower," a planter; "Gardening Illustrated," a gardener; "The British Trade Journal," John Bull; "The Chemical Age," an alchemist; "The Nursery World," Peter Pan; "The Leather Trades Review," a leather worker; "The Miller," a miller; "Discovery," a Polar explorer. The fourteenth member of this colourful party will represent the book publishing activities of the sister company—Ernest Benn, Limited—and will be attired as Chaucer.

FENO ELECTRIC HEATERS.

Messrs. J. Schleper and Sons, 217 Heerengracht, Amsterdam, manufacturers of the Feno electric heaters, announce that they are willing to indemnify factors and dealers against actions for infringement of patents which may be brought against them by Mr. Alan Wright, on behalf of Inventum Electrical Appliances, Ltd., or by Inventum Appliances, Ltd., itself in respect of the sale of Feno heaters.

TRADE PUBLICATIONS.

THE latest publication of RADIO INSTRUMENTS, LTD., 12, Hyde Street, London, W.C.1, is a well-produced brochure dealing with the "Madrigal" receiver.

A cardboard lamp stand issued by Philips Lamps, Ltd. It is very handy for displaying Argenta lamps on the counter or in the window.

Flameproof controllers are dealt with in a new pamphlet, No. 258/1, issued by MAVOR AND COULSON, LTD., 47, Broad Street, Mile End, Glasgow.

A highly decorative and artistic calendar has been sent to us by CALLENDERS CABLE AND CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38, Upper Thames Street, London, E.C.4, have issued a "Selsco Wiring System" catalogue. The reference number is 428, and this issue supersedes No. 185.

We have already drawn attention to the "Cosmos" lamp calendar for 1930, published by METRO-VICK SUPPLIES, Trafford Park, Manchester, and the same company has now issued a lamp folder illustrated on similar lines.

The latest publications of A. P. LUNDBERG AND SONS, LTD. 477, Liverpool Road, Holloway, London, N.7, include list El. 85, describing d.c. motor starting switches; El. 86, relative to removable-key switches, single and two-way tumbler types; and El. 87, concerning "Twin ob" switches.

"Do You Really Want Dry Steam?" is the title given to a new publication by WARREN BROTHERS (MIDDLESBRO') LTD., Prudential Buildings, Middlesbrough, the subject dealt with being Howards patent steam separator. The same firm has issued a list of ships in which these steam separators are used, including the "Mauretania," "Carmania" and "Viceroy of India."

In connection with the large and varied range of radio accumulators manufactured by the FULLER ACCUMULATOR CO., (1926) LTD., Woodland Works, Chadwell Heath, the company has issued a booklet (List 262A) on the general care and maintenance of these types of accumulators. In connection with unspillable accumulators, special and separate notes have been issued, and these are now available to the trade for distribution.

A well-bound, comprehensive and excellently produced catalogue has been sent to us by the BRITISH PORCELAIN CO., LTD., 343, Abbey House, 4, Victoria Street, London, S.W.1. The catalogue, consisting of nearly 300 pages, gives details and illustrations of a complete range of porcelain insulators for outdoor and indoor use, wall entry, roof bushing, etc. Particulars of other items, such as special cast terminals of copper, strain clamps, etc., are also given. The catalogue is numbered 407 and is now available to the trade.

New publications by FERRANTI, LTD., Hollinwood, are the following lists:—Wb. 402, type AF4 transformers; Wc 405, output transformers, condensers and chokes; We 406, radio measuring instruments; Wd 408, electro-dynamic loud-speakers; Wd 409, permanent trickle chargers; Wa 409/1, motor car battery chargers; Wd 410, type AF5 transformers; Wd 411/2, fixed condensers; Wc 412, push pull transformers; Wb 415, the "Ferranti" anode feed system; Wa 415/1a, anode feed resistances; Wb 417, h.t. supply units; Wb 418/1, valve testers; Wa 420, radio switches; Wd 401, type AF 3 transformers.

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N.-E. ENGLAND SCHEME.

N.-E. England Electricity Scheme as Adopted by Central Electricity Board.

THE North-East England Electricity Scheme, which was submitted by the Electricity Commissioners in June last, has now been approved by the Central Electricity Board.

In the scheme as approved the area defined by the Commissioners is unaltered.

There is a provision that instead of constructing the principal main transmission lines along any of the routes specified in part I (1) of the third appendix, the Board may acquire any main transmission lines belonging to authorised undertakers and suitable for the purposes for which the first-mentioned lines are intended.

The secondary main transmission lines required for the purpose of interconnecting the systems of authorised undertakers entitled to receive a supply of electricity directly or indirectly from the Board with the system of the Board, are specified in part II of the third appendix; the secondary main transmission lines to be constructed by the Board except that any of those lines may by arrangement between the Board and any of the said authorised undertakers be constructed by such undertakers.

The owners of each of the generating stations specified in the fifth appendix shall be under the obligation as and when required by the Board to make arrangements with the Board: (*a*) with respect to the working of the station so as to generate such quantity of electricity at such rates of output and at such times as the Board may direct; and (*b*) with respect to the supply to the Board of all electricity so generated. So long as any generating station is being operated in accordance with the directions given by the Board the Board shall be under the obligation to supply either directly or indirectly to the owners thereof such amount of electricity as the owners may require for the purposes of their undertaking. The Board shall pay to the owners of the generating station for the electricity supplied to the Board such price as may from time to time be agreed between such owners and the Board or failing agreement as may be determined by arbitration.

The Board may if they think fit enter into temporary arrangements with the owners of any other generating station within the area to which the scheme relates with respect to the giving to the Board a supply of electricity of such amounts as may be agreed between the Board and the owners giving the supply.

Schedules of Stations and Lines.

The list of selected generating stations is as proposed in the Commissioners' Scheme.

In part I (1) of the third appendix, referring to extra high pressure overhead lines and/or underground mains, the following routes are substituted for those suggested in the Commissioners' scheme:—(1) North Tees to York, (2) North Tees to Dunston, (3) Dunston to Sunderland via or with connection to Carville A and B and South Shields, (4) Dunston to Sunderland, (5) North Tees to Darlington.

In part I (2) of the third appendix, relating to transforming stations in connection with the principal main transmission lines, it is provided that such transforming stations are to be provided at such points as to the Board may seem convenient for the purposes of supply to or from the undermentioned places: Carville, Darlington, Dunston, North Tees, South Shields, Sunderland. South Shields is added to the Commissioners' list and Scarborough is deleted.

In part II (1) of the third appendix, relating to secondary main transmission lines, the list of routes proposed by the Commissioners is superseded by the following list: (1) Scarborough to Bridlington as far as the boundary of the area of the scheme, (2) Scarborough to York via or with connection to Malton, (3) Malton to Whitby, (4) Darlington to Northallerton, (5) Dunston to Manors via or with connection to Close.

For the list of transforming stations in connection with secondary main transmission lines proposed in the Commissioners' scheme, the following list is substituted: Close, Darlington, Malton, Manors, Northallerton, Scarborough, Whitby.

The list of undertakers the frequency of whose supplies is to be changed from 40 to 50 cycles per second remains as in the original scheme, and a provision is added that no further 40 cycle generating plant beyond that already sanctioned by the Electricity Commissioners shall be installed in the area of the scheme by the owners of such undertakings.

The list of stations (specified in the fifth appendix) with regard to which temporary arrangements are to be made is unaltered.

ELECTRICITY SUPPLY.

GLASGOW Electricity Committee has authorised mains extensions at a cost of £12 000.

Basingstoke T.C. is to invite tenders for additional generating plant, to cost about £12 785.

Barnsley Electricity Committtee has received sanction to borrow £6 330 for mains extensions.

Swansea Electricity Committee seeks sanction to borrow £25 000 for lighting mains and services.

Dumfries T.C. has decided to extend the mains at a cost of £2 550, of which £1 500 is for a Maxwelltown scheme.

Dartford Electricity Committee is asking for a grant for the second instalment of the 11ing main scheme at a cost of £6 500.

Buckie (Banffshire) T.C. is to apply to the Electricity Commissioners for a Special Order to supply and distribute electricity.

The City of London Electric Lighting Co., Ltd., is considering a scheme for the extension of its power station in Southwark.

Sanction has been received by East Ham T.C. to a loan of £4 500 for additional accommodation for offices, stores, etc., at the electricity works.

Armitage P.C. has decided to adopt electricity for public lighting and to obtain energy from the Trent Valley and High Peak Electricity Co.

The Minister of Transport has decided not to grant the application by the Grampian Electricity Co. for leave to erect overhead lines and poles in the burgh of Doune.

The terms of the Windsor Electrical Installation Co. for the supply of electricity for public lighting at 3d. per kWh for five years have been accepted by Windsor T.C.

Fulham Electricity Committee seeks sanction to borrow £20 000 for domestic wiring and apparatus.—Various electricity mains are to be extended at a total cost of £1 030.

Ripon Corporation has applied for a loan of £3 000 for the extension of the electricity undertaking, with a view to supplying Bishop Monkton and other outlying districts.

Droxford R.D.C. has withdrawn its objection to the West Hants Electricity Co.'s application for a Special Order to supply electricity in the Council's area, with the exception of Hambledon.

Plymouth Electricity Committee has agreed upon the terms with the Cornwall Electric Power Co., for the supply of electrical energy at Torpoint and Saltash and the area up to St. Germans.

Aylesbury T.C. has applied for loans for £15 000 for mains and £9 000 for services for three years, and also for £2 000 to cover the cost of changing over certain sections of the borough from d.c. to a.c.

The lighting of Brentford Docks is to be improved by the G.W.R. by the provision of a modern electric installation. Flood lighting is to be provided at points where this system can be conveniently adopted.

Wigton R.D.C. has now consented to discuss with the Old Silkstone Co. the question of the inclusion of the area in the company's application for an Order to authorise its West Cumberland electricity scheme.

Tipperary U.D.C. has refused to accept the terms of the Electricity Supply Board for the lighting of the town, unless the Board is prepared to extend its poles, free of extra charge, to the approaches to the town in the urban area.

Aberystwyth T.C. has appointed a committee to ascertain terms for the purchase of the local electricity undertaking of the Chiswick Electric Supply Corporation. The Council has the option to purchase the undertaking in three or four years' time.

Bedford Electricity Committee has arranged terms for the supply of street lighting at Clophill. The corporation will convert existing gas standards at £1 10s. each and charge 5d. per kWh for electricity. The Committee has obtained sanction to borrow £4 000 for mains and £5 000 for plant.

Mr. J. Scott, consulting engineer to the West Lancashire R.D.C., is preparing specifications for an electricity scheme for Hesketh and Tarleton. The Electricity Commissioners have sanctioned the proposals in respect of these two areas and also in respect of Rufford, Banks, Halsall and Scarisbrick.

Battersea (London) Electricity Committee has voted £686 for services to 73 premises; £320 for mains extensions for private services; £2 110 for replacement with armoured cable of old v.b. distributors; and £250 for foundations for the Central Electricity Board's transformers at the generating station.

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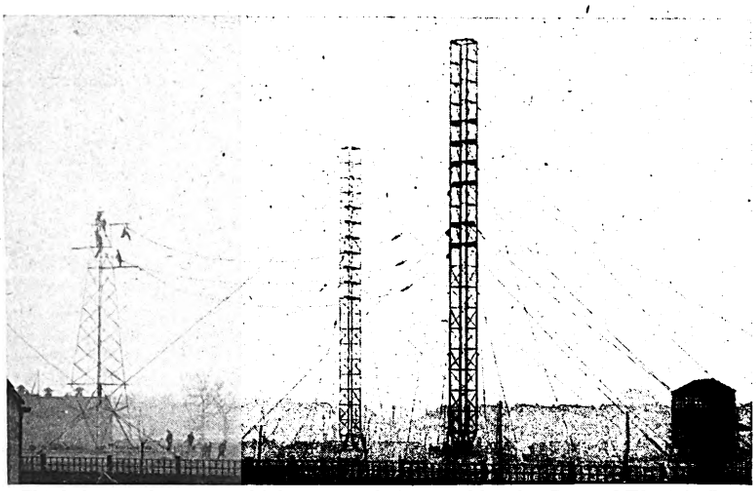
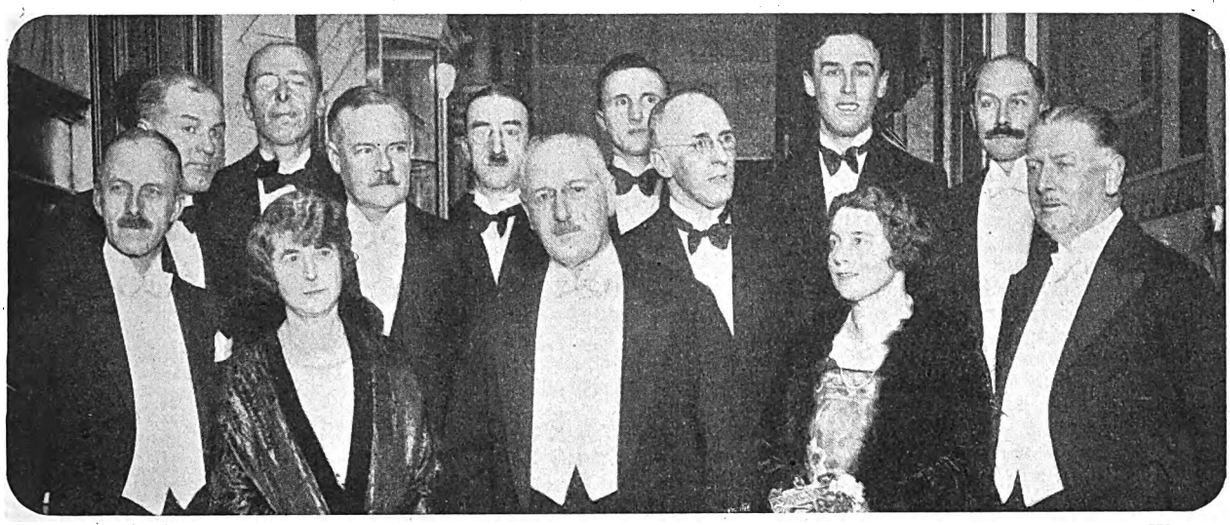
ELECTRICAL NEWS IN PICTURES.

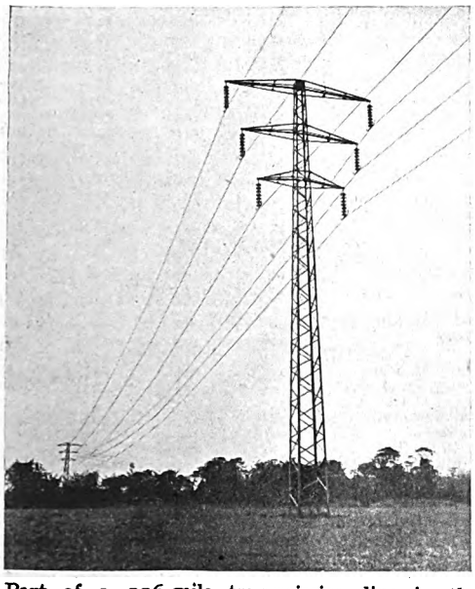


The lofty steel towers which are now being used by the General Electric Co., Ltd., at Wembley, in connection with investigations into overhead line problems.

Mr. H. E. Blackiston, of Bermondsey, who has been appointed electrical engineer and transport manager, W. Hartlepool. See page 147.



Some well-known personalities in the electrical industry taken on the occasion of the annual dinner of the I.E.E. (Western Centre). Left to right—Front row: Mr. C. J. Morley New, Mrs. Morley New, Col. Sir Thomas F. Purves, Mrs. S. B. Haslam and Mr. S. B. Haslam. Included behind are: Mr. P. F. Rowell, Mr. R. Hodge, Mr. E. P. Knill, Mr. J. W. Spark, Mr. P. J. Plevin, Mr. W. J. Bache, Mr. L. F. A. Driscoll and Mr. F. W. Godden.



Part of a 116-mile transmission line in the Shannon Electricity Scheme. The towers which have been adopted in many respects resemble in appearance those used by the Central Board.

The control room at 2RN, the centre of broadcasting in the Irish Free State. The room is being fitted with a number of special sets designed to give maximum efficiency of reception on particular wavelengths, and between them they will cover the entire broadcast band. By means of these receivers, continental and foreign programmes will be relayed by Dublin.

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COMPANY NEWS.

Electrical Stock and Share Market Again Quiet—Improvement in Supply Companies' Share Prices—Directors' Reports and Dividend Announcements.

THE market for electrical stocks and shares has again been quiet, and a comparison of share prices with those ruling a week ago exhibits few features.

Radio Corporation of America shares have recovered one and a half points to 38, which is 5 points below the quotation a fortnight ago. Hydro-Electric Securities are slightly better at 44, after being higher, and the same remark applies to International Holdings at 5¾. Cables and Wireless "A" have touched bottom at 73½, but the "B" stock is a little firmer at 36½. Anglo-American Telegraph ordinary have dropped a point to 60½, quoted ex. dividend.

Electrical Equipment shares have shown weakness in spots, Enfield Cable Works ordinary falling half-a-crown to £4 15s., and British Insulated Cables 1s. 3d. to £3 17s. 6d. Ever-Ready descriptions have sagged a bit further, the ordinaries 1s. to 17s. 6d. and the participating preference 3d. to 28s. 9d. General Electric ordinary shares are unchanged at £2 6s. 3d., but the "B" preference at 25s. 6d. have lost the sixpence gained last week, as also have Associated Electrical Industries ordinary. Telegraph Construction £12 shares have improved from 24½ to 26.

Electricity supply companies' shares present a healthy appearance, and advances of 6d. are registered by the ordinary shares of the St. James and Pall Mall, from 25s. to 25s. 6d.; South London, from 25s. 6d. to 26s.; and Westminster, from 25s. to 25½. Whitehall Investments preference are also 6d. better at 24s. Victoria Falls Power ordinary receded 1s. 3d. on ex. dividend quotations.

In the transportation group there has been buying of British Electric Traction six per cent. preference stock, which, as a consequence, has been marked up 4 points to 129½. Calcutta Tramways preference shares have given way 1s. 3d. to 12s. 6d. Underground Electric Railways of London shares have shed 6d. of their last week's rise of 1s. 6d. Metropolitan Railway ordinary stock is 1½ points down. Winnipeg Electric Company's refunding stock is a point up at 84½ compared with last week.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6¼	" " " C. Cum. Pref. ..	20/6	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	61/3	61/3	78/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	48/1½	48/1½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	36/3	36/3	44/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	40/3	46/3	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	47/4	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " " 6% C.P. ..	15/-*	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	89	89	92	80½
—	Hydro Electric Securities ..	44	42¾	87	20
—	International Holdings	5½	5½	35½	6
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/6	27/6	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/6	27/6	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	26/6	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	100	100	104	95
10	Melbourne Electric Ord. Stk. ..	172	170	182	150
1/9½	Metro. Elec. Sup. Ord.	37/6	37/6	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	28/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upou-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(e)	St. James & P.M. Ord. (£1) ..	25/6	25/-	28/6	23/6
8	Scottish Power Ord.	30/-	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
4	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
6½	S. London E.S. Ord.	26/-	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	93	93	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	60 -*	61/3	69/-	46/3

(a) 19½d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅝d. per share.
* Ex dividend.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest.
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/-	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/-	23/6	25/4½	18/9
6	" " 1st Mt. Deb. ..	104	104	106	97½
8	Yorks Elec. Power Ord.	32/6	32/6	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	80½	80½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	80½	88½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7 67	" " " " 6% Pf. Stk.	129½	125½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	13/9	15/9	13/-
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	74¾	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	58
4	" " 4% Perp. Deb. ..	76½	76½	81½	76
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	72½	72½	79	42½
4	" " " " 4% Pf. Stk.	72	72	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	50½	50½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " " 5% Deb. ..	70½	70½	72½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	65	66½	81	54½
3½	" " " 3½% Pf. Stk. ..	62	62	76	60½
3½	" " " 3½% Deb. ..	67½	67½	73½	67½
5	Met. Dist. Rly. Ord. Stk.	74	74	81½	52½
4½	" " " 4½% 1st Pref. ..	80½	80½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	85½	85½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	23/-	23/6	28/6	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	81½	83½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indu		28/-	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	78/9	99/4½	56/-
6	" " " 6% C.P. ..	22/6*	22/0	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	73/9	73/9	91/3	63/9
6½	" " 6½% C.P. ..	25/-	25/-	23/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½*	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	20/-
4	" " 1st Mt. Deb. ..	69½	69½	75	68
20	Enfield Cable Works Ord. ..	95/-	97/6	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	5/-	5/-	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb. ..	68½	68½	107½	65
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	18/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/9	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord.	46/3	46/3	81/3	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P. ..	25/6	26/-	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	121/3	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	26	24½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk.	225	225	314½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½*	61½	63½	56½
6	" " " 6% Prefd. Stk...	102½*	102½	105½	91
1½	" " " Deferred Stk...	24*	25	27	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	73½	76½	90½	73½
—	"B" Ord. Stk.	36½	35½	104	33
—	5½% Cum. Pref. Stk. ..	98½	98½	99	90
3½	Eastern 3½% Pref. Stk.	62½	62½	70½	58½
4	" 4% Deb.	76	76	81½	73
4	Eastern Extension 4% Deb. Stk.	76	76	80½	73
22	Great Northern Telegraph (£10)	31	31	43½	26
—	International Teleph. & Teleg. ..	$75	$75	$261½	$84½
15	Marconi Int. Mar.	46/3	46/3	90/-	16/6
4½	New York Telep. 4½% Mt. Bds...	97½	97½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	38	36½	115⅝	18½
4½	United R. Plate Teleph. 4½% Deb.	87½	87½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

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Directors' Reports, &c

CROMPTON PARKINSON, LTD.—Intm. div. of 11¼% (same as last year), will be payable on March 31.

CUBAN TRANSATLANTIC RADIO CORPORATION.—A substantial interest in this concern has been acquired by the Radio Corporation of America.

LIMA LIGHT, POWER AND TRAMWAYS CO.—It is announced that 160 6% 1st mtge. debs. have bn. purchased and cancelled during the six months ended Jan. 1, 1930.

HALL TELEPHONE ACCESSORIES (1928), LTD.—Net pft. for year to Dec. 31, 1929, £30 094. Fin. div. on ord. shs. 6%, makg. 10% for year. Intm. div. of 4% has been paid. To gen. res. £5 000.

ASCOT DISTRICT GAS AND ELECTRICITY CO.—A special mtg. will be held at the company's offices on Feb. 10 to consider a Bill now being promoted in Parliament to authorise conversn. of the existing cap., the raising of addtnl. cap., etc.

SIEMENS UND HALSKE AKT.-GES.—A "Financial Times" correspondent reports that it is rumoured in Berlin that negotiations between Siemens und Halske Akt.-Ges. and Dillon Read and Co. of New York for a loan have been concluded. It is said that the loan will amount to $25 000 000, and will be in nom. $400 shs., issued at 233, and repayable at the end of 100 years at par.

ALLGEMEINE ELEKTRICITATS GESELLSCHAFT, BERLIN.—Net pft. for past year £958 500; increase £133 500. Div. 9%; increase 1%. Fwd. £170 000, with view to proposed abolitn. of remaing. pref. shs. Turnover of company and subsidiaries increased from £25 000 000 to £29 000 000, but general falling-off in home business during current year has resulted in decline in orders in hand from £19 250 000 to £17 500 000.

ALUMINIUM CORPORATION, LTD.—A scheme of reconstructn. has been drawn up which will involve the cancellatn. of the three outstandg. deb. issues, and the writing down and merging of preference and ordinary shs., etc. The effect on the balance-sheet will [illegible] 3,963, representg. works, plant, and properties, will be reduced to £300 000, and the £231 281 lost on the Eigiau Dam disaster will be eliminated. Cash and debtors will stand at £197 920.

MEXICAN TELEPHONE CO. ERICSSON.—This company, a subsidiary of the Swedish L. M. Ericsson Telephone Co., has decided to double its sh. cap. from 10 000 000 kronor (£600 000) to 21 600 000 kronor (£1 200 000) by issuing 60 000 new "B" shs. of nom. 180 kronor (£10) at 200 kronor a share. New issue has been reserved for hldrs. of old "A" shs. or "B" shs., who are entitled to subscribe to one new "B" sh. for every old one. The new cap. is to be used for extensn. of company's telephone system in Mexico, where the company's concessions comprise the entire country.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Pft. for year ended Aug. 31, 1929, £341 510, agst. £313 809, after deductg. £209 000, agst. £300 000, payable under first schedule to Act No. 3377. After providg. for int., sinkg. and service funds, blce. is £124 308, agst. £124 308. Addg. transfer from res., £21 286, agst. £21 283, makes £145 595. Res. for income-tax receives £25 300, agst. £24 400, pref. div. absorbs £40 000 and ord. div. is 10%, free of British tax, leavg. £235 to be paid over to State Electricity Commission of Victoria. Government has given notice to co. that it intends to purchase undertakgs. on Sept. 1, 1930.

ALDERSHOT GAS, WATER AND DISTRICT LIGHTING CO.—Rev. for 1929, £251 023, agst. £231 789. Expenditure £190 595, agst. £181 708. Surplus for year £60 428, agst. £50 080. From this have to be deducted divs. on consol. pref. stk., int. paid to bank and on redeemable mtgge. bonds and deb. stk., while statutory divs. have been paid for first half of year at rate of £5 19s. 6d., agst. £5 13s. 6d.% p.a. on "A" stk.; £4 9s. 6d., agst. £4 3s. 6d.% p.a. on "B" stk.; £5 (same) % p.a. on "C" stk. Directors recommend full statutory div. of £6 4s., agst. £5 15s.% p.a. on "A" stk., £4 14s., agst. £4 5s.%p.a. on "B" stk., and £5 (same)% p.a. on "C" stk. Fwd., £6 451, agst. £7 322.

PROVINCIAL ELECTRIC SUPPLY ASSOCIATION.

Matters Affecting the Industry—The Rating of Electricity Supply Companies' Undertakings—Assisted Wiring and Load Improvement.

THE eleventh general meeting of the Provincial Electric Supply Association was held on Tuesday at the Holborn Restaurant, London.

Mr. K. A. Scott Moncrieff presided in the unavoidable absence of the chairman of the association, Sir Harry Renwick, Bt., K.B.E.

The meeting was preceded by luncheon, and Mr. Scott Moncrieff read the speech prepared by Sir Harry Renwick, which dealt with questions arising from Parliamentary matters affecting the electrical industry and the activities of the association upon the various schemes adopted by the Central Electricity Board under the Electricity (Supply) Act, 1926. He dealt particularly with the question of standardisation of frequency under those schemes, and he expressed the hope that the Central Board would afford greater assistance to the smaller undertakings in this respect.

Sir Harry next dealt fully with the operation of the Rating and Valuation Act, 1925, and the heavy increases in assessments (in some cases as high as 700 per cent.) experienced by all electricity supply companies, and gave instances of the cost of extra rating amounting to between ¼d. and ½d. per unit on every unit sold. He emphasised the fact that while the companies are being burdened each year with higher costs, they are being forced to make reductions in rates for supply. He said that the association was following closely the provisions of the Coal Mines Bill now before Parliament, the effect of which must increase the coal costs of public utility undertakings.

After dealing with the litigation which the association had undertaken on behalf of the member companies, he referred to the case of the Attorney-General v. the London and Home Counties Joint Electricity Authority, under which judgment the Bill which the joint authority had promoted in Parliament for the transfer of purchase rights, at present in the hands of local authorities, to the joint authority had to be withdrawn as the High Court found that each set of clauses was outside the powers of the joint authority. He deplored the want of harmonious working and co-operation between the joint electricity authority and the local authorities and the companies.

After treating with a large number of other important matters concerning the electricity supply industry, Sir Harry dealt with the many services rendered by the association to its member companies and the advantages accruing from having a central executive body in London. The association had admitted to membership during the past year 10 other companies, and it could now be said to represent practically the whole of the electric lighting companies in the country outside London.

Sir Harry urged the necessity of treating the generation, distribution, and sale of electricity as a commercial matter; generation and distribution were no longer scientific marvels, but the science and art of salesmanship must be regarded as vital to the electricity supply industry as to the exploitation of the hundred-and-one commodities of every-day life. The actual livelihood of the 52 000 or more employees in the industry must rest upon the enterprise of the suppliers in disposing of their energy to consumers.

Sir Harry expressed the view that industry could not go too far in advertising their commodity and in educating the public to its value and its advantages. Propaganda and the necessity of giving service to consumers in the matter of hire purchase and assisted wiring facilities could result in the quadrupling of the consumption by consumers. He gave examples of small artisan houses where the usual yearly consumption approximated 100 to 150 units, and with assistance from companies in the electrification of the same type of house the consumption had reached over 1 000 units per annum.

Sir Henry paid a tribute to the controlling bodies of the industry—namely, the Ministry of Transport, the Electricity Commissioners, and the Central Electricity Board, and stated that it was not only the aim but the duty of the association to give to those authorities support and co-operation in their very difficult duties.

The balance sheets and accounts for the years ended December 31st, 1927, and December 31st, 1928, were unanimously approved, and the proceedings terminated with votes of thanks to Sir Harry Renwick for his hospitality and for his work as chairman of the association, and to Mr. Scott Moncrieff for presiding at the meeting.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ARMITAGE, F. D. AND CO., 225, High Street, Uxbridge, wireless dealers. £10 18s. 4d. December 2nd.

EGERTON, R., AND CO., 26, Pear Tree Road, Derby, electrical engineers. £12 9s. 9d. December 12th.

ELTHAM RADIO SERVICE, 3, Marlewood Parade, Eltham, wireless dealers. £19 9s. December 4th.

HOLDERNESS, Mr. D. S., 26, Wallingford Street, Wantage, radio dealer. £26 19s. 11d. December 11th.

NORTH SURREY ELECTRICAL FACTORS, LTD., 77, George Street, Croydon. £10 5s. 4d. December 2nd.

NORTH WALES ELECTRIC MAINTENANCE CO., 3, Prospect Terrace, Llandudno, wireless dealers. £19 14s. November 19th.

SCHOFIELDS, The Arcade, Waterfoot, wireless dealers. £11 2s. 4d. December 9th.

SEYMOUR, W. H., 4, High Road, Ilford, wireless dealer. £14 15s. 6d. November 27th.

SHEPPARD, Mr. G. A., 55, St. Johns Road, Stamford Hill, wireless dealer. £18 5s. December 4th.

SIDWELL AND CO., 36, Bristol Road, Birmingham, electrical engineers. £12 14s. 5d. October 23rd.

Deeds of Arrangement.

BEMAN, Eugene Cecil, trading as NEWMAN ELECTRICAL CO., 5 and 6, Eden Street, Hampstead Road, dealer in electrical goods. Dated January 17th; filed January 22nd. Trustees, W. A. J. Osborne, 119, Finsbury Pavement, E.C., and another. Liabilities unsecured, £5 305; assets, less secured claims, £4 710.

FORD, Herbert William, 57B, Victoria Street, and 50, The Esplanade, Burnham-on-Sea, wireless and electrical engineer. Dated January 17th; filed January 21st. Trustee, A. Collins, 28, Baldwin Street, Bristol. Liabilities unsecured, £303; assets, less secured claims, £148.

Receiverships.

ELECTRICAL AND CHEMICAL EBONITE CO., LTD. C. F. Palmer, of 86/88, Queen Victoria Street, E.C.4, was appointed receiver on December 30th, 1929, under powers contained in debenture dated May 27th, 1925.

M. P. A. WIRELESS, LTD. J. J. Ure, C.A., of 11A, Hart Street, W.C., was appointed Receiver and Manager on January 8th, 1930, under powers contained in first mortgage debentures dated May 8th, to November 28th, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

NEWPORT ELECTRICAL CO., LTD. (Mon.). Registered January 18th, £400 debenture to L. J. Brown, Brynderyn, Victoria Avenue, Newport; general charge. *Nil. May 17th, 1928.

N. S. ACCUMULATORS, LTD., London, S.E.—Registered December 30th, series of £1 500 debentures; present issue £500; general charge. *Nil. May 28th, 1928.

RHEOSTATIC CO., LTD., Slough, electrical engineers.—Registered January 6th, mortgage to bank; charged on land at Salt Hill.

WEALD ELECTRICITY SUPPLY CO., LTD., London, E.C.—Registered January 2nd, charge to bank; charged on Fairview, Hawkhurst. *£100 000. October 22nd, 1929.

Satisfactions.

ASHTON ELECTRICAL CO. (PRESTON), LTD. Satisfaction registered January 11th, £200, registered October 6th, 1927.

BUILTH WELLS ELECTRIC SUPPLY CO., LTD. Satisfaction registered January 11th, £2,500, registered April 10th and October 15th, 1926.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BANKS, B. D., AND CO., electrical engineers, 476, Cowbridge Road, Cardiff. A meeting of creditors has decided that, unless the debtor is able to find sufficient guarantees for a composition of 10s. in the £, his petition in bankruptcy shall be filed. The statement of affairs reported liabilities of £1 020, all due to unsecured creditors, and assets estimated to realise £364, less preferential claims of £109, or a deficiency of £765. The debtor stated that he estimated his turnover at about £40 weekly, while his drawings had been at the rate of £5 a week, and the other overhead expenses totalled approximately £15. There was a life policy on the debtor's life, the surrender value of which was approximately £25, and this was held by the bank.

WILD, Mrs. E. H., trading as the C. B. PORTABLE RADIO CO., wireless apparatus dealer, 117A, Abergele Road, Colwyn Bay. The deed of arrangement executed by this debtor has been confirmed by a meeting of creditors. A statement of affairs was submitted, which showed liabilities of £675, all due to the trade, and a deficiency of £534. The debtor commenced trading at Colwyn Bay in June of last year, and subsequently removed to her present address. The creditors include:—Hirst, Ibbotson and Taylor, £141; Murdock Trading Co., £27; Harwol Specialities, £50; Ward and Co., £23; Hollingdrake and Son, Ltd., H., £112; Northern Steel and Hardware Co., £72; Selectors, Ltd., £25; B. V. C. Engineering Co., £18.

London Gazette, etc.

Bankruptcy Information.

GOLDSMAN, Jacob Louis, 100, High Holborn, London, W.C.2, radio engineer. Receiving order January 22nd. Debtor's petition. First meeting, February 3rd, 11.30 a.m., and public examination, March 13th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

JACKSON, John Harold, The Dock House, Winsford, Chester, electrical engineer. Receiving order, January 21st. Debtor's petition.

Notice of Dividend.

BLAIR, Edward Winnington, electrical engineer and contractor, lately at 6, Queen's Parade, Brent Street, Hendon, Middlesex, trading as BLAIR AND SON. First and final dividend, 6s. 11d. per £, payable January 30th, Official Receivers, 29, Russell Square, London, W.C.1.

The above notice is in substitution for notice of dividend of 7s. 2d. per £ published in the "London Gazette" of January 14th, the dividend then advertised not having been paid.

Bankruptcy Proceedings.

HOEY, Frank Walter Charles, of 51, Montgomery Road, Chiswick, wireless and electrical dealer, lately 29, Sicilian Avenue, London, W.C. Under the Receiving Order made on January 7th on the debtor's petition, the first meeting of creditors was held at the London Bankruptcy Court last week. The statement of affairs submitted showed liabilities £4 635 and assets £2 409. From statements made by the debtor in preliminary examination, it appeared that in April, 1926, he purchased for £1 150 the business of wireless and electrical accessories' dealer carried on under the style of Scientific Appliances at the above address. The business had not been a success from the start, and owing to ill-health he had not been able to concentrate on it. His rent was £200 per annum, and the wages of his two assistants averaged £8 10s. a week. Up to early in 1929 he paid his way. In that year a person who carried on business at Stamford Hill called upon him and made considerable cash purchases In November, 1929, that person started buying on credit, and in the following month purchased goods on credit to the value of £2 000. At this time the debtor was being pressed by creditors, and he in turn pressed his customer for the payment of his account. He saw him on various occasions, but was put off by various excuses, and just before Christmas he called at the customer's business address but found the premises locked up. Inquiries were still being pursued, but up to the present nothing has been heard of the man. In consequence of this severe loss, he sold his business for £400, which he paid into the bank in reduction of his overdraft. He filed his petition because he was being pressed by creditors, and also because he thought that the Official Receiver would be able to bring more pressure to bear on this man than he himself was able to do. In the absence of any resolutions, the case was left with the Official Receiver. Creditors:—Aeonic Radio Co., Ltd., £133; Acoustophone, Ltd., £49; Acquaproof Co., Ltd., £68; Barton, A. D., and Co., £121; Burndebt Wireless Co., £138; Bedford Electrical and Radio Co., £49; Benjamin Electrical Co., Ltd., £155; Concerts Radio Electrical Co., £140; Cole, E. K. and Co., Ltd., £38; Cosser, G. C., Ltd., £33; Dew, A. J., and Co., Ltd., £50; Dubilier Condenser Co., £42; Celistem, Ltd., £26; Downing and Co., Ltd., £71; Edison and Swan Electric Co., Ltd., £125; Formo Co., Ltd., £97; General Electric Co., Ltd., £145; Garnett Whitley and Co., Ltd., £132; Graham Fairrish, Ltd., £55; Haw and Co., £742; Midland Wireless Services, Ltd., £187; Mullard Bros., Ltd., £45; M.P.A. Wireless, Ltd., £26; McMichael, Ltd., £49; Premier Electric Heaters, Ltd., £38; Phillips Lamps, Ltd., £119; Sun Electrical Co., Ltd., £42; Siemens Bros., Ltd., £93; Saxon Radio Co., Ltd., £24; Sterns Manufacturing Co., Ltd., £126.

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ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

INVINCIBLE.—507 780. Class 8. Instruments and apparatus for use in wireless telephony, but not including electric batteries. Gas Light Fittings Co., Ltd., 322, Walworth Road, London, S.E.17; merchants. November 13th, 1929. To be associated with No. 494 477 (2 662) and another.

SUNSTAR.—507 781. Class 8. Instruments and apparatus for use in wireless telephony, but not including electric batteries. Gas Light Fittings Co., Ltd., 322, Walworth Road, London, S.E.17; merchants. November 13th, 1929. To be associated with No. 494 479 (2 662).

PHILILITE.—505 341. Class 13. Electric lamps and electric lighting fittings, all being metal goods not included in other classes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Emmasingel 13d, Eindhoven, Holland; manufacturers. August 16th, 1929. (Date claimed under International Convention, April 23rd, 1929.) To be associated with No. 505 343 (2 698) and others.

LEWBESTITE.—507 689. Class 50. Electrical fittings manufactured from animal and vegetable substances not included in other classes, and wire covered with asbestos and wire covered with a composition in which bitumen predominates. The London Electric Wire Co., and Smiths, Ltd., 7, Playhouse Yard, Golden Lane, London, E.C.1; manufacturers. November 11th, 1929. To be associated with No. 442 591 (2 391) and others.

SEMPELIS.—508 505. Class 8. Wireless telephonic apparatus and parts thereof, and radio receiving sets in combination with gramophones. Fanny Alford, The Nook, Rockbeare, near Exeter; merchant. December 6th, 1929.

HYPERMITE.—507 136. Class 8. Wireless telephonic and telegraphic instruments and apparatus. Radio Instruments, Ltd. 12, Hyde Street, London, W.C.1; manufacturers. October 22nd, 1929.

EXTENSCALE.—507 254. Class 8. Electrical resistances and electrical transformers; and ammeters, voltmeters, wattmeters, galvanometers and similar electrical testing apparatus. Elliott Brothers (London), Ltd., 1, Central Buildings, Westminster, London, S.W.1; electrical engineers. October 28th, 1929.

KODITE.—508 769. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Kodak, Ltd., Kodak House, Kingsway, London, W.C.2; manufacturers and dealers. December 13th, 1929. To be associated with No. 75 818 (548) and others.

KODAWIND.—508 770. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Kodak, Ltd., Kodak House, Kingsway, London, W.C.2; manufacturers and dealers. December 13th, 1929. To be associated with No. 75 818 (548) and others.

SECOS.—509 047. Class 8. Philosophical instruments, scientific instruments and apparatus for teaching. Lissen, Ltd., Lissenium Works, Friars Lane, Richmond, Surrey; manufacturers. December 24th, 1929.

LIVER.—508 128. Class 5. Wire; and unwrought or partly wrought metal for use in the manufacture of electrical goods. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. November 23rd, 1929. To be associated with No. 472 161 (2 536) and others.

METAL AND CHEMICAL PRICES.

TUESDAY, January 28th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£76 10 0		10s. 0d
Electro Wirebars	,,	£83 15 0	—	—
H.C. Wires, basis	per lb.	11⅝d.	⅛d.	—
Sheet	,,	11⅜d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s.2⅛d.	⅛d.	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	—
Foreign or Colonial	,,	£21 12 6	2s. 6d.	—
Tin—				—
Ingot	per ton	£174 15 0	15s. 0d.	
Wire, basis	per lb.	2s. 4½d.	½d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 17 6	7s. 6d.	—
Mercury	per bottle	£23 5 0	—	—

Sulphur—Flowers, Ton £12 0 0 ,, Roll, ,, £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10 0 *Boric Acid* (Crystals) ,, £30 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2½d *Sodium Bichromate*—Per lb., 3½d.

Rubber—Para fine, 8½d.; plantation, 1st latex, 7 ⅛ d.

*** The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

According to James Forster and Co., there is nothing to report, prices being still under control. Conditions are quiet in the United States with the price unchanged at 6.25 cents per lb.

Closing prices on January 24th were £21 11s. 3d. for all positions, practically unchanged on the week.

The students of the Brush Electrical Engineering Co., Ltd., held their annual supper dance at the King's Head Hotel, Loughborough, last Friday. A large company, amongst whom was Mr. Emile Garcke, chairman of the company, spent a very enjoyable evening.

There was a large attendance at the eighth annual dinner of the staff of Francis Polden and Co., Ltd., electrical contractors, London, when Mr. Francis Polden thanked the staff for the excellent work and support which they had given during the past year. The dinner was succeeded by a concert and dancing, and the evening owed much of its success to the hard work of Mr. E. D. Gill, secretary of the company.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

320 705 H. F. JOEL, JUN. Means for controlling apparatus at a distance. (4/8/28.)
320 706 RELAY AUTOMATIC TELEPHONE CO., LTD., and B. B. JOHNSON. Telephone exchange systems. (4/8/28.)
320 711 W. W. TRIGGS (WILLIAMS OIL-O-MATIC HEATING CORPORATION). Electric circuit controls for electrically operated liquid-fuel burning-apparatus. (10/8/28.)
320 713 M. TROUTON. Electrical vibratory devices such as loud speakers. (10/8/28.)
298 897 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric switch operating devices. (15/10/27.)
298 575 ELECTROLUX, LTD. Absorption refrigerating apparatus containing an inert gas. (11/10/27.)
299 047 DR. A. SCHERBIUS and E. R. RITTER (trading as SCHERBIUS AND RITTER). Electric switches. (21/10/27.)
320 783 S. G. S. DICKER (N.V. PHILIPS' GLOEILAMPENFABRIEKEN). Electric discharge tubes. (1/11/28.)
320 784 BRITISH BRASS FITTINGS, LTD., and A. LOGAN. Electric heating units for cooking and like purposes. (2/11/28.)
299 856 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Keying systems for use in radio or line telegraphy. (2/11/27.)
300 139 TECALEMIT, LTD. Means for automatically breaking the circuit of the accumulators on automobile vehicles. (5/11/27.)
320 793 J. A. CRABTREE. Electrical plug-and-socket couplings. (7/11/28.)
302 180 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Circuit arrangements suitable for use in signalling systems. (10/12/27.)
311 314 AKT.-GES. BROWN, BOVERI ET CIE. Electric insulators with screens of porcelain or the like non-conducting material. (9/5/28.)
310 021 AKT.-GES. BROWN, BOVERI ET CIE. Electric insulators. (20/4/28.)
303 011 BRITISH THOMSON-HOUSTON CO., LTD. Synchronous inductor frequency changers. (24/12/27.)
303 027 E. CITOVICH. Electrochemical processes. (24/12/27.)
307 009 LANDIS AND GYR SOC. ANON. Electric switch, more particularly for automatically operated switchgear. (1/3/28.)
303 367 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Circuit arrangements suitable for use in thermionic valve transmitters. (31/12/27.)
320 818 L. ST. C. BROUGHALL. Electrolytic preparation or purification of metals. (31/12/28.)
320 822 R. P. A. ANDERSSON. Multiple-filament electric incandescent lamps. (3/1/29.)
304 232 MASCHINENFABRIK OERLIKON. Step switch for regulating the voltage of transformers under load. (17/1/28.)
320 825 F. G. MCDONALD. Electric ignition switch indicators for motor vehicles. (10/1/29.)
305 168 VERFINIGTE GLUHLAMPEN UND ELEKTRICITATS AKT.-GES. Method of and apparatus for recording by means of cathode rays, rapidly occurring phenomena. (1/2/28.)
304 700 BRITISH THOMSON-HOUSTON CO., LTD. High frequency electric signalling systems. (24/1/28.)
304 734 SIEMENS-SCHUCKERTWERKE AKT.-GES. Driving devices for "pilgrim step" motion rolling trains. (25/1/28.)
320 832 ANCIENS ETABLISSEMENTS BARBIER, BENARD AND TURENNE SOC. ANON. Feeding devices for the carbons of arc lamps. (9/11/28.)
305 987 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Radio and the like receiving systems. (13/2/28.)
306 151 E. KELSEN. Electrolytic manufacture of iron. (16/2/28.)
320 627 J. L. BAIRD and TELEVISION, LTD. Television apparatus and the like. (16/4/28.)
320 628 J. L. BAIRD and TELEVISION, LTD. Speed controlling means for television and like apparatus. (16/4/28.)
320 687 J. L. BAIRD and TELEVISION, LTD. Apparatus for the production and reception of electric signals including television apparatus and the like. (20/6/28.)
311 242 DR. P. MEYER AKT.-GES. Mercury electric switches. (7/5/28.)
320 611 J. Y. JOHNSON (I.G. FARBENINDUSTRIE AKT.-GES.). Manufacture and production of magnetic cores of high permeability. (14/7/28.)
320 916 L. A. LEVY and ALMEIDA ACCUMULATORS, LTD. Secondary electric cells. (27/4/28.)
291 056 AKT.-GES. BROWN, BOVERI ET CIE. Controlling arrangement for electric ship propulsion systems. (25/5/27.)
291 063 DR. C. SCHINZEL. Method of producing printing-plates by electrochemical processes. (25/5/27.)
320 819 E. Y. ROBINSON and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Vacuum electric tube devices. (19/6/28.)
292 538 E. KIEBACK and P. PETER (trading as KIEBACK AND PETER MESSGERATE UND REGLER, DIPL. ING. [Firm of]). Automatic electric circuit-controllers. (21/6/27.)
320 850 BRITISH THOMSON-HOUSTON CO., LTD., and F. P. WHITAKER. Mercury arc rectifiers. (20/6/28.)
292 626 SIEMENS AND HALSKE AKT.-GES. Thermionic valve modulation circuits. (21/6/27.)
320 870 MUIRHEAD AND CO., LTD., F. H. MUIRHEAD and J. V. FOLL. Automatic telegraphic reperforators. (23/6/28.)
292 957 BRITISH THOMSON-HOUSTON CO., LTD. Automatic reclosing circuit-breaker systems. (27/6/27.)
292 960 BRITISH THOMSON-HOUSTON CO., LTD. Automatic reclosing circuit-breaker systems. (27/6/27.)
290 658 SIEMENS AND HALSKE AKT.-GES. Magnetic alloys. (20/5/27.)
290 219 L. ROUZET. Variable condensers. (10/5/27.)
320 897 SWITCHGEAR AND COWANS, LTD., and D. FIRTH. Automatic regulation of power factor in a.c. systems. (21/4/28.)
320 857 A. D. CONSTABLE and A. E. FRANKLING. Electric switches. (18/7/28.)
320 889 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Systems of control for alternating-current electric motors. (21/7/28.)
320 922 J. STONE AND CO., LTD., and A. E. HONEY. Electric lighting installations for railway and like vehicles. (21/7/28.)
320 923 F. MERK. Switch arrangement for line inter-communication switches with multiple lines. (23/7/28.)

Applications for Patents.

October 11th.

30 920 H. C. HEIDE (MOTOR METER GAUGE AND EQUIPMENT CORPORATION). Electric gasoline gauge.
30 911 OESTERREICHISCHE DYNAMIT NOBEL AKT.-GES. Electric fuses. (14/11/28, Austria.)
30 912 E. PFIFFNER. Electric conductor. (15/10/28, Germany.)
30 914 SIEMENS-SCHUCKERTWERKE AKT.-GES. Trunk cable. (20/10/28, Germany.)
30 949 TELEFUNKEN GES. FÜR DRAHTLOSE TELEGRAPHIE. Telegraph systems. (26/11/28, Germany.)
30 934 TELEPHON-APPARAT-FABRIK E. ZWIETUSCH AND CO. GES. Containers for electrical condensers. (3/11/28, Germany.)
30 878 WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Refrigerating apparatus. (30/10/28, U.S.)

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October 12th.

31 051 J. E. Adams. Electrical transmission systems.
30 998 Askania-Werke Akt.-Ges. vorm Centralwerkstatt Dessan und C. Bamberg-Friedenau and E. Roux. Magnetic balance for measurement of intensities.
31 016 H. G. Baggs, R. A. Smith, and J. A. Wilkins. Portable electrical fittings.
31 043 British Electrical and Allied Industries Research Association, P. D. Morgan and S. Whitehead. Mounting suspended electric cables.
31 039 British Thomson-Houston Co., Ltd. (Cie Francaise pour l'Exploitation des Procédés Thomson-Houston). Electric relays.
31 002 A. O. Couyoumdjian. Rotary electric convertors, etc.
31 041 S. Cowen. Attachment for electric lamp switches, etc.
31 015 C. F. Edwin and Siemens Bros. and Co., Ltd. Dry cells.
31 032 D. S. Gough. Boxes for thermionic valves, etc.
31 038 International General Electric Co., Inc. Amplifying devices. (13/10/28, Germany.)
31 022 Metropolitan Electric Tramways, Ltd., and J. Schofield. Tramway trolley heads.
31 033 E. J. Mitchell. Electromagnetic sound reproducing units.
31 046 N. V. Philips' Gloeilampenfabrieken. Apparatus for testing discharge tubes. (13/10/28, Holland.)
31 044 S. Ruppel. Electric switches. (13/10/28, Germany.)
31 028 Standard Telephone and Cables, Ltd. Traffic control system.
31 008 H. G. A. R. Wilson. Electric supply systems.

October 14th.

31 141 Allmanna Svenska Elektriska Aktiebolaget. Electric power station systems. (15/10/28, Sweden.)
31 202 M. Bragg. Electrical accumulator contacts.
31 148 British Electrical and Allied Industries Research Association. Circuit breakers.
31 175 British Thomson-Houston Co., Ltd., and L. Griffiths. Ignition apparatus.
21 280 British Thomson-Houston Co., Ltd. Colouring lamps. (15/10/28, U.S.)
31 173 British Thomson-Houston Co., Ltd. (General Electric Co., N.Y.). Temperature indicators.
31 161 J. C. Buchholz. Fuse for electric rail vehicles.
31 087 C. C. Henkes. Electrically-operated signs, etc.
31 170 C. Leven. Electrical coupling, etc.
31 092 W. J. Line. Switch earthing devices.
31 182 J. E. Pollak (Associated Telephone and Telegraph Co.). Microphones.
31 128 Selenophon Licht und Toubild-Ges. Apparatus for photographic recording of alternating currents. (25/10/28, Austria.)
31 119 A. Townsend. Electric vacuum cleaner.
31 148 E. B. Wedmore. Circuit breakers.
31 196 E. T. Williams. Poles for overhead lines, etc.

October 15th.

31 340 R. G. Alger, Associated Electrical Industries, Ltd., and C. Sykes. Electric heating elements.
31 308 P. Allenic. Electrical connection. (3/11/28, France.)
31 338 Associated Electrical Industries, Ltd., W. Needham and C. Sykes. Electric heating elements.
31 339 Associated Electrical Industries, Ltd., J. W. Buckley and C. Sykes. Electric hot plates, etc.
31 293 Automatic Telephone Manufacturing Co., Ltd., L. M. Simpson. Electric totalisators.
31 260 H. V. Clark and H. G. Davis. Reduction of echo effects in electric signalling systems.
31 278 F. E. Collinson. Tuning wireless apparatus, etc.
31 257 F. W. Dixon and Douglas Motors, Ltd. Battery ignition systems for engines.
31 285 C. C. Garrard and General Electric Co., Ltd. Electric switchgear.
31 215 Harris and Sheldon, Ltd., and R. G. Turner. Electric inspection lamps.
31 296 Kupfer und Messingwerke Akt. Ges. Hirsch. Electric induction furnace. (15/10/28, Germany).
31 279 International General Electric Co., Inc. Accumulators. (15/10/28, Germany.)
31 250 Magnet-Werke Ges. fur Eisenach Spezialfabrik Elektromagnetic Apparate. Electromagnetic chuck. (14/12/28, Germany.)
31 355 Maschinenfabrik Oerlikon. Igniting mercury vapour arcs. (29/10/28, Switzerland.)
31 334 J. M. Rokes and Telegraph Construction and Maintenance Co., Ltd. Electric welding machines.
31 324 Siemens und Halske Akt. Ges. Production of insulating bodies. (17/10/28, Germany.)
31 343 Siemens und Halske Akt. Ges. Distant transmission of measurement values. (31/1/028, Germany.
31 300 G. Tauschek. Setting valves, etc., electromagnetically. (22/10/28, Austria.)
31 336 Telefunken Ges. fur Drahtlose Telegraphie. Radio receivers, etc. (15/10/28, Germany.)
31 337 Telefunken Ges. fur Drahtlose Telegraphie. Electrical recording devices. (20/10/28, Germany.)
31 227 J. Ward. Magnetic controllers for loom shuttles.
31 284 Westinghouse Brake and Saxby Signal Co., Ltd. Multiple control apparatus. (20/10/28, U.S.)

October 16th.

31 431 G. A. L. Baldwin. Valves for wireless.
31 480 H. C. Atkins and Gramophone Co., Ltd. Wireless receivers.
31 509 J. Bolsom and A. E. Chapman. Wireless receiving and projecting apparatus.
31 481, 31 483 G. E. Condliffe and Gramophone Co., Ltd. Electron emitting cathodes.
31 496 A. K. Croad (Sand Spun Patents Corporation). Magnetic clutches. (22/7/28.)
31 400 W. H. Dearden, G. Lawton and Standard Telephones and Cables, Ltd. Manufacture of magnetic material.
31 481, 31 482 F. Ellington and Gramophone Co., Ltd. Electron emitting cathodes.
31 484 F. Ellington, Gramophone Co., Ltd., and W. F. Tedhan. Electron emitting cathodes.
31 438 General Electric Co., Ltd., and J. M. Waldram. Models for design of illuminating systems.
31 439 General Electric Co., Ltd., and D. A. Oliver. Amplifiers.
31 469 P. J. Hageman. Wireless receiving apparatus, etc.
31 452 I.G. Farbenindustrie Akt. Ges. Manufacture of material capable of being marked by electrolytic decomposition. (16/10/28, Germany.)
31 442 International General Electric Co., Inc. Amplifying arrangements (16/10/28, Germany.)
31 432 R. A. Kennedy. Wireless apparatus.
31 429 H. Leitner. Dynamos, etc.
31 394 W. J. Line. Switch fixing and earthing.
31 453 R. E. D. Maradei. Electric lamps.
31 371 W. Needham. Manhole covers, etc.
31 402 Standard Telephones and Cables, Ltd. Dust covers for relay panels, etc.
31 404 Standard Telephones and Cables, Ltd. (W. Hatton). Automatic telephone systems, etc.
31 401 Standard Telephones and Cables, Ltd. (L. J. J. Schreiber and E. H. Preud'Homme). Bells for telephone etc., systems.
31 403 Standard Telephones and Cables, Ltd. (Western Electric Co.). Wave signalling systems.
31 501 Telephon-Apparate-Fabrik E. Zweitusch and Co. Ges. Containers for electric condensers. (10/11/28, Germany.)
31 366 G. Wilkinson. Electric heat storage cookers.

October 17th.

31 530 T. S. Anderson and S. E. Lloyd. Variable condenser.
31 599 Arcturus Radio Tube Co. Photoelectric cells. (18/10/28, U.S.)
31 586 Associated Electrical Industries, Ltd., and J. B. Hansell. Oil-immersed electrical apparatus.
31 585 Automatic Telephone Manufacturing Co., Ltd., F. E. Comyn and R. Taylor. Telephone systems.
31 591 C. E. G. Bailey. Electrical measuring apparatus.
31 587 British Thomson-Houston Co., Ltd., and J. C. Reed. Mercury arc rectifiers.
31 588 British Thomson-Houston Co., Ltd. Control of inverse voltage.
31 522 J. H. Carrick and Greenwood and Batley, Ltd. Electrical generating machines.
31 525 H. S. Cooke. Electric switches.
31 557 R. D. Dunlop. Magnetos.
31 614 Electrical Research Products, Inc. Signalling systems. (19/11/28 U.S.)
31 521 G. C. and J. C. Forsyth. Couplings, etc., for electrical tubing.
31 619 H. J. Garnett and W. S. Smith. Submarine cables.
31 591 Gramophone Co., Ltd. Electrical measuring apparatus.
31 527 G. W. E. Hardy. Disinfector for telephone apparatus, etc.
31 567 D. Kingsbury, W. R. Rawlings and A. Reyrolle and Co., Ltd. Plug and socket connections, etc.
31 590 Lissen, Ltd., and R. P. Richardson. Thermionic valves.
31 549 Loewe-Audion Ges. and B. Wienecke. Connection of directly heated filaments of electron valves to electric mains. (17/10/28, Germany.)
31 539 C. O. Marshall. Coupling for electrical tubing, etc.
31 615 J. Robinson. Wireless receiving apparatus.
31 610 Siemens-Schuckertwerke Akt. Ges. Continuously acting absorption machines. (26/10/28, Germany.)

COMING EVENTS.

Friday, January 31st (To-day).

Institution of Electrical Engineers (North-Eastern Students' Section).—Armstrong College, Newcastle-upon-Tyne. Joint meeting with the Graduates of the North-East Coast Institution of Engineers and Shipbuilders. Paper by Mr. W. G. Thomson on "The Electrical Propulsion of Ships." 7.15 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster, London, S.W. Informal meeting. Paper by Mr. F. Onions on "Superheating." 7.30 *p.m.*

Saturday, February 1st.

Institution of Electrical Engineers (North-Western Students' Section).—Visit to the works of Messrs. W. T. Glover and Co., Trafford Park, Manchester 2.30 *p.m.*

Monday, February 3rd.

Institution of Electrical Engineers (Western Centre).—Abbey Hall, Catherine Street, Plymouth. Faraday lecture by Captain P. P. Eckersley on "Broadcasting by Electric Waves." 7 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Discussion on "Maintenance of Telephone Plant," opened by Mr. H. G. S. Peck. 7 *p.m.*

Tuesday, February 4th.

Electrical Development Association (Leeds Branch).—Electricity Department, 1, Whitehall Road. Lecture by Mr. C. F. Wells on "Domestic Electrification with special reference to E.D.A. Electric Homes (Outlet) Campaign."

Electrical Association for Women.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lantern lecture on "Plastic Lighting and Modern Architecture—Changing Styles in Cities and Homes," by Mr. G. S. Francis. 3 *p.m.*

Electrical Association for Women (Bristol and District Branch).—Electricity Offices, Colston Avenue. Lecture by Mr. L. Burdes on "Your Servant—Electricity." 3 *p.m.*

Electrical Contractors' Association (Derby Branch).—Ordinary meeting. 5 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—17, Albert Square, Manchester. Joint meeting at the invitation of the Institution of Post Office Electrical Engineers. Paper by Mr. S. S. A. Watkins on "Talking Films."

Institution of Electrical Engineers (Dundee Sub-Centre).—Lamb's Restaurant, Reform Street. Informal meeting. Discussion on "Curious faults and Experiences." 7.30 *p.m.*

Electrical Society of Glasgow.—30, Gordon Street. Lecture by Mr. T. Ingram Craig on "The Electric House." 7.30 *p.m.*

Television Society.—Engineers' Club, Coventry Street, Piccadilly Circus, London. Lecture by Mr. G. P. Barnard on "The Photoconductivity of Selenium and various other Substances." 8 *p.m.*

Wednesday, February 5th.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting. 2.30 *p.m.*

Institution of Electrical Engineers (Wireless Section).—Institution, Savoy Place, Victoria Embankment, London. Visit to the Laboratory of the City and Guilds Engineering College, South Kensington. Short papers on new developments. 6 *p.m.*

Institution of Electrical Engineers (Tees-Side Sub-Centre).—Cleveland Technical Institute, Middlesbrough.

Sheffield Illumination Society.—Lighting Department. Paper on "Office Notes," by Mr. E. Marrison. 8 *p.m.*

Thursday, February 6th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Institution of Electrical Engineers.—Hotel Cecil, Strand, London. Annual dinner. 7 for 7.30 *p.m.*

Friday, February 7th.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Dr. R. L. Smith-Rose on "Radio Direction Finding by Transmission and Reception." 5.15 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London. Papers by Mr. G. F. Shotter on "A New Null Method of Testing Instrument Transformers and its Applications," Messrs. R. S. J. Spilsbury and A. H. M. Arnold on "Some Accessory Apparatus for Precise Measurements of Alternating Current," and Mr. A. H. M. Arnold on "Precision Testing of Current Transformers." 7 *p.m.*

North-East Coast Institution of Engineers and Shipbuilders (Graduate Section).—Bolbec Hall, Newcastle-on-Tyne. Joint meeting with the Institution of Electrical Engineers Students' Section. Paper by Mr. W. G. Thompson on "The Electrical Propulsion of Ships." 7.15 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Paper by Mr. G. F. O'Riordan on "Co-operation between Technical Institutions and Industry." 7.30 *p.m.*

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THE ELECTRICIAN

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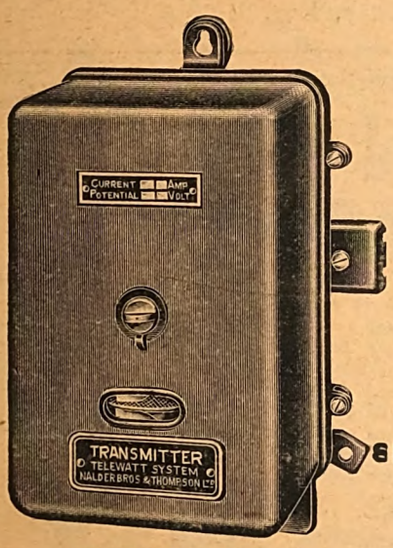

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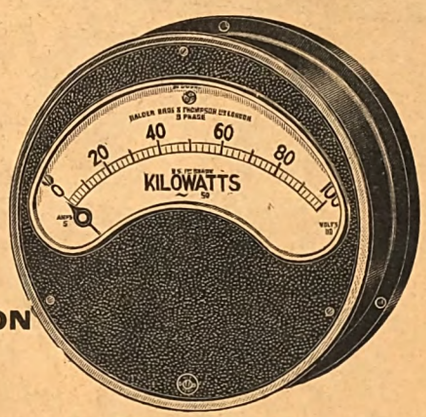

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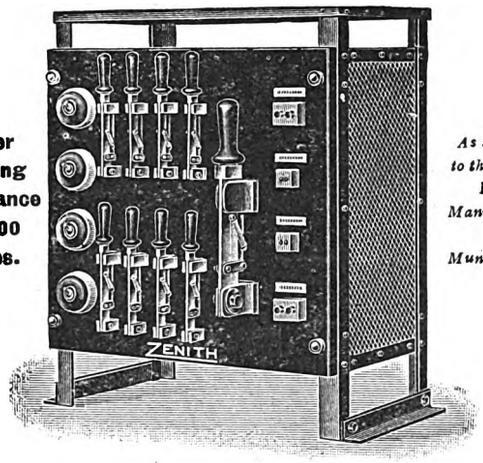

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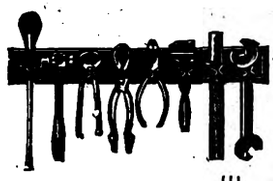

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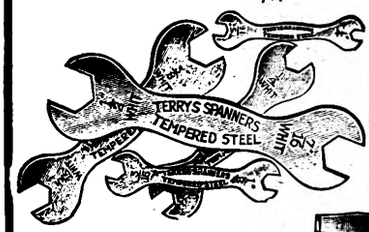

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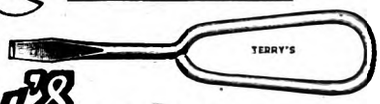

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

No. 2697. [Vol. CIV. No. 6.] Friday, February 7, 1930. Annual Subscription, 25s. Overseas, 30s.

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Current Topics.

The Jubilee Dinner.

NEARLY thirty years ago the KING, after his return from his Empire tour as DUKE OF CORNWALL AND YORK in the "Ophir," made his famous "Wake-up England" speech at the Guildhall. Inspired by that rousing call to action the firm of Benn Brothers, Ltd., at once initiated Empire numbers of the two or three trade journals then published by the firm. Then, as now, the times were difficult—the South African War was still dragging on—and the future was uncertain. Yet, as Sir ERNEST BENN recalled in the telegram which he sent to the KING on the occasion of the memorable Jubilee Dinner of the firm on Saturday, since responding in that way to HIS MAJESTY'S call to action, progress has been continuous. The KING'S active interest in British industry and trade has been repeatedly manifested both before and during the stern period that began so soon after he came to the throne. It was obviously fitting to convey to him the loyal greetings of those who, working during the latter half of their completed fifty years of activity under the inspiration of his Guildhall speech, had become, through the expansion of their group of trade journals, more and more closely associated with the industries and commerce of the country—in short, with its lifeblood. The gratifying nature of the KING'S reply will be an added encouragement to all concerned to go forward to still greater things, and to assist in every possible way that trade revival which is now, even more than in 1901, our greatest national need.

There was much said by the speakers on Saturday night which will long be remembered by those who were privileged to be present. The tributes paid to the founder by Mr. RUNCIMAN and by the present head of the firm so clearly flowed from deep springs of friendly and filial affection and respect that even those who had never enjoyed the society of Sir JOHN BENN could not fail to gain the impression that a very great and lovable character had laid the foundations of a business which has become a national force and a force that is under progressive yet prudent guidance. In this connection we cannot refrain from remarking that, if, as Dean INGE somewhat wickedly suggested, the ghost of the notorious Sweeney Todd flits through Bouverie House, which now stands on the reputed site of that homicidal barber's shop, his evil presence has been so thoroughly exorcised by the wholly beneficent spirit of the founder that no member of the staff has even so much as suspected his existence.

THE ELECTRICIAN, although not an original member of the family of trade and technical journals, now numbering a round dozen, which form the Benn group, has been one of them for some fourteen years. It was in the dark days, half-way through the Great War, that the association began. In fact, it can be said that the present control of the journal has roughly coincided with the beginning of that new era of electrical progress in Great Britain which will, we believe, play a great part in the rehabilitation of our industrial life. Cheap and plentiful electricity can undoubtedly do a great deal to assist us to regain our former supremacy, but unless it is backed by other vital, if less material efforts, it will not by itself restore prosperity. It is in the mental attitude of employers and workers that the fundamental causes of success or failure must be sought. In this sphere we believe that the growth of the firm of Benn Brothers during the fifty years of its existence has in it a lesson which could be widely learned with great advantage to the nation. It is a proud boast to state, as Sir ERNEST BENN was able to do on Saturday, that in the whole course of its existence the firm had never sacked anyone for lack of trade. It is also contrary to most of the popular notions of the day that a constant effort to reduce the number of individuals engaged in particular activities should

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lead to a progressive expansion in the total number of employees. In other respects, such as the five-day week and the profit-sharing schemes which have made nearly half the staff shareholders in the enterprise, the organisation, if not unique, has at any rate developed features which make for enthusiastic service and lead to healthy growth. The electrical industry is fortunate in that it is not in need of radical overhaul like so many of the other great industries of this country. Yet we feel that the report which we print in this issue of the speeches at the Jubilee Dinner, with the light that they throw on the principles which have guided the firm of Benn Brothers to its present happy condition, will be read by the electrical world with real interest, for its members can say with us that "while taking off our hats to the past we take off our coats to the future," with its great task of setting our country once more firmly on its feet.

An Old Feud.

FOR many years relations between the Post Office and the Marconi Co. were far from cordial, and although the Marconi radio system has now become part of the new Imperial Communications Co., the old hostility seems to be still in evidence. There is certainly no other easily discernible reason for the failure of the Post Office to agree with Imperial and International Communications, concerning the use of the company's wireless stations for long distance telephone services, and its persistence in developing its own system of radio telephonic communications. We await with interest the report of the Cabinet Committee under the presidency of Lord THOMSON which has been considering the protest that Sir BASIL BLACKETT (chairman of the I. and I.C. Co.) made to the Chancellor of the Exchequer concerning the attitude of the Post Office towards the company.

Cause and Effect.

IN spite of being offered at a discount of $2\frac{1}{2}$ the Central Electricity Board's issue of 5% Stock made little appeal to the investing public, the underwriters being left with 91% of the £7 000 000. Dealings began at $1\frac{3}{4}$ to $1\frac{1}{4}$ discount. This experience is symptomatic of the general rise in the yield expected from fixed interest bearing securities which has resulted from the weakening of the British Government's credit caused by the prospects of higher taxation and the general apprehension as to the nature of the next Budget. In the case of this particular issue it is possible that the uncertainty as to the outlook introduced by the Coal Mines Bill also exerted an unfavourable influence on investors.

Trade Outlook.

THE Federation of British Industries Business Barometer for the first quarter of 1930 is not a cheerful document. It is considered that the present situation has many points of similarity with that which supervened after the American crisis of 1893 and that time may have to be given for a recovery from a decade of falling commodity prices with its accompanying diversion of an excessive proportion of energy to retail activities as well as for reorganisation of the capital investment market and of the industries and occupations dependent on it. Appreciable progress may be achieved this year towards the reduction of short period money rates and in the direction of co-operation between American and Central European banks for the redistribution of their excessive quantities of gold or the expansion of the volume of credit on existing reserves all over the world. But the other requisites for a world trade recovery—willingness of investors to accept a smaller return on their savings and re-establishment of the foreign capital market on something more nearly approaching pre-war conditions—may take considerably longer to achieve. While there are grounds for anticipating a relatively early recovery in many directions, some time is likely to elapse before there is a resumption of a sustained general upward movement. Inspection of the curves covering the years 1926–1929 which accompany the F.B.I. Barometer reveals tendencies which are far from satisfactory. The only industries in which the employment curve shows a distinctly favourable trend are electrical engineering, coal mining, "other metal industries," chemicals and boots and shoes. The curve relating to our own industry, we are glad to see, is much the healthiest looking of the series.

English Electric Reorganisation.

THE proposals for the financial reorganisation of the English Electric Co., Ltd., are described by the directors as "drastic and unpleasant, but necessary." Yet if, as there is good reason to anticipate, the reduction in fixed charges and the provision of additional capital enables the company to bring its works to the fullest efficiency and, by increasing its output, to earn satisfactory profits the present surgical operation will be amply justified. We hope that it will restore the patient to financial health. The company's technical record is excellent and has brought it a large volume of business, in spite of the financial difficulties with which it has had to struggle during its decade of existence. Freed from their cramping influence it should soon be able both to expand its activities and make them profitable.

The St. Lawrence Project.

TWO Canadian engineers—the late Mr. HENRY HOLGATE, who, we regret to note, died last month, and Mr. J. A. JAMIESON—appointed by the Montreal Board of Trade to study the St. Lawrence Deep Waterway and power project have expressed very decided opposition to the scheme. They state that the power potentialities are 5 103 100 H.P. of which 2 903 100 is entirely Canadian. The Dominion is also entitled to half (1 100 000 H.P.) from the international section, making a total of 4 003 100 H.P., or almost 80 per cent., and leaving 1 100 000 as the American share. It is pointed out that apportionment of the cost of the works between water power and navigation would be difficult and the conditions are further complicated by uncertainty as to whether the Dominion or Provincial Governments would own the power.

Canada's Loss.

THE Empire as well as Canada has been deprived this week of a distinguished servant by the death of Mr. PETER LARKIN, who has represented the Dominion in London as High Commissioner for the past eight years. Shrewd, approachable and of a commanding presence, Mr. LARKIN in early life built up a large Canadian business from nothing. Within ten years he had acquired wealth. He has upheld Canadian interests on this side of the Atlantic while taking an Imperial view of his responsibilities and it will not be an easy matter to replace him. The palatial Canada House in Trafalgar Square, which took the place of the dingy premises in Victoria Street, is a lasting memorial.

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JUBILEE DINNER OF BENN BROTHERS, LTD.

The King's Message—Notable Celebration of Fifty Years of Progress—Tributes to the Founder—Growth of an Idea Backed by Personal Courage—Factors in Success.

TO celebrate the Jubilee of the firm of Benn Brothers, Ltd. the firm held a banquet at the Wharncliffe Rooms, London, on Saturday, February 1st.

Sir, Ernest J. P. Benn (chairman) presided, and amongst those present were Lady Benn, Sir William Plender, Bart., and Lady Plender, the Rt. Hon. Walter Runciman, M.P., and Mrs. Runciman, the Rt. Hon. Wedgwood Benn, M.P. (Secretary of State for India) and Mrs. Benn, Lord and Lady Charnwood, Lord Ebbisham, Viscount Hambleden, Sir Hugh Bell, Bart., Sir Frank Newnes, Bart., and Lady Newnes, Sir William Lawrence, Bart. (Treasurer of the Royal Horticultural Society), the Dean of St. Paul's (the Very Rev. W. R. Inge), Mr. Arnold Bennett, the Finnish Minister and Mme. Saastamoinen, the Latvian Minister and Mme. Vesmans, the Lithuanian Minister and Mme. Bizauskas, the Esthonian Chargé d'Affaires and Mme. Mollerson, Sir Robert and Lady Welsford, Sir William Crawford, Sir Charles Mallet, Sir Cecil Walsh, Lady Brooke, Sir Arthur Shirley Benn, Mr. R. D. Blumenfeld, Mr. O. E. St. John Hornby, Mr. C. Lidbury (General Manager, Westminster Bank), Mr. H. P. Benn, Prof. R. S. Conway (a Trustee of "Discovery"), Mr. Gordon Robbins (deputy chairman, Benn Brothers, Ltd.) and Mrs. Robbins, Mr. B. G. Arthur, Mr. Percy Best, Mr. George Isaacs (General Secretary N.A.T.S.O.P.A.), Mr. A. Warne Browne (Secretary National Federation of Retail Furnishers), Mr. and Mrs. Claude Taylor (Exhibitions Branch, Board of Trade), and Mr. and Mrs. Frank H. Elliot, Mr. and Mrs. John A. Benn, Miss Betty Benn, Miss Benn, Miss Dorothy Benn, Mr. and Mrs. H. B. Crole-Rees, Mr. and Mrs. A. R. Pain, Mr. E. G. Benn, Mr. F. E. Hamer, Mr. and Mrs. E. E. Starke, Miss F. Robinson, Mr. T. M. Sparks, Mr. Norman French, Capt. E. W. Gregory, Mr. E. W. Carter, Dr. J. Gordon Parker, Mr. H. V. Taylor, Mr. A. J. Bonwick, Mr. H. W. Duck, Major W. N. Hills, Major H. Fletcher, Major A. I. Harris, Prof. J. W. Hinchley, Mr. F. Cassleton Elliott, Mr. H. E. Alden, the Rev. A. Taylor, Mr. F. M. Welsford, Mr. G. P. Baker, Mr. R. D. Savage, Mr. G. Russell Chapman, Mr. E. P. Tetsall, Mr. W. Hollins, Mr. G. H. Lepper, Mr. H. Taylor, Mr. S. H. Hodgkin, Mr. B. A. Glanvill, Mr. N. Foyle, Mr. W. E. Dedrick, Mr. G. G. Laidler, Mr. W. A. Gibson Martin, Mr. W. F. Harvey, Mr. A. E. Minshull, Mr. C. E. M. Joad, Mr. G. B. Harrison, Mr. Alan Thomas, Mrs. Pullein-Thompson, Mr. T. K. Bowman, Mr. Walter Blaber, Mr. F. Denny, Mr. H. A. Harnett, Mr. Evan Pughe, Mr. J. Gloag, Mr. F. Richardson, Mr. T. W. Griggs, Dr. Percy Dearmer, Mr. Eric Austin, Lt.-Col. W. A. Vignoles, Major T. Rich, Mr. W. W. Wilmott, Mr. A. H. Browett, Mr. H. W. Leonard, Miss Piper, Mr. and Mrs. B. C. Holding, Mr. F. H. Hallows, Mr. D. G. Rodger, Dr. G. W. Anderson, Mr. Wallace Coop, Miss E. L. Grimley.

THE KING'S MESSAGE

IN response to a loyal message sent by the chairman, Sir Ernest Benn, the following telegram was received :—

"The King is interested to hear that to-day you are commemorating the 50th anniversary of the foundation of your firm and, that on this auspicious occasion representatives of so many important trades are joining in the celebration. I am commanded to convey to all present the sincere thanks of his Majesty for your message of loyal greeting, and express the hope that every success may attend the efforts of your publishing house for the development of British trade.—CLIVE WIGRAM."

An interesting feature of the reception was the attendance of a guard of honour composed of fourteen members of the staff attired in costumes symbolical of the publishing activities of the Benn organisation The thirteen journals published by Benn Brothers, Limited, were represented as follows :—

THE CABINET MAKER —A carpenter (Mr. R. Edmonds).

THE HARDWARE TRADE JOURNAL —A blacksmith (Mr. W. L. Saunders).

THE ELECTRICIAN —Symbolical fancy costume (Miss M. Viner).

THE TIMBER TRADES JOURNAL —A lumberman (Mr. C. Mason).

THE FRUIT GROWER —A planter (Mr. L. Currell).

GARDENING ILLUSTRATED.—A gardener (Mr. E. C. Osborn).

THE BRITISH TRADE JOURNAL.—"John Bull" (Mr. A. Stevens).

THE CHEMICAL AGE —An alchemist (Mr. E. O. Piears).

THE NURSERY WORLD.—Peter Pan (Miss L. Cripps).

THE LEATHER TRADES REVIEW.—A leather worker (Mr. B. F. Lintern).

THE MILLER —A miller (Mr. W. McNaught).

DISCOVERY.—A Polar explorer (Mr. A. D. Holmes).

The fourteenth member of the guard of honour represented the book publishing activities of Ernest Benn, Limited, Mr. I. W. McDougall being attired to represent Chaucer.

The chairman (proposing the toast of The King) said: In view of the very exceptional nature of this gathering and occasion, I felt myself justified, and I felt I should be interpreting your wishes and expressing your feelings, if I sent a telegram of devotion and loyalty to His Majesty the King. I ventured to remind the King of a speech which he made in 1901 in which he called upon England to "Wake Up," and to tell him of the way in which we took advantage of that speech to found those Empire numbers that have been a feature of our business ever since.

Now, said Sir Ernest, I have the great delight and the very great honour to read to you a telegram which His Majesty has been graciously pleased to have sent in reply. (The King's telegram appears in the centre of this page).

I now give you the toast of His Majesty the King.

Sir William Plender (proposing the toast of "Fleet Street") said :—

There will always be a fascination about Fleet Street. Its past—remote and recent—recalls great figures, its religious communities are a memory, its old buildings are no more; but Fleet Street, the birthplace and home of the greatest Press in the world, still has and will always have its romance which the lengthening years cannot destroy. To-night we celebrate an eventful chapter in the history of the great publishing house of Benn. The old buildings, occupied by the firm, founded by the father of Sir Ernest, have been abandoned, and their vast business is now housed in a noble building which adds to the architectural features of Fleet Street; and we congratulate him on that achievement. But great as is the accomplishment of that effort, marking as it does a monumental episode in the Jubilee year of the firm's history, it will be no more enduring, and it is no more noteworthy than the high position which the firm of Benn occupies in the publishing world of Fleet Street through the untiring efforts, the unwearying energy and the genius of our honoured friend who presides over us to-night.

Dean Inge responded. For the purposes of this evening, he said, Fleet Street becomes Bouverie House. Fleet Street, which Dr. Johnson regarded as the very centre of the universe and the one place worth living in. I have no doubt that if he could revisit his former home, and have ascertained that the Benn family was not of Scottish extraction, he would have smiled very graciously on their activities. For fifty years this firm has been famous for issuing excellent trade journals, and more recently it has become famous as a publishing firm, and with very great enterprise it has endeavoured to put on the market very cheap and good books which will have a really wide and educating effect. I imagine that the work that is being done in that way is beyond all praise. Of the general character of Fleet Street as representing journalism in general, I have just one remark to make. It is popular taste which determines the character of our newspaper, and if there is far too much space given to subjects like betting and gambling and unsavoury crimes, the fault rests not with Fleet Street, but with the public which insists on having this fare served up to them. Therefore, what we have to aim at is to try to purify and elevate popular taste. I believe our hosts this evening are doing their very best in that direction. A great many of their cheap books I have read during the last year or two are most admirable, and I hope they are as widely read as they ought to be.

The Rt. Hon. Walter Runciman, M.P. (proposing the toast of "The Firm") said: I have the honour to propose the toast of "The Firm of Benn Brothers." I do it in many capacities: first of all as an old friend of the Benn family. Sir John Benn was one of my oldest and closest political and personal friends, and I venture to say that those who knew him, knew one of the most cheerful and courageous spirits who has ever appeared in the City of London. He was for many years in the House

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of Commons, and he endeared himself to everyone who knew him.

Then the time came in due course for the head of the firm to become Sir Ernest Benn, and such a combination of courage and uprightness as was characteristic of his father soon became known in the enterprise of which he was the author, the inspiring spirit and the driving force. It is a great pleasure, Mr. Chairman, to be here in response to your request and to be one of your guests to-night. I think Sir Ernest is well justified in saying that his is now the largest trade publishing establishment in the Continent of Europe. It is a proud boast, fully justified by its record.

We are living in very dark and gloomy days. The re-arrangement of the values of the world on a stable basis has not yet been completed, but stability is one of the first necessities of our time. The time will come, very soon I believe, when we shall settle down to the new state of things. New levels are being found with great rapidity, but the mentality of investors, both in stocks and shares and in commodities, has been rudely disturbed by both economic and psychological causes.

British Commerce and Honesty.

We can only say that what has happened in London during recent months is not characteristic of British industry or commerce or finance. We can thank God that the real basis upon which British commerce has been built up has been honesty. We all take it for granted that those from whom we buy and those to whom we sell are honest men. Unless we started off with that axiom commercial life would be impossible. It is because that has been so deeply ingrained in our habits and principles that some of the most distinguished financial houses were so easily taken in during the last twelve months. It is not altogether to their discredit. They know how to meet their misfortunes, but the one thing they cannot insure against is the dishonesty of their customers. Let us still go on taking that honesty for granted, and let us believe that one of the reasons why London still remains, in spite of the war and the ambitions of other capitals, the financial centre of the world, is because our bankers, our financiers, our merchants are honest men who only issue honest paper, men who have attracted to the City of London the clearing of all transactions in the world because of their honesty, and men who will maintain her proud position because a three months' bill in London and the certificates of corporations and companies alike bear the value that is put upon them. So long as we maintain that character we need not fear as to the future.

Of one thing we can be assured, that so long as the great houses of the commercial world follow the example of Benn Brothers and call in their younger generations while they are still young, the prosperity of this Empire will return and be maintained. Because of its distinguished past, and its contributions to industry and commerce, as well as to literature, and because the head of this great establishment has been wise enough to call to his aid those who are the younger children of one of the best pairs of mothers and fathers ever born in England, that we rejoice with them to-night and wish continued prosperity to the firm of Benn Brothers.

Sir Ernest Benn replied: I have, he said, to apologise for the absence of the Lord Privy Seal, Mr. J. H. Thomas, who is confined to his house with a cold, and to express very deep appreciation of the delightful speech Mr. Runciman has just given us.

You will believe that this is a very proud moment for me. The first gathering of the staff which I remember was in 1887, in my father's sitting room in Finsbury Square, when we numbered all told fourteen or fifteen persons. If you care to take a still longer view and think of the rather under-sized boy of eleven, in his mother's Sunday boots, tramping from Stepney to Mincing Lane to earn 5s. a week as a messenger, and survey all the road from then till to-night, with an ex-President of the Board of Trade, the representatives of four European States, and this distinguished gathering to do honour to the enterprise he founded, you have a story not only full of interest, but with a very definite bearing on most of the problems that face the country to-day.

Work of an Individualist.

This business was founded upon an idea backed by personal courage, an idea which was scoffed at by all the experts of the day, and discouraged, so far as I can discover, by most of my father's friends. It is essentially the work of an individualist. It had no doles to support it, no facilities, guarantees, subsidies or any of those modern devices now thought essential to success in industry. Sir John conceived the notion that mahogany and eighteenth century design might be made popular at the end of the Victorian period, and he pushed that notion, against odds and in face of imminent bankruptcy, to the success with which we are familiar. I mention that to remind you that this business is founded upon a consciousness of serious purpose, and we are proud to think that most, if not all, that

The Jubilee Dinner—Some of the 450 members of the staff and guests who were present.

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we have done from the start until to-day has something of the same quality behind it.

There are exactly thirty-four speeches, each of which would be appropriate to this evening's entertainment. I could talk at length upon the distinguished company which has honoured us by joining in our Jubilee Dinner. In the presence of cabinet ministers I should be glad to talk for half an hour about that other subsidiary, the Trade Promotion Trust, and endeavour to impress them with our belief in the great opportunities for the spreading of prosperity which lie in the development of consumer credit. I could keep you interested with a description of my wonderful tour of the Baltic States, but I must content myself with just acknowledging the delightful and generous hospitality that was so freely showered upon me last autumn. If any of you wish to know what it feels like to be a person of importance, take a trip to the other side of the Baltic Sea and let it be whispered that you are in some way connected with "The Timber Trade Journal." We are to-night especially grateful to the distinguished diplomats from Finland, Esthonia, Latvia and Lithuania, who have honoured us by attending.

I would like to make a speech to you about the policy of an all-working Board of Directors, to which we have just welcomed two very dear new colleagues.

The Five-Day Week.

My thirty-fourth speech would be about the five-day week which we established fourteen years ago, and, in our individualistic way, without any encouragement from anybody but ourselves, have maintained with great success ever since. If I attempted to deal with our profit-sharing or our saving schemes, or if I discussed the fact that nearly half the staff are shareholders, I should keep you here all night.

I should have liked the Lord Privy Seal to have been here to hear our views on employment, for we can claim to know something about employment in our own line of business. Our wages bill in 1880 started at £5 2s. a week, in 1926 it passed £50 000 a year, and in 1929 was £71 000. I am talking, of course, only of the publishing and administrative staffs which we directly employ. This growth is explained by a constant serious endeavour to get rid of work, to do without people, and to put one man into two jobs. We find that there is always a market for the product of work undertaken and executed in this spirit. But we have one or two little ideas of our own. In the whole of our history we have never sacked anybody on account of lack of trade. That does not seem to us to be an adequate reason for shirking our responsibilities as employers. But my difficulty has not been so much to find jobs to put men into as to find men to fill the jobs.

I take no credit for the truly remarkable spirit which permeates our concern. The basic ideas with which it is saturated came from the heart and the brain of Sir John, and such is their quality that they continue to live. We are "colleagues and friends in a great fellowship of work in which individual effort has been happily reconciled with central control" Perhaps the real secret is in the serious purpose of the business as a whole. No proposition which has nothing but profit in it makes any appeal to us. Our business is to print sense as distinguished from sensation, to inform rather than to inflame. Like most really good concerns, notwithstanding our phenomenal prosperity, no great personal fortunes have been made out of this business. Our aim is rather to found a solid institution. We work for profit, we have to balance our accounts, but we have never made from the nature of our work more profit than is necessary to give that balance and security which is essential to all. It is an open secret that in the recent industrial boom your proprietors might easily have become millionaires had they been actuated by no higher motive than mere personal gain.

What I have already said is sufficient explanation of the enthusiastic and delightful way in which the staff, as a whole, has adopted the John Benn Hostel. It is perfectly natural that an institution such as ours should not exactly feel the need, but rather take great joy in backing a great and good work founded as a memorial to our own late chief. We held recently what I believe to be the only bazaar that has been held in an office in the City of London, and a very successful function it was. You will, I know, be interested to hear that the Lord Mayor has been kind enough to place the Mansion House at my disposal on May 27th next for the third annual banquet of the John Benn Hostel, and you will also welcome the news that Viscount Astor will preside and the Lord Chief Justice will be the chief speaker.

Some people fail to realise that the creation and the establishment upon a sound and permanent basis of a great business is a two or three generation job. Our business, with all its success is not much more than a quarter developed even now. So that at our Jubilee Dinner, to borrow Mr. Duck's happy phrase, "we take our hats off to the past and our coats off to the future."

I am not always in agreement with Mr. Bernard Shaw, but I venture to use, by way of peroration, his words when I say "Life is no brief candle for me; it is a sort of splendid torch which I have got hold of for the moment, and I want to make it burn as brightly as possible before handing it on."

Mr. John A. Benn (proposing the toast of "The Staff") said: As a member of the staff it gives me the greatest pleasure to propose the toast of the staff. Every man born in the Benn family for half a century has taken part in the day-by-day work of the business.

In looking back over the names of the staff for fifty years past, there are many to whom special tribute might be paid. I will only say how glad we are to have with us to-night several whose connection with the firm dates back to the 'eighties, and others who have served as long with companies now amalgamated with Benn Brothers. We are particularly happy in being able to invite so many ladies to join our celebrations. From the outset Sir John Benn was guided in his career by my grandmother, who was with us at a staff gathering only two years ago. The keen interest she felt in the welfare of the firm is remembered by everyone. I think it is particularly happy that Lady Benn's portrait appears with that of our founder in to-night's menu card. The notion is still held in some quarters that women have unequal opportunities with men, but Benn Brothers have finally dispelled that notion. To-day we have fourteen editors and fourteen managers working under a single roof. That, Mr. Chairman, is an achievement of which every one of us can be justly proud. Here is a team of writers and business men in fourteen distinct trades, each with its own special problems and technicalities, which for expert knowledge it would be hard to beat. Our editors and managers deal on an average with 2 000 queries a week of a purely technical character, all of them vitally essential to the success of industry.

Mr. J. A. Knivett (responding to the toast) said: This is our jubilee celebration. It is the jubilee celebration of Benn Brothers and Sisters. It is, indeed, a great honour to me in having my name associated with this toast. Thirty years ago I joined the firm. The staff at that time consisted of about twelve members; to-day, as you have heard from our worthy chief, it numbers upwards of 350. It is gratifying to us, the members of the staff, to know that during the fifty years the firm has made such good progress.

Editorial Independence.

Mr. T. Mortimcre Sparks (Editor, TIMBER TRADES JOURNAL) also responded. He said: There is not an advertising manager, or even an editor, who is not intensely proud of his paper. Proud, too, are we, sir, very proud indeed, of the distinguished pilot under whose sure guidance there has been brought safely into the port of prosperity a group of papers as influential as, if not more influential, than any other group of trade papers in the world. If I and my colleagues on the editorial side deserve in any degree the kind things sometimes said of us, it must be largely due to the inspiration and fearless lead of one who is not only a prominent exponent of individualist thought and action, but who at all times encourages his editors to accept the responsibility attaching to the most absolute independence in the conduct of their journals.

The Right Hon. Wedgwood Benn, M.P., said: I should have preferred to address you as a close, discerning and grateful student of "The Confessions of a Capitalist," but I am really rising to ask permission to say a word on behalf of a body of which I am a proud member—the ex-members of the staff of the firm of Benn Brothers. It is 22 years ago since I ceased doing any active damage as a member of the staff of the firm. We lived then in quieter and more sedate times. We cannot claim any real part in this great enterprise as it exists to-day, but we can say we take a certain pride not only in its size and power, but in the reputation it holds.

Sir William Crawford proposed the health of the Chairman, and the toast was accompanied by musical honours.

The dinner was followed by a dance, a feature of the programme being a group of "dances of fifty years ago."

A telegram was received from Mr. W. E. Warrilow, the former publisher of THE ELECTRICIAN conveying best wishes for a happy reunion and even greater prosperity.

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SURFACE CONDENSERS.

Some Operating Troubles—Their Cause and Avoidance—Types of Packing—Material for Condenser Tubes—Causes of Corrosive Action—Cleaning Methods.

By F. JOHNSTONE TAYLOR.

OF recent years the condenser has come to be regarded as a very important part of the equipment of a modern steam plant. While the various types of jet condenser function exceedingly well and possess the advantages of simplicity, cheapness and general freedom from trouble, surface condensers figure on most large plants, especially those involving high pressure steam and high efficiency turbines, and are, of course, invariably used in marine installations.

It would certainly at first appear that the passing of water through a series of tubes on to which the steam falls to be then extracted in the form of water and non-condensible gases could hardly give rise to any serious troubles provided the whole apparatus was properly designed and constructed for the duty expected from it, but actually in practice even the best condensers are by no means immune from operating troubles, the greater number of which can be summarised in the word " tubes."

The efficient working of a surface condenser is indicated by the maintenance of full vacuum, though the actual degree called for depends upon the plant as a whole. A relatively low vacuum may not be a very serious matter with a reciprocating engine, but with a turbine even a slight falling off in the vacuum means a relatively heavy loss of power and a direct increase in the coal consumption, so that the maintenance of condenser efficiency is often a vital matter in the operation of a steam plant.

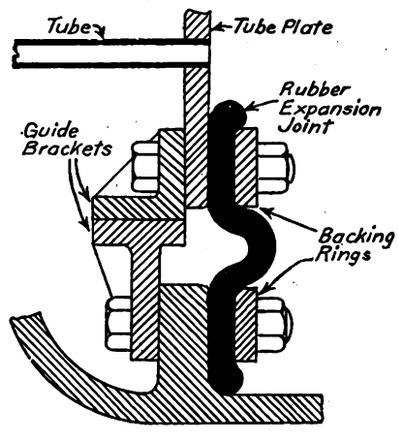

Fig. 1.—Rubber expansion joint.

It is hardly necessary to point out that deficiency of cooling water will soon upset the working of the best condenser, and the amount passing ought to be estimated periodically; this can be determined from the load and rise in temperature by the expression—

$$\text{g.p.m.} = \frac{1{\cdot}89P}{T}$$

g.p.m. denoting the number of gallons per minute of circulating water, P the pounds of steam per hour exhausted, and T the temperature rise of the circulating water in its passage through the condenser. If the amount of water is deficient it may be due to leakage in the pump stuffing boxes, while the condition of the piping and inlet tube sheet should also be looked to.

In the case of centrifugal circulating pumps, the water seal of the stuffing boxes may be the cuase of the trouble, and these should be supplied with water at not less than 15 lb. pressure.

Air, by blanketing the steam side of the tubes, greatly lowers the coefficient of heat transfer and decreases the vacuum. Excessive air leakage is indicated whenever a low vacuum, cold condensate and a normal rise in temperature of the cooling water are combined. Little air actually enters a condenser with the steam, the larger part leaking in through joints in the condenser and turbine casing at the l.p. end, and by way of small pipes.

In the case of large condensers a check should be kept on air in-leakage when a steam jet air pump is used, as the latter can easily be equipped with an air meter to measure the discharge, from which any undue increase will be readily apparent.

There are several points where air leakage may be suspected. The condenser shell joints quite often open through vibration loosening the bolts, and when there is overheating due to shortage of condensing water expansion and contraction has the same effect, and in addition the heat may soften the packing.

In the case of the turbine, the l.p. sealing rings require maintaining in good order, while at low loads the lower pressures in the lower stages are apt to set up temperature changes which are severe on the joints. Low pressure bleed connections may also be suspected, especially when the heater is vented back to the condenser, while all piping under vacuum should be regularly inspected.

A common defect in vacuum piping is the fitting of ring gaskets which extend to the bolt circle only, whereas full gaskets should be invariably used for vacuum piping to prevent their being sucked in if they become loose. The small air leaks which remain after inspecting the gaskets and tightening the bolts, may often be stopped by the use of a heavy asphaltum paint liberally applied along all joints. It is very desirable, too, to avoid small pipes wherever possible, such as those from the condenser to evaporator condensers or auxiliary condensers, for priming pumps or laboratory purposes. They are always a source of trouble by being extremely difficult to keep tight, and the leakage may easily be so great as more than to pay for the installation of separate steam jet air pumps or ejectors for these purposes.

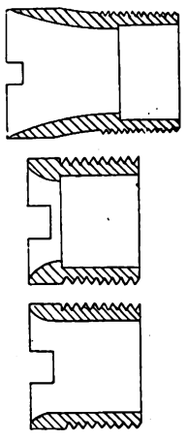

Fig. 2.—Types of ferrules.

Leakage of circulating water from the box to the steam space will do no harm provided that the water used is not deleterious to the boiler feed, but unfortunately this is frequently the case, and it is one of the conditions which dictate the use of a surface condenser in preference to a jet condenser. In practice it is a very difficult matter to make a condenser absolutely watertight, because conditions of expansion dictate the use of tube packings in at least one end. At least that is the usual construction, and something will be said about packings later on.

The expanded tube might be assumed to eliminate all packing troubles, though as yet its use has not become very general. To make use of tubes expanded into both tube plates, the one at the inlet has to be made smaller than the water box and fastened to it by a rubber expansion joint of the type indicated in Fig. 1, a simple yet effective arrangement designed by the American Wheeler Condenser Co. The weight of the tube plate and the tubes is carried by the two guide brackets, which being free to move horizontally one upon the other allow free movement of the tube plate with varying temperature. The guide brackets form a cradle support and are placed approximately 45 deg. on either side of the vertical centre line of the condenser. Bolts extend through the guide brackets and hold them to the tube sheet and water shell respectively on the steam side. The rubber expansion joint is of similar design to that used on large turbine exhaust connections. It is held by two backing rings bolted on the water side of the tube sheet and water box casting. The detection of water in-leakage may be effected by chemical analysis in the case of sea water or water containing chlorides in excess, using the well-known silver nitrate method, while those acquainted with electro-chemistry would have no difficulty in applying an electro-conductivity test to the same end. Alternatively, shutting down the steam side and measuring the water removed by the condensate pump will also reveal in-leakage.

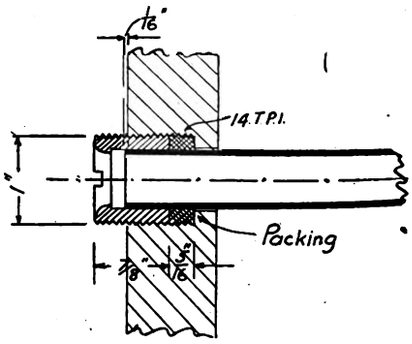

Fig. 3.—Standard B.E.S.A. ferrule.

Split tubes are often indicated by a visible increase in the quantity of water in the hot well. To determine the exact

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location of a leak, the condenser must be shut down, the water boxes opened and the steam space filled with water, when leaks can be easily seen and rectified. In this connection it is necessary to remind the operator that the added load on the condenser may necessitate its being blocked up if it is normally supported from the turbine casing and on springs. Alternatively if the water boxes are drained and the air pump put in motion, leaks in the tube head will be revealed by a candle flame being drawn in at the points where the leaks occur. Condensers out of action for any length of time should be filled with pure water.

Before dealing with tubes and their defects it would be well to say something in reference to tube packing. The main object of the packing between tube and tube plate is to keep the vacuum in and the water out, but the design of this small component may play quite an important part in the efficient working of the condenser from other directions. It is essential that it should provide for smooth unobstructed flow, ease of fitting, ease of removal, non corrodibility and, obviously, tightness under all conditions. To this should be added inability to damage the tube when tightened up or removed. There are several different types of packing in general use, that formed with corset lacing impregnated with paraffin being perhaps the most usual, though not necessarily the most efficient. Yet, carefully made with the correct amount of paraffin and intelligently applied, with care taken not to tighten the ferrules sufficiently to crush the tube, it is very satisfactory.

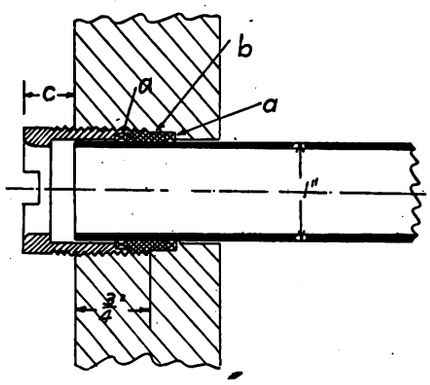

Fig. 4.—Two fibre washers and length of lacing.

In Fig. 2 are shown types of ferrule suitable for this packing, the top one being used when the tubes are expanded in one end, the middle one with a shoulder internally to prevent the creeping of tubes packed at both ends, while the lower one is recommended for condensers having a high water velocity. The standard B.E.S.A. ferrule is shown in Fig. 3. The packing usually takes the form of an asbestos ring compounded with graphite, which should be of a size easily slipped into the stuffing box with the fingers.

A method favoured by American engineers is that shown in Fig. 4, in which (*a*, *a*) are two fibre washers and (*b*) is a length of lacing. The ferrule is screwed into place and tightened to within $\frac{1}{16}$ in. of the tube plates as shown by dimension (*c*). The condenser is then heated up and the ferrule finally screwed to within $\frac{1}{16}$ in. of the tube plates, the holes being tapped to a uniform depth of $\frac{3}{4}$ in.

While both these systems are generally considered preferable to linen grummets, the latter are in fairly common use, and Fig. 5 shows the usual method of application. A hole is drilled and tapped in the tube plate (*a*) to accommodate the ferrule (*b*) through which the tube (*c*) passes, the black portion indicating the position of the linen grummet. The grummets ought, if possible, to be supplied ready made by the condenser people, but if they have to be made up, coarse linen soaked in beeswax and turpentine is recommended. The stitching, which should be done with a fine thread, should be on the inside of the grummet, and neither on the outside nor the edge, as this gives a tendency to distortion when the ferrule is applied. The threads should be thoroughly cleaned.

Fig. 6 shows a well-known form of metallic packing by the John Crane Co., which has recently come into favour. They are of special value where a condenser is equipped with an electrolytic system of combating the corrosion evil. The rings (*a*, *a*) are formed of spiral layers of very thin babbitt foil, while (*b*, *b*) are expansion rings. These rings are caulked by a special tool, and they do not depend upon the ferrule at all for tightness. In fact, screwed ferrules are not essential, and an alternative arrangement to the ferrule shown is one having a very large flange, which keeps the packing of the six surrounding tubes in position, and so eliminates some 85 per cent. of the screwed ferrules which would otherwise be required.

The selection of suitable material for condenser tubes has occupied the attention of the leading brass concerns for a number of years, both in Britain and America. It is doubtful if the ideal material for all conditions will ever be realised at a commercial price;* at the best one has to rely upon the best that can be produced by high class firms specialising in this particular commodity. Tubes are almost invariably formed of brass of some mixture or other, and those generally adopted in practice are the 70 : 29 : number "one" copper-zinc-tin mixture known as Admiralty metal and a 60 : 40 copper-zinc composition sold under the trade name of Muntz metal. The latter material is generally satisfactory with fresh water, and it is relatively cheap because it can be worked hot, which renders the manufacture of the tubes a comparatively easy matter. On the other hand, Admiralty metal with its admixture of tin is resistant to corrosion to a marked degree, and though fairly ductile when cold it cannot be worked hot, and is a costly metal. Muntz metal tubes are formed in the same way as copper tubes. That is to say, a cast billet is cropped and machined and a rough tube is made by the conical roller and mandrel system as applied in a somewhat similar manner to steel tubes. This rough tube is then cold drawn to size and annealed. In the case of Admiralty metal, the first process is that of casting a shell, a simple operation in itself, but in this particular instance calling for the utmost care in the making of the cores, as the shells must be absolutely free from any trace of gas bubbles. They are then bored and turned prior to the formation of the tube by a series of cold drawing and annealing processes. Tubes can also be made by the "cupping" process which is claimed to produce the very best tube, but its expense appears to be against its general adoption.

Final Annealing.

Apart, from the metal or the method of manufacture, the final annealing to which the tubes are subjected has an important bearing on their behaviour in service and the general practice is to finish them with a low temperature anneal. Condenser tubes are at the present time made to the standard engineering specifications which ensure, as far as possible, a straight tube of uniform thickness and bore, free from surface defects, hard enough to resist crushing at the ends or sagging between the tube plates, but not so hard as to risk season cracking.

Condenser tubes are liable to fail in four ways. Season cracking, for instance, results, as the previous paragraph would infer, from improper annealing whereby strains in the metal are not removed. It can be entirely avoided by proper manufacture, especially in the rigid control of the annealing temperatures at the different stages. Complete corrosion of the tube may occur as a gradual general thinning accompanied by slight de-zincification. It often occurs at the inlet ends of the tube if there is an opportunity for the accumulation of gases there due to the crushing of the tube under the packing. Generally, however, it results from a highly acid water, as, for instance, that from cooling towers, which is apt to become concentrated. One should not be too ready to blame the makers for this defect, though a properly mixed and tempered tube, not damaged in handling, would be slow to fail in this manner. De-zincification is often the result of vibration and or high water temperatures. The streaks of practically pure copper often seen in Muntz metal tubes which have (improperly) been used with salt water are frequently attributed to an original segregation of copper and zinc in spots. It is, however, purely a chemical condition; mechanical segregation is impossible as the copper and zinc are soluble in one another, forming a homogenous solution. Actually it would be impossible to manufacture a tube from a segregated billet, because it would be devoid of strength. Perhaps the most common trouble of all is pitting or local action. The deposit of foreign particles carried by the circulating water may cause a local cell action at the point of deposit, while pitting may

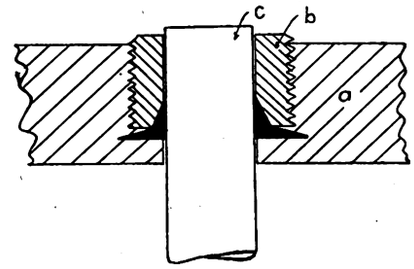

Fig. 5.—Use of linen grummets.

* The writer understands that Monel metal tubes c/20 gauge are new offered at 5/- per lb., which is about 50% over the cost of the best brass tubes, and they are coming into favour with the steamship companies.

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also be caused by excessive local heating such as would result from steam directly impinging on the tubes. In this case the action is assisted by a certain amount of erosion. Generally speaking pitting can be kept in check by maintaining a fair water velocity in the tubes to keep them clean, while direct impingement of the steam on the tubes is a matter for the designer.

At the present time those who have to operate large condensers working with turbines designed for a high vacuum are a good deal troubled with tube corrosion, so much so, in fact that several investigators have been at work during the past few years seeking the cause and possible remedies. From a study of the various instructive papers relating to the subject it is generally agreed that the appearance of the affected tubes is that of nibbled or water worn material, but under the microscope the actual metal is seen to be very smooth, rather than roughened as with ordinary metallic corrosion. The attack, moreover, is frequently distributed over a considerable length of tube, in place of being confined to an isolated area. The whole circumference and two or three feet of its length may be affected, or it may occur at the top, the bottom or sides of the tube quite indiscriminately. Again, a small amount of cuprous oxide may be present and some ferric hydrate from the water ends, yet there is little blue or green basic salt and no metallic copper. This corrosive action is most commonly found in the first pass towards the ends of the tubes at which the water enters, and generally within the first three or four feet. The first inch or two is not as a rule attacked, except in very severe cases. The remainder of the tube may be unaffected, although in the case of long tubes it has a tendency to break out again near the outlet end. It has been found that tubes not so attacked during the first few weeks of their life are usually immune from rapid corrosion.

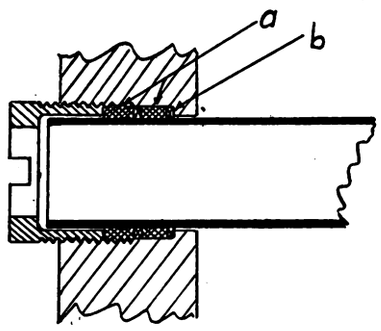

Fig. 6.—Crane metallic packing.

There is, however, an element of uncertainty as to the liability to attack in similar condensers working under similar conditions; the tubes in one may fail in a few weeks, and yet in the other case last for several years. A large number of tubes have been examined closely, and while a good many mechanical defects were apparent, neither the composition nor mixing of the alloy seem to be conducive or otherwise to corrosion. Neither have mechanical defects been proved to be in themselves a cause, though when corrosion has set in such defects naturally hasten distintegration. The proportions of the mix appear to have no appreciable effect except in the case of tubes with a high nickel content which are the more resistant.

The troubles, therefore, appear to lie elsewhere, and observations of water flow have revealed turbulent motion and entangled air. The subsequent impingement of the entangled air on the tubes is regarded a very potent factor in the cause of corrosion. Not so much in respect of its amount, though, as in its fine subdivision in the form of foam.

Then there are the observations conducted on a large scale by Sir Chas. Parsons and communicated in a paper read before the Institute of Naval Architects in April, 1927, and which relate specially to the matter of occluded gases from the water which cause corrosive action at the tube entrance. It has frequently been observed that tubes are eroded, corroded, pitted and eventually holed, but always, or nearly always, from the water side. The action is usually confined to tubes in certain regions of the tube plate, and if such tubes be replaced from the common batch they usually fail just as quickly, while in other positions in the tube plate the original tubes have remained immune so that there appear to be distinctive areas in which the conditions favour corrosion or erosion. Further, it appears that the action is greatest at the entry ends of the tubes, frequently extending only a few feet from the mouth. Facts which seem to suggest that the cause may be hydrodynamical rather than electrical or chemical, and that the areas of corrosion and erosion as previously suggested are associated with regions of turbulent motion in the water box.

The scale which is known to form on a condenser tube is of different composition under different conditions; that, for instance, forming on a brass tube contains not only the constituents formed from copper, but also some formed from the zinc—probably zinc hydroxide. If this scale is highly pervious it will afford little protection against corrosion, on the other hand if it is a more or less impervious it will serve to delay attack, if not to wholly prevent it. This matter of scale formation is highly important. Entangled air will set up water hammer which, while ineffective on clean metal, will destroy the scale, and sea water, which will foam, is very destructive in this direction. Temperature also has an effect upon corrosion, it being more rapid at low temperatures than at high ones, a fact which accounts for the more rapid corrosion in high vacuum condensers as already noted. An increase of temperature has the effect of assisting the deposition of metallic copper, this in turn favours the formation of a scale consisting of zinc hydroxide, basic carbonate and oxychloride. This latter constituent confers on the scale a property of partial permeability, and when in large amounts so strengthens and hardens the scale that, once formed, it is not easily destroyed. Yet it is somewhat permeable, and corrosive action may go on underneath it.

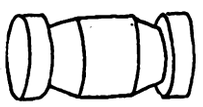
Fig. 7.—Rubber plug.

If, however, as undoubtedly it does do, scale forms a natural protective agent, there is an argument in favour of artificially "seasoning" the condenser by the slow circulation of sea water prior to its being put into operation, and the use of tubes which have been previously artificially "seasoned" in a similar manner. But perhaps the best method of dealing with the corrosion evil is that due to Mr. H. Austin, of the Cunard Line, who, as superintending engineer, has had a large experience with condensers operating under every conceivable condition except, perhaps, those using dirty water. It involves the simple and inexpensive procedure of coating the water side of the tubes with bituminous solution, though to do so rapidly and cheaply when one has to deal with, perhaps, several thousands of tubes, calls for suitable equipment. This, as used by Mr. Austin, is an ingenious adaptation of the compressed air paint spray which it is not necessary to describe in detail.* The system has, however, proved very effective in combating tube corrosion. The main points to ensure success are to have the tubes thoroughly dry before spraying is commenced by admitting steam into the condenser immediately prior to applying the coating and to apply two or three very thin coats rather than one thick one. After the spraying of each tube surplus solution is wiped from the bottom of the tube by means of a spiral form of hair brush passed through it.

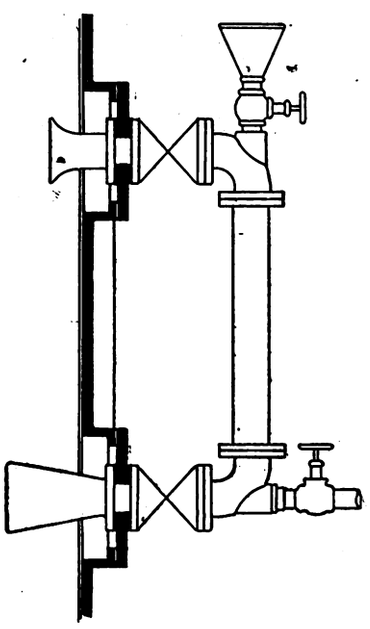
Fig. 8.—Apparatus for removing hard scale.

Corrosion, it will have been seen, is an evil which may well occur with the clearest of sea water, but dirty water, which power station engineers frequently have to put up with, introduces another trouble, that of fouling. The average river and canal water contains plenty of material to cause slime, even though the heavier matter is excluded by means of a modern rotary strainer. When troubles of this class occur it is a good idea to make investigations as to whether the trouble is due to colloidal or organic matter, rather than to pure mechanical deposit of silt. "Dirty" water has a peculiar property of creating, through the micro-organisms contained in it, a gelatinous slime in the tubes of condensers, a condition

* The apparatus is described and illustrated in "Marine Engineer" March, 1925.

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favoured by the heat being abstracted from the tubes. When this condition is in evidence the evil may often be combated by the use of chlorine. The injection of very minute quantities of chlorine into water is now quite an everyday feature of water purification, and the apparatus for doing so is adaptable to dosing condensing water. This has the effect of preventing the formation of the slimy deposits referred to, which considerably lessens the labour of cleaning and undoubtedly assists in maintaining full vacuum at all times.

Mechanical cleaning methods would have to be adapted to the nature of the filth encountered. Silt or loose sediment can be removed by a water jet, while divided condensers are cleaned by the obvious means of shutting down one-half and using the high velocity of the full volume of circulating water through the other. Then the condenser can be drained of water and steam heated, which, by drying the deposits, often facilitates their removal, as under this treatment they usually crack and tend to flake off the tubes. Then a certain amount of cleaning can be done by suitable tube brushes, but it is rather a slow process, and rubber plugs of the type shown in Fig. 7 are often resorted to; these are shot through the tubes by air pressure, but in this connection it should be noted that some classes of tough deposit such as iron hydroxide are apt to pack under the influence of the plug and form a thin, though very tough, coating of heat resisting scale, rendering matters worse than before. There are, however, various forms of mechanical scraper which can be air-shot through the tubes. But whatever form of mechanical cleaner is used it must always be borne in mind that condenser tubes, unlike boiler tubes, are relatively soft and can easily be damaged by rough treatment or excessive abrasion.

Removal of Hard Scale.

For hard scale, resort has to be made to chemical methods, but extreme care is necessary in their use. Hard calcareous scale is amenable to treatment on these lines by a weak solution of hydrochloric or muriatic acid circulated through the tubes, afterwards thoroughly flushing out the condenser to remove all trace of this corrosive liquid. The apparatus generally fitted to condensers for this purpose is shown in Fig. 8.

In operation the condenser is filled up with clean water, the two valves leading to and from the condenser are opened, and steam is turned on to the ejector at the bottom. By this means water is sucked through the upper bell-mouthed opening and discharged through the lower perforated cone. When circulation is thus established the cleaning agent is poured into the upper funnel and the cock opened through which it is entrained and diffused into the cleaning water. The process may take several hours according to the quality and amount of the scale.

Bearing in mind the corrosive action of acids and especially the commonly used muriatic acid, some protective measure against its effects is desirable. This takes the form of adding certain colloids to the cleansing solution. These are obtainable from chemical manufacturers, and in addition to forming a safeguard against corrosion, permit of the rapid carrying out of the cleaning process. The trouble with chemicals used without a protective agent is electro chemical action between the tubes, the steel end plates and the iron body. The iron forms a negative pole, so that the brass is first protected through the iron, assuming good metallic contact between the tubes and the end plates.

After a time a reverse current occurs when sufficient iron has been deposited on the surface of the condenser and the graphite contained in the iron has been left on the surface of the metal. This carbon then composes with the brass tubes, the brass then acting as the dissolving electrode; thus a very considerable corrosion of the brass is introduced. The addition of colloidal organic substances causes the formation of capillary active protective lining through which the acid is kept away from the iron. If this is done the solution may be warmed, and this makes its action much more rapid.

It is hoped from the foregoing that the reader will have realised that a surface condenser, while a more or less uninteresting piece of apparatus, requires to be treated with respect. A good condenser designed and constructed for a given duty will, when installed by a first-class firm, perform that duty, but after a time there is more or less bound to be a falling off in its performance as indicated by a reduction in the vacuum or considerably enhanced duty of the air and circulating pumps to maintain it. To do so is a matter of prime importance, especially with turbines, because every fraction of an inch of vacuum lost means either so much loss of power for the same steam consumption or an enhanced steam rate per H.P., reflecting eventually on the fuel bill. Condenser troubles are now pretty well defined and understood by designers and builders: these notes are intended to be of assistance to those who operate steam plants, and are responsible for the proper functioning of such condensers as may come under their charge.

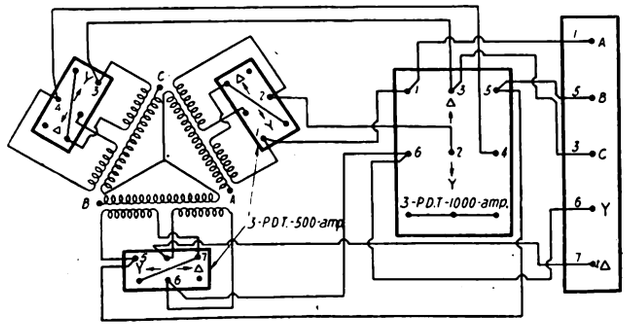
REPAIRS AND CHANGEOVERS.

Utility of Portable Transformer Bank.

By J. DUDLEY PEASE.

FREQUENTLY during repair work or system changeovers from delta to Y secondaries, it is necessary to provide continuous and adequate service. Often the installation of a temporary transformer bank has proved expensive as it is in use only for a few days or hours.

One company has found a portable transformer bank mounted on a trailer of considerable value. It has facilitated such changes with a minimum of cost and interruption to



Connections of portable transformer bank.

service. The trailer is equipped with three 100 kVA single-phase transformers connected as shown in the accompanying illustration and forms a very flexible set.

Primary cables enter the trailer through the roof, pass through 100 ampere primary cut-outs and thence to the transformers. A pothead is installed in the primary neutral, so that the neutral may be opened for the closed delta connection, and closed for the Y connection. Simply by throwing three two-pole and one three-pole double-throw switches either a delta or a Y connection can be made.

Conductors of 800 000 circ-mil cable connect transformers to switches and switches to terminal board where the secondary supply cables which enter the trailer through the floor may be shifted quickly either to the delta or Y connection. A colour scheme is used to mark the delta and Y connections in order to prevent the operator from making a false connection.

STEAM TURBINES FOR ELECTRICAL PLANT.

THE British Engineering Standards Association has recently issued Specifications Nos. 132–1930 and 215–1930, both of these being revisions of earlier specifications. No. 132–1930, a revision of the 1920 edition of this specification, deals with steam turbines and has been in preparation for several years, the work having been carried out in parallel with the international specification for steam turbines by the International Electrotechnical Commission. It is interesting to note that so close has been the co-operation between the British and the International Committees that the new edition of B.S.S. 132 is, to all intents and purposes, identical with the International Specification as tentatively agreed by the I.E.C. Advisory Committee at the meeting in London in July last. It is also of interest to note that, whereas the 1920 edition of the Specification was confined to steam turbines for electrical plant, the new Specification is not restricted to turbines for use in connection with such plant. Considerable attention has been paid by the Committee responsible for this Specification to the list of recommended standard ratings, an endeavour having been made to restrict the standard sizes to the fewest possible number. In this matter the Committee has had the advantage of the close co-operation of the Electricity Commissioners in so far as home requirements are concerned, the result being that the list of standard ratings, although given only as a recommendation, represents a thoroughly practical series of sizes for home and export purposes.

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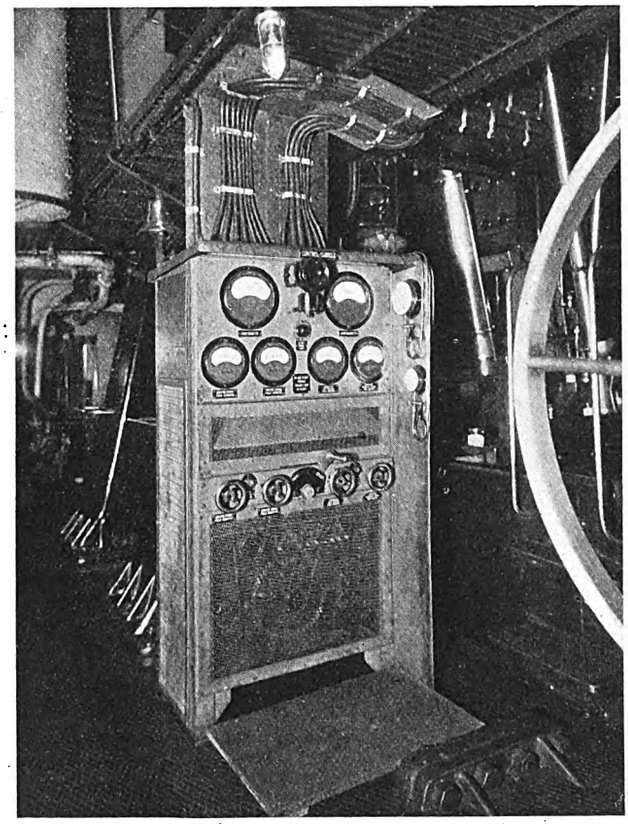
MARINE ELECTRICITY.

Advances in Turbo-Electric Propulsion—Where Diesel-Electricity is Supreme—Return of the "City of Hong Kong."

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types," etc.)

IT is instructively indicative of the all-round progress which marine electricity is making that whereas a year ago an article under this heading published in THE ELECTRICIAN of February 1st, contained very little other than theoretical suggestions as to the application of electric propulsion in this country, and news of actual construction of important electric ships only in America—to-day one can record nearly a year's operation of the first big British turbo-electric liner, the definite placing of contracts for two further larger ships for the same company and the re-electrification of an important small fast fruit carrying ship.

This represents to the electrical industries many thousands of pounds of potential and actual work. It represents to the shipowner further food for thought and yet another problem to solve when he is considering the ordering of new tonnage, and just how much the electric ship is beginning to mean to shipowners who have hitherto shown very little practical interest in its advancement, may be seen by the persistent rumour that the Furness Withy Co. are to build a turbo-electric



The control cubicle of the "City of Hong Kong."

vessel for their fast service between New York and Bermuda. It is just over two years ago since they took delivery of the 19 070 tons gross "Bermuda" for this service, a vessel of 11 250 brake horse power with accommodation for 616 first class and 75 second class passengers. This ship has given nothing but satisfaction since the day of her completion, and the measure of her success may be judged by the fact that although she was designed obviously from the point of view of being able to be used for world cruising, she has never yet been taken off her New York–Bermuda route.

It would appear then that the owners must be entirely satisfied with their choice of Diesel engines for this ship, but that they have been unable to remain impervious to the march of progress, if such this be, and to refuse to consider the possibilities of the electric ship. I have always felt that the turbo-electric ship would one day constitute a serious rival to the Diesel-propelled ship, just as it will prove the most potent weapon by which steam will come into its own again.

The "Bermuda" operates regularly from New York, which in effect is her home port, although she is a British ship, and in New York those responsible for her operation must have had ample opportunity for observing the operation of the increasing number of electric ships which regularly use this port. Possibly, again if the rumour is correct, this may in some way have influenced their choice.

These new American electric ships about which so much is written, and concerning which exactly a year ago there was published in these columns a very interesting table of costs, have, in effect, established a marine electrical technique of their own and it is interesting in them to see that very few of the original ideas of layout for electrical machinery at sea have been followed. The tendency has been not to separate propelling motors from the generating plant with the consequent apparent gain in space and the elimination of a long length of shafting, but rather to concentrate on propelling motors, compact turbo generators and equally compact high pressure, high superheat water tube boilers in a small space, which in some ways approximates to that occupied by the very best airless injection supercharged Diesel machinery.

As an example of what we mean by this we have only to consider the case of "La Marea" which is now undergoing complete re-electrification in Belfast. This ship completed originally in 1924 had Diesel electric propulsion. For various reasons this has been now removed and the latest type of turbo-electric propulsion substituted, and although the substitution has cost the shipowners something like 30 ft. in length, for the ship has had to be lengthened that amount (and, of course, the necessary power to propel this extra 30 ft.), the result may be looked upon as one of the latest and most up-to-date interpretations of small ship electric propulsion that we yet have, and it certainly is worth the attention of every shipowner to see what has been done.

Nine Years' Progress.

In particular, it is worth contrasting "La Marea" with one of the earliest turbo-electric ships completed in this country, fitted out, incidentally, by the British Thomson-Houston Co., as is also "La Marea." The older vessel is the "San Benito" completed in 1921. Her main turbo-alternator, with the turbine running at 3 000 r.p.m., delivers current at 1 100 V. It takes steam from three Scotch boilers at 190 lb. per sq. in. pressure and 200 deg. F. superheat. "La Marea," under her new arrangement is to have a boiler layout giving steam at 400 lb. per sq. in. pressure and 710 deg. F. superheat. The boiler is a special Babcock and Wilcox unit and is fitted with an air preheater. Examination of the general arrangement plan of the "San Benito" is indicative in other ways of the advances that have been made in turbo-electric propulsion. In considering this somewhat older arrangement, however, we should remember that whereas in the earlier days electric propulsion was fitted more or less experimentally, and very often half apologetically, to-day it is fitted with a definite purpose in view, although even now we must remember that this definite purpose certainly does not show up in the fuel bill, but rather must be assessed to such matters as flexibility, long life of machinery and manoeuvrability, as well as ability to cruise at low speeds with great economy.

Alternatively, in the case of a ship like "La Marea," which is a fruit carrying vessel with high auxiliary load, to be able to obtain cheap electricity for driving and refrigerating machinery, fans and other equipment, and yet to show, perhaps, how vague was the conception of marine electricity in the days when the "San Benito" was completed, it is amazing to realise that the cargo refrigerating engine is steam driven, that the three auxiliary generator sets are driven by relatively slow-running vertical reciprocating engines, that the main circulating pump has for standby purposes a steam engine to drive it as well as the electric motor. The three Scotch boilers are arranged in a separate boiler room, two alongside each other and one forward of the pair. They are surrounded by fuel oil tanks and it seems safe to suggest that the space they take up is probably double that which will be required for the boiler installation on the reconstructed "La Marea."

Thoughts engendered by small electric ships such as these suggest that a dogmatisation on the respective spheres of Diesel-electric or turbo-electric propulsion is in some ways

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more difficult than it has ever been, and although one still contends that the electric ship will never have universal application, will never even have the catholicity of application that the motorship has to-day, it must inevitably find much use for passenger liners, for vessels with refrigerated machinery and for high auxiliary loads, and for a diversity of harbour craft.

It is in these latter that Diesel-electricity will possibly find its biggest appeal, although every new ship, steam or motor, that is completed goes to show that for auxiliary purposes Diesel-electricity is unquestionably, merely on grounds of economy, supreme. In which connection it is interesting to note that the P. and O. Company is reported to have decided on horizontal Diesel engines for auxiliary purposes on its new big turbo-electric liners. It has often been urged in these pages that, foreign though it may be to marine ideas, the horizontal prime mover of " Diesel-electric " type has a great deal to recommend it in connection with generator sets for auxiliary purposes or even on certain ships for propulsive purposes. At least one shipping company has now decided to go in for this type.

Whilst discussing Diesel engines for auxiliary purposes, a rather interesting case comes to mind which I believe is the first, if not the only case of its kind in which at sea on a direct driven Diesel engined yacht the generator sets can be cut out entirely, because on the two main Diesel engines the fly wheels are dispensed with, and a.c. type generators substituted. The generators which replace the fly wheels are separately excited three-phase 70-cycle units supplying current at 220 V. They have each a 10 kW output and run at the same revolutions, thereby eliminating all vibration. As has been mentioned these generators supply all the current needed to be used at sea, and the electric equipment of this yacht, which is only 160 ft. in length and has a total shaft horsepower of 1 000, is exceptionally complete, containing such comparative luxuries, viewed from a merchant ship angle, as automatic steering arrangements in association with gyro compasses and a gyro stabiliser. In effect, this arrangement from a layout point of view seems to be a variation of the idea of having belt-driven generators, and it would seem quite a good idea if it were possible to operate storage batteries in conjunction with the arrangement.

It has an interesting variation also of another important machinery arrangement, which is an electric motor on the main shaft, namely electric " supercharge," and in this connection it is now necessary to put on record that the " City of Hong Kong," the first ship to be fitted with electric supercharge (the Metro-Vickers unit) has successfully completed her maiden voyage to Indian ports and returned to Manchester.

It is stated that the auxiliary turbo-electric drive was in continuous operation throughout the voyage and gave complete satisfaction. On the return journey very heavy weather was encountered in the Bay of Biscay but, owing to the electric super-charge, it was possible to maintain a higher speed than had been possible on any previous occasion under similar conditions, mainly due to the steadying effect of the electrical equipment which eliminated propellor racing.

This is an important point which shipowners unquestionably are carefully noting. The even turning moment of the electric motor, superimposed on the varying torque of the reciprocating engine, besides decreasing the engine vibration was found to have reduced the wear on the main bearings and also the wear in the cylinder so that the usual overhaul at the end of the trip was found unnecessary. This auxiliary turbo-electric drive or electric supercharge is one of the most important recent developments in marine electricity.

Further details of the " City of Hong Kong " are illustrated in this article. The net saving with this ship, it is claimed, as a result of fitting electric supercharge, has been about 27 per cent. as compared with previous voyages. It is not stated, however, how this figure is arrived at, but it may be taken that the ship has been eminently satisfactory.

"CITY OF HONG KONG."

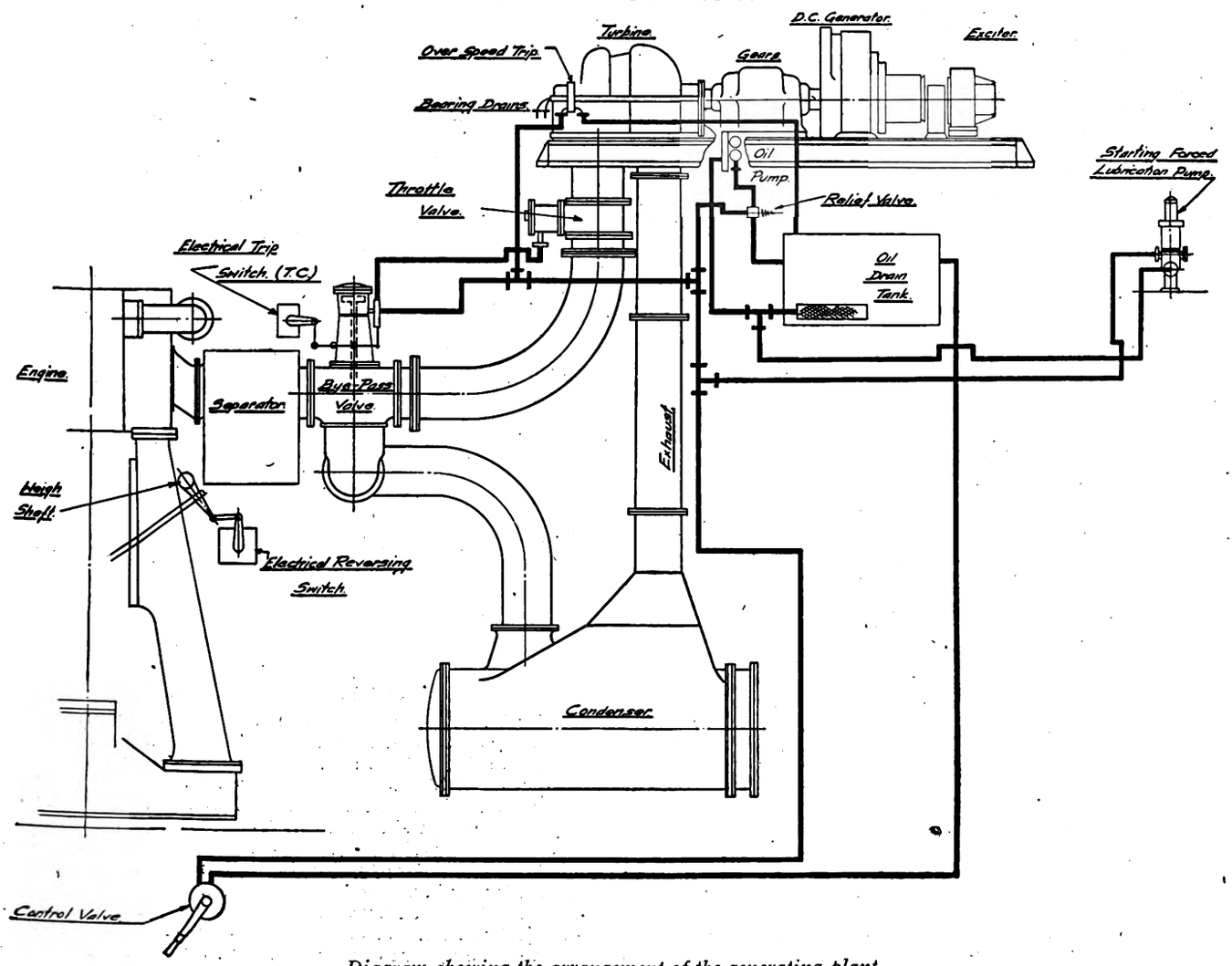

Diagram showing the arrangement of the generating plant.

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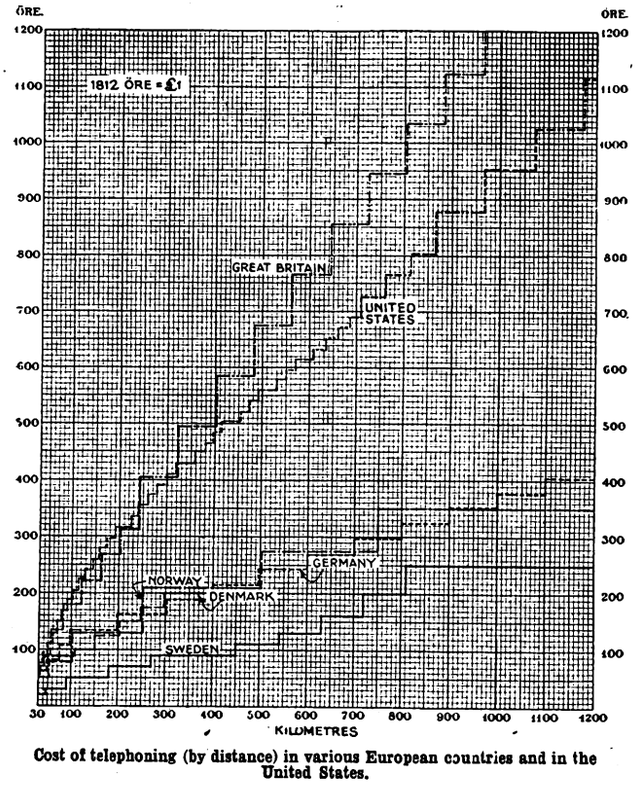
TELEPHONE COSTS.

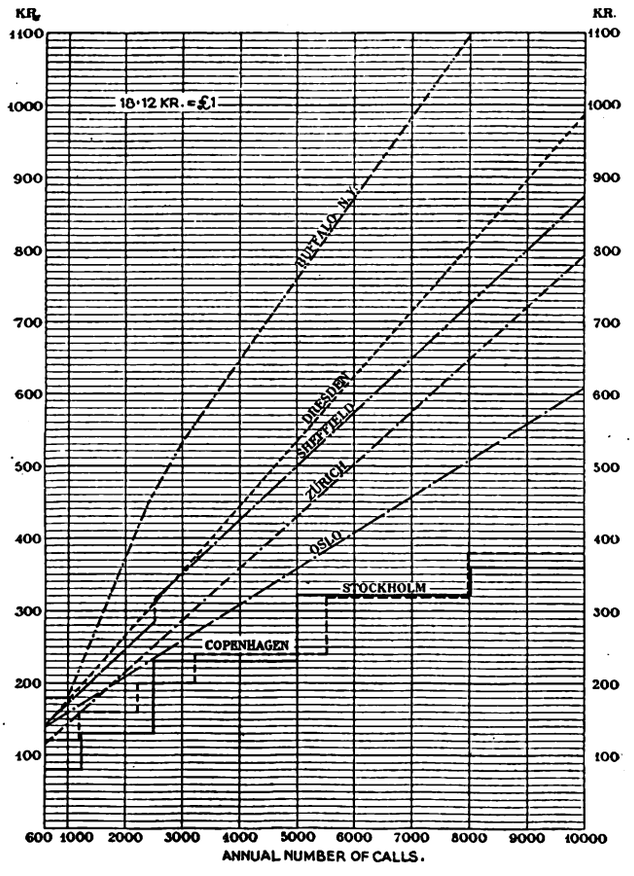
Great Britain's Unenviable Position.

WE are indebted to Dr. Alfred Ekstrom for the interesting diagrams reproduced below. These show the cost of telephoning for various distances in certain European countries



Cost of telephoning (by distance) in various European countries and in the United States.

and in the United States and the annual cost of a telephone according to the number of calls in a number of cities. These diagrams have been distributed by the Swedish General Post Office to all their telephone subscribers.



Cost of a telephone according to annual number of calls in certain cities.

ENGLISH ELECTRIC PROSPECTS.

What the Reorganisation Means.

FINANCIAL details of the important reorganisation scheme which is now before the shareholders of the English Electric Company, Ltd., are summarised on page 185 of this issue. There are, however, certain aspects of the proposals which deserve to be emphasised. In the first place, the reorganisation plan involves no alteration in the all-British character of the undertaking. Secondly, it will provide £750 000 of fresh capital, which will be available for the re-equipment of works with the most modern plant and tools, in addition to effecting a reduction of £110 000 per annum in fixed charges. It is well known that the depreciation allowance permitted under the present income tax law is quite inadequate in view of the rapidity with which machine tools and other plant become obsolete, and in these circumstances it is impossible to provide adequately for replacements before earnings become liable to income tax. The effect is to add a minimum of 20% to the cost of all replacements outside the amount which can be legally set aside for depreciation. The new capital which the English Electric Company will obtain if the plan is approved by shareholders will enable it to overtake arrears in this respect, and thereby improve the efficiency of its works. With the additional help of the large reduction in fixed charges a return to the payment of reasonable regular dividends should be brought within sight.

The English Electric Company is just over ten years old. It was formed at the end of the war as a combination of the Dick Kerr Works, the United Electric Car Works of Preston, the Coventry Ordnance Works, the Phœnix Works, Bradford, and the Siemens Works, Stafford. The company also controls Willans and Robinson, and is interested in the Siemens and English Electric Lamp Company and the English Electric Company of Canada. The company's works at Rugby, Preston, Stafford and Bradford are engaged in the manufacture of a great range of electrical machinery and apparatus, and the comprehensive Contract Department at Rugby has handled and is dealing with many schemes of large size in this country and abroad. Of the latter the installations at Athens, Budapest and the Tata Company's undertakings in the Western Ghats may be mentioned. In the hydro-electric field the English Electric occupies a unique position amongst British companies.

During its career the company has carried out a large number of large electric traction contracts in South Africa, India, New Zealand and South America as well as the Post Office tube in London, which presented intricate problems requiring special treatment. The equipment of Brookman's Park represents another branch of the company's activities in which the development of h.t. d.c. generators up to 20 000 V for radio work is a feature. Electric welding plant forms a flourishing department. Much attention has been given to power factor correction in a.c. work, and switchgear has become one of the largest individual departments. Every size and type of transformer is now made. Export trade is said to show a definite improvement since a year ago. Although the Australian outlook is somewhat clouded, so far little effect has been felt in this field, and good orders for motors of mill type are being supplied. The demand for motors in New Zealand is good, and India has proved a valuable outlet, particularly for Fullagar and Diesel oil engine plant. An improvement in the South American and Canadian markets, which have not hitherto been as productive of orders for British electrical plant as they should be, is regarded as a likely development of the immediate future.

PATENT LAW REFORM.

Major H. Fletcher Moulton in a recent lecture on "Some Desirable Changes in Patent Law" before the Institute of Patentees said that we should approximate our law to that of the United States by permitting a patentee to obtain a patent even if he had disclosed the invention, provided that he applied within six months. The Patent Office search of this country should be extended to include foreign specifications and standard text-books, but if the patent showed something which was new in view of those searches, the patentee should be allowed to obtain a patent as at present at his own risk as to subject matter. It might be advisable in some cases, to permit of the system of regrant where, by error, the true invention had not been claimed.

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THE R.B.C.B. STANDARD TOTALISATOR.

An All-Electric Machine for the Racecourse Betting Control Board—The Apparatus at Thirsk Described.

AS is already known, betting by totalisator involves the return of the whole of the stake money to the successful backers—less a small percentage by way of tax or commission to cover expenses. In its earliest form the system was worked by hand, and the results made known to the public by means of a manually operated indicator. Later, mechanical means were devised, both for registering the bets, totalling them, and displaying the results on an associated indicator, the mechanism being driven by electric motors. The adoption of totalisator betting on British racecourses in July, 1929, soon made apparent the inadequacy of the older, manual method of calculation, involving, as it did, large staffs, and the possibility of error; whilst existing mechanical totalisators were considered too unwieldy and inflexible. To meet the demand for an all-electric totalisator, the British Thomson-Houston Co., Ltd., and Automatic Telephone Manufacturing Co., Ltd., reviewed the possibility of adapting Strowger automatic telephone exchange mechanisms and circuits to a solution of the problem. As an outcome a totalisator, free from inertia, and meeting all the requirements of the Racecourse Betting Control Board, has been designed, and a six-horse demonstration equipment was viewed by a representative of THE ELECTRICIAN on January 28th at Thirsk racecourse, when its possibilities were exhibited and its principles explained.

Components of the Installation.

The R.B.C.B. Standard Totalisator incorporates two well-known components of Strowger automatic telephone equipment, the horizontal automatic relay and the heavy duty rotary line switch. A complete totalisator installation of this type comprises ticket issuing machines; various Strowger switch and relay groups, mounted as detachable units, on single-sided racks, an indicator, and a central control board. The ticket issuing machines installed at Thirsk were made by the Bell Punch and Printing Co., Ltd., and depression of the various keys in response to the requests of backers closes electrical contacts and sets up series of impulses which actuate the Strowger mechanism, only ten wires, apart from battery leads being required between an 80-horse ticket issuing machine and the Strowger switch and relay groups of the main equipment.

The number of ticket issuing machines in use and their location is determined by the nature and magnitude of the race meeting. Suffice it that any desired number can be accommodated, and that there are different machines for the five denominations or values of individual stakes—viz., 2s. (the unit), 10s., £1, £10 and £100.

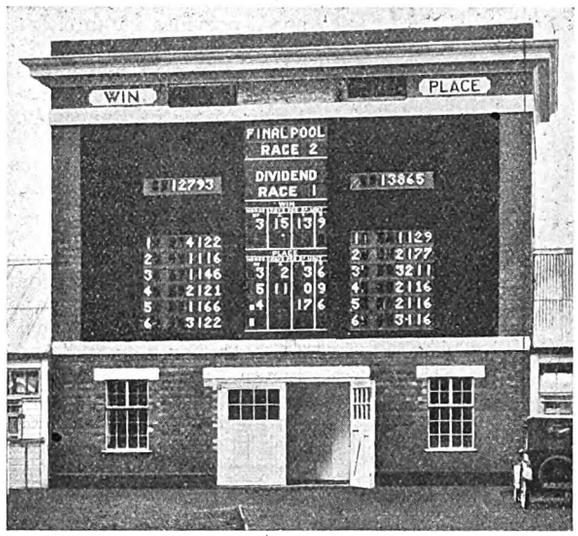

Fig. 1.—The standard R.B.C.B. totalisator at Thirsk, showing the front of the demonstration indicator.

From the ticket issuing machines the circuits (ten wires per machine) pass to the main equipment, which comprises the following Strowger switch and relay groups. The "place" change-over relay group consists of a number of relays, the function of which is to discriminate between "win" and "place" bets before these reach their respective adding machines for registration. The decoding relay group receives the signals over the ten wires from the ticket issuing machine, transforms them into their corresponding betting equivalents, and, if all is in order, passes them on for registration by the adding machines. This group responds to operation of the horse number and "win" or "place" keys on the ticket issuing machine, making the corresponding selection. On

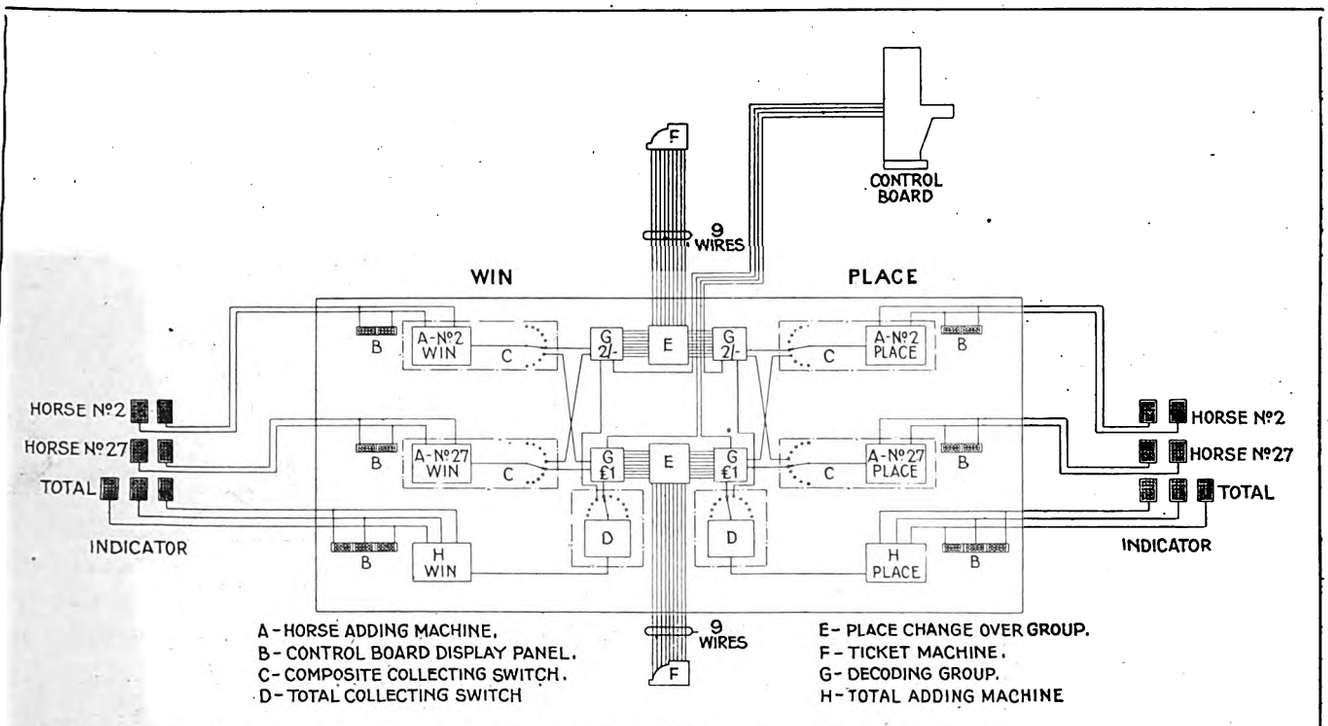

Fig. 2.—Illustrating the theoretical arrangement of the all-electric totalisator which has been adopted as standard by the Racecourse Betting Control Board.

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depression of the stake key the group releases the bet for registration on the adding machines.

Interposed between the decoding relay group and each adding machine are the collecting switches. These comprise Strowger heavy duty rotary line switches, and their function is to successively collect the bet signals from the various ticket issuing machines. Whilst betting is in progress these switches are in continuous rotation at a speed of about 50 r.p.m., the brushes traversing 2 400 contacts per minute. This high speed provides an ample margin for coping with the busiest pre-race period when hundreds of ticket issuing machines may be in use simultaneously. In these circumstances the total adding machines would also be in continuous operation, the totals changing as rapidly as forty to fifty times per second.

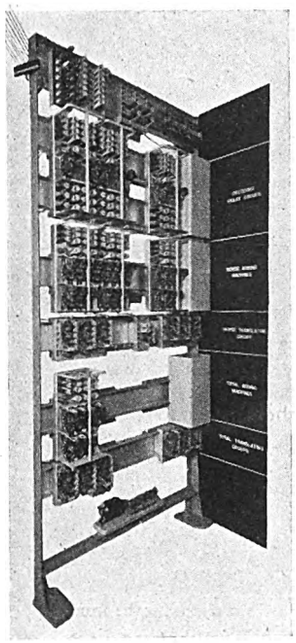

Fig. 3.—Illustrating the "Strowger" electro-mechanism and method of mounting, the covers being removed from all except three of the detachable units.

Strowger heavy duty rotary line switches in association with relays comprise the adding machines, of which there is one for each horse "win" and each horse "place," together with two total adding machines, "win" and "place" respectively. The adding machines are interchangeable, and their name implies their function — viz., that of aggregating the bets received from the collecting switches and transmitting the resultant totals to the indicator for visual display. The maximum capacity of each adding machine is 2 400 bets per minute, of each denomination, or a total of 12 000 bets per minute. In the unlikely event of this capacity being exceeded, the machine automatically controls ticket issuing, which is held up until the adding machine has overtaken its arrears and is again in a condition to register bets.

The whole of the Strowger switch and relay groups above described, constitute the main equipment of the R.B.C.B. standard totalisator and are mounted on single-sided racks, at a convenient central point, as shown in Fig. 3. The individual groups are all arranged to "jack-in" on horizontal pressed steel shelves of channel section, the arrangement being such that any group can be immediately detached or replaced without disturbing the permanent wiring or interfering with the general progress of betting. This method of mounting and wiring the equipment coincides with that recently developed for the Post Office by the Automatic Telephone Manufacturing Co., Ltd. Each group has an individual dust-proof metal cover, whilst slip-on covers also protect the wiring, tags, etc. The flexibility assured by the universal "jack-in" principle is another important advantage, and, in the case of the R.B.C.B. standard totalisator, enables all equipment to be removed and stored except when required for a race meeting, leaving only the racks and permanent wiring in situ. Furthermore, the arrangement makes for extreme mobility and facilitates common use of the Strowger equipment at various racecourses where the dates of the fixtures do not coincide. The "jack-in" principle applies similarly to the ticket issuing machines, as well as to the component sections of the indicator.

The Indicator Board.

The indicator of the R.B.C.B. standard totalisator is on the lamp monogram principle, each unit or numeral comprising a bank of 24 lamps, the lighting of selected groups of which form luminous figures in accordance with the signals transmitted by the adding machines. The front of the demonstration indicator at Thirsk illustrating the effect when totals are displayed is shown in Fig. 1. It will be seen that there are six banks of lamps or monograms in line with the number of each horse and seven for the respective totals, "win" and "place." Every lamp is light-insulated from its neighbour, housed in a blackened background and surmounted by a blackened grille, the result of this arrangement being that the illuminated figures are clearly visible in direct sunlight from a distance of over 150 yards to the public on the course, and from any angle up to 30 deg. Associated with each figure is the mechanism for controlling the grouping of the lamps for lighting in accordance with the received signals, both the mechanism group and the bank of lamps being on the "jack-in" principle and interchangeable. Individual monograms and their associated control units can be removed during the progress of betting without affecting the totals, which will indicate correctly and in accordance with the amended figures immediately the indicator units are replaced in circuit.

If necessary the R.B.C.B. indicator can be arranged as at Thirsk to display simultaneously on both sides, and any number of subsidiary indicators can be worked in parallel with the main indicator without additional equipment, or regard to their location.

Main Control.

The central control board, Fig. 4, is the key to the entire installation and enables the fullest possible control over the betting, including all ticket issuing machines and the horses running in each race to be exercised by one individual if necessary. It is equipped with a number of keys, and corresponding signal lamps, one key representing each horse and each total adding machine, "win" and "place" respectively. Betting is started by manipulation of the corresponding keys at the control board. Thus, if both "win" and "place" betting are permitted, the total "win" and total "place" keys are operated followed by the various horse "win" and "place" keys representing the actual runners. If there is no "place" betting these keys are left normal, and it is impossible for the ticket issuing machines to accept "place" bets. Restoration of the horse and total keys to normal immediately stops all betting inasmuch as the issue of tickets is controlled from the adding machines, and a horse adding machine cannot continue in service unless the corresponding total adding machine is also working. The signal lamp associated with each key glows as long as the key is in the operated position and enables the controller to see at a glance what portion of the equipment is working and registering bets. Furthermore a miniature replica of the main indicator, seen to the left of the control board, reproduces the horse and total figures simultaneously with their display on the main indicator, thereby keeping the controller informed of the state of the betting at any moment. By means of a master key the end of the betting period which coincides with the start of the race may be controlled by the starter or other official from the starting post, remote from the control board. Manipulation of this key stops the issue of tickets at all machines on the course, and simultaneously the signal lamps at the control board are extinguished. The general arrangement of the circuits is indicated in Fig. 2.

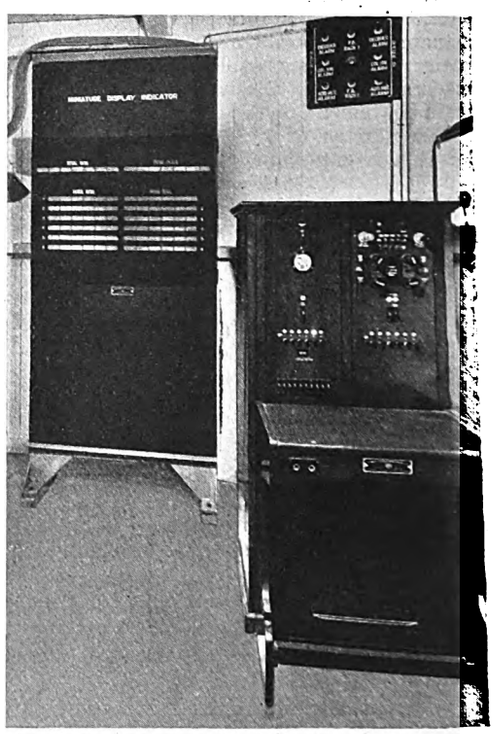

Fig. 4.—The central control board and miniature indicator as installed at Thirsk.

The equipment claims to represent a marked economy over other systems in cabling between machines and the central equipment as well as reducing the possibility of breakdown due to cable faults. Furthermore, due to simplicity of the circuits and the absence of any need for electrical synchronisation of switches, the utmost accuracy is claimed.

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HIGH POWER MERCURY ARC RECTIFIERS.

Great Technical Progress Achieved.

MR. J. C. Read, M.Sc., A.M.I.E.E., of the British Thomson-Houston Co., read a paper before the Rugby Engineering Society on Wednesday on "High Power Mercury Arc Rectifiers." He said that the striking technical progress of the last few years had changed the high power rectifier from a rather unsatisfactory device to one which would without doubt find a useful place in high voltage d.c. railway electrification work. Arc backs had become sufficiently rare for satisfactory commercial service to be regularly obtained. There had also been a most striking development in the rating that could be obtained from a given size of rectifier and the limits of current and voltage obtainable in a single unit were now well above anything at present likely to be required.

For ordinary power and lighting service at 500 V and below the rectifier was only commercially justifiable in very rare cases and not at all at lower voltages. Possibilities in the direction of developing rectifiers of lower arc drop of the hot cathode type might ultimately extend the field to lower voltages. For traction at 600 V the rectifier had higher cost, larger floor space and 1½% to 2% lower efficiency than rotating machinery and was only justifiable in special cases. At 1 500 V the rectifier compared with two 750 V rotaries in series was about equal in cost, or slightly lower, required less floor space and had 1½% to 2% better efficiency. Owing to its lower power factor and impossibility of regeneration the two classes of apparatus would probably exist side by side at this voltage. At 3 000 V and above the rectifier would probably displace rotating machinery almost entirely as soon as a little more experience had been gained with it. It had heavy advantages in cost, efficiency and floor space sufficient to offset the loss of the ability to use regenerative braking. At this voltage the rectifier might even go far to settle the rivalry between the d.c. and a.c. systems of railway electrification in favour of the former.

The Berlin suburban railways were completely electrified at 800 V, principally with rectifiers, of which 119 of various makes were in use. On the Czechoslovakian railways a 1 500 V 4 270 kW rectifier was in use. The Consolidated Mining and Smelting Co. were installing a 650 V 6 500 kW rectifier and the entire supply for the Delaware, Lackawanna and Western Railroad would be given by 18 rectifiers of 3 000 V, totalling 37 000 kW.

Mr. Read then discussed a variety of principles, his paper being illustrated by a number of instructive diagrams and graphs.

ELECTRIC POWER ON STEAMSHIPS.

Reduction of Fuel Costs.

IN the Ellerman Line steamer "City of Hongkong," which has now returned from India, there is in use a device invented by Mr. James Scott, electrical engineer, of Liverpool, which, it is claimed, enables fuel costs to be reduced by at least 25 %, while more power and increased speed are secured.

This equipment, which is said to increase greatly the efficiency of the reciprocating steam engine, consists of a specially designed steam turbine, driven by the exhaust steam after it leaves the low pressure cylinder of the main reciprocating engine, and directly coupled to an electric generator, the energy from which drives an electric motor, which, in turn, is directly coupled to the propeller-shafting.

The designers believe that further economies are possible by the introduction of pulverised fuel, which, with the improvement effected by the equipment described, should help towards bringing coal into its own again as a competitor with oil as fuel for ships.

INSULATORS AND FOGS.

The British Porcelain Co. inform us that they have been manufacturing insulators designed to meet fog trouble of very similar pattern to that illustrated on page 133 of our last issue since 1926. They add that insulators of this type were supplied by them to the Sydsvenska Kraft A.B., Malmoe, Sweden, while Professor Velandis was consulting engineer to that company. There is a difference between the fog insulators designed by the British Porcelain Co. and Bullers, Ltd., in regard to the shape and arrangement of the corrugations under the sheds.

H.T. DISTRIBUTION.

Transformer Losses.

AT the informal meeting of the Institution of Electrical Engineers, held on January 26th, the subject of discussion was "High Tension Distribution" with Mr. W. A. Ritchie in the chair. The discussion was opened by Mr. G. V. Twiss, who exhibited several lantern slides illustrating instances and examples, drawn mainly from distribution systems under his supervision in various parts of England and Wales.

Mr. Twiss first remarked that as the result of centralisation of generation a complementary state of decentralisation was manifest in the greater use of electrical transmission. He preferred to describe as transmission lines those extra high-voltage services whose function is to supply lower voltage systems which are not tapped for supply at first hand.

An interesting technical note was in regard to transformer losses in a small section described, 15 transformers having a total capacity of 1 300 kVA. The iron losses of these transformers constituted a 24-hour load and necessitated the supply of about 60 000 units per annum.

In assessing the copper losses of these transformers it should be noted that the load factor of the losses was smaller than the load factor of the system. Assuming a value of, say, 12% for the loss load factor, the copper losses would be about 20 000 units per annum. The total transformer losses therefore amounted to approximately 80 000 units per annum.

Mr. Twiss said that h.t. distribution was closely concerned with the electrification of rural and small urban areas, the main requirement being economy consistent with reliability. Coincident with such economy of capital expenditure it was necessary that there should be a very high degree of efficiency in selling methods in order to secure the fullest use by the rural communities of the supply provided.

On the discussion being thrown open, a number of questions were put to Mr. Twiss, to which he subsequently replied, keeping a large meeting closely interested for long past the usual hour.

Mr. A. F. Harmer said he was glad to note that the same type of transformer was used for indoor and outdoor service. He asked why Mr. Twiss was erecting 33 kV lines which must shortly become obsolete.

Mr. E. Kilburn Scott asked what sort of demand was required to make a line practicable, and to this question he obtained the reply that if the annual revenue of a service was about one-fifth or one-quarter of the capital outlay the supply was an economic possibility.

In reply to Mr. W. E. Lang, who urged that the wiring contractor be given every encouragement, as he could best bring in consumers and develop an area, Mr. Twiss said he was in agreement, but in new areas the contractor was not often available and was reluctant to come. It had been found that collaboration was the most successful method.

Messrs. F. B. Allcock, H. D. Barlow, J. R. Bedford, J. H. C. Brooking, A. G. Hilling, G. H. Holding, S. B. Jackson, C. F. Moundson, R. S. Odd, N. Prentice, C. W. Prescott, J. F. Shipley, D. H. Stewart, and C. Wade also spoke.

INDUSTRIAL RESEARCH.

Report for Year Ended July 31st.

THE report of the Department of Scientific and Industrial Research for the year ended July 31st, 1929, which has just been issued, contains a review of the work done in fuel research, radio research, daylight and artificial illumination, and electrodeposition. Particulars are also given of the new grant scheme in support of the work of research associations, the report of the National Physical Laboratory and the Metallurgical Research Board, engineering research, and work done upon lead cable sheathing, the report of the Radio Research Board, dealing with the propagation of waves, directional wireless, direct reading direction finders, atmospherics and radio standards and precision measurements. A review is also given of the work of the research associations connected with the industries producing or handling cast iron, non-ferrous metals and scientific instruments, the electrical and allied industries, and numerous other trades. The report is published by H.M. Stationery Office, London, &c., price 3s. 6d. net.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Symmetrical Components.

[To the Editor.]

Sir,—I have read with interest the review of Dr. Gunther Oberdorfer's book, "Das Rechmen mit symmetrischen Komponenten," which appeared over the signature W. F. C. on p. 733 of your issue for December 13th, 1929. This review contains certain statements of a general character which seem to call for some comment.

It does not appear to be generally appreciated that the principle of symmetrical components was first published in France by L. G. Stokvis (see "Comptes Rendus," vol. 159, p. 46, 1914), the same writer contributing a paper on the subject in the "Electrical World," vol. 65, p. 1111, 1915. Fortescue's classic paper of 1918 contains, I believe, an independent recognition of the principle and applies it in the development of an operational calculus of a very general character, by means of which numerous important problems arising in the unbalanced operation of polyphase machinery are analysed. The independent development of the subject by Stokvis, Genkin and other French electricians, and by Fortescue and his associates in America has led many recent writers to refer to the principle of symmetrical component analysis as the "Stokvis–Fortescue principle," thereby giving credit to both initial investigators.

Your reviewer correctly states that the method has received but slight attention in Great Britain. I should like to point out that with the object of introducing the principle to British engineers I contributed in 1926 to the Selected Engineering Papers of the Institution of Civil Engineers an elementary monograph on the method of symmetrical co-ordinates in polyphase theory, see No. 40 of that series. No doubt this publication has escaped your reviewer's notice.

I am of the opinion that the writer of the review takes too limited a view of the utility of the method in practice, at the same time questioning its value as part of the equipment of an electrical engineering student. In regard to the first point I would respectfully point out that the use of the method is not confined to the analysis of short-circuit phenomena or other instances of unbalanced loading which, as the writer justly points out, are often unstable and "very nebulous"; indeed, by far the greatest use of the method is in the investigation of problems quite other than short-circuit conditions or other states of momentary unbalance. For example, in America at the present time the method is the fundamental basis of calculations of the stability of large interlinked power systems and a voluminous literature on this problem alone is already in existence. Moreover, the use of symmetrical co-ordinates is the most satisfactory way of treating the theory of sensitivity and stability of protective devices. Again, there are numerous problems in the theory of unbalanced circuits, e.g., the supply of single-phase power from three-phase networks, which are steady-state conditions and which can be most lucidly and concisely analysed by means of symmetrical components. There are numerous additional instances which could be cited in which clarity and analytical simplicity are obtained by the use of the Stokvis–Fortescue principle, but limitation of space precludes their discussion in a brief letter.

As regards the second point, its utility to the student, I can state from my experience as a teacher of electric circuit theory that no other way of discussing unbalanced systems succeeds in giving the student such a clear picture of the physical conditions existing in transient or steady operation of such systems, especially as regards the flow of energy. I am unable to see that there can be any artificiality in analysing such complex phenomena as occur in unbalanced systems in terms of those elementary properties of balanced systems with which students are already familiar.—I am, etc.,

B. Hague.

The Polytechnic Institute,
Brooklyn, New York.
January 12th.

Technical Abbreviations.

[To the Editor.]

Sir,—Your correspondent, "H. H.," does not like the abbreviation kWh, and calls upon us to change our standards. What does he mean by "*our* standards"? This abbreviation may not be entirely logical, but it has the merit of being internationally agreed, and until a change is agreed internationally the confusion caused by a change on the part of British engineers would undoubtedly be a strange recompense for our moral satisfaction in being logical. "H. H." suggests that the Germans should use a capital H for the noun "hour," but does he not remember that the symbol H is already used in another sense, again internationally?—I am, etc.,

J. F. Stanley.

Thornton Heath,
February 1st.

Insulating Oils.

[To the Editor.]

Sir,—Mr. E. B. Wedmore, Director of the British Electrical and Allied Industries Research Association, has brought to my attention the fact that in figure 4 of my article on Insulating Oils in your issue of November 29th, 1929, I have omitted to state that the electrodes used by Mr. J. E. T. Cogle in the experiments described were ½ in. diameter spheres spaced 2·54 m/m. (0·10 in.) apart, instead of the standard B.E.S.A. 4 m/m. (0·157 in.) spacing.—I am, etc.,

Allan Monkhouse.

Leningrad.
January 20th.

BOOK REVIEWS.

Elements of Radio Communication. By John H. Morecroft. (London: Chapman and Hall.) Pp. x+269. 15s. net.

Students of radio requiring something more sound and thorough than the "popular" fare, but being insufficiently equipped to attempt such works as the author's "Principles of Radio Communication," should find this book helpful. It gives a general review of those parts of the alternating current theory which are of fundamental importance in radio, and follows on with specific applications of these principles to radio telegraphy and telephony.

While practically no mathematical knowledge more advanced than algebra is required for mastery of the text, the requirements of most radio students, apart from the engineers specialising in this branch of communication, are reasonably well met in this volume. Much of the specific treatment is directed to broadcasting, and reasonable amplifications, power factors, losses, and so on, are given for apparatus designed for the broadcasting frequencies. The final chapter deals with all kinds of receiving sets, from a simple crystal circuit to the most modern a.c. operated receiver. Attention is also directed to balanced circuits, push-pull amplifiers, different types of loud speakers, the selectivity and fidelity of amplifiers, filters, etc.

G. W. D.

Telegraphy and Telephony. By E. Mallett. (London: Chapman and Hall.) Pp. ix+413. 21s. net.

While many books have been written on various aspects of electrical communication, there is apparently no single work containing an outline exposition of the application of scientific principles to the art of electrical communication, which serves as an introduction to the specialised books, and yet does not deal largely with the teaching of electricity and magnetism, which is better done elsewhere. It is this apparently well defined gap in the literature of the subject that the author has attempted to fill.

The book is therefore designed to meet the needs of a university or technical college student who has studied electricity and magnetism up to a second year standard, and of those junior engineers who find themselves engaged in "light" electrical engineering without having had any instruction in the subject at college. From the examinations point of view it may prove a suitable text book in the telegraphy and telephony papers in the final examinations for the B.Sc. (Eng.) of the University of London, in the higher grade technological examinations of the City and Guilds Institute, in the I.E.E. entrance examination, and in the Civil Service Commission's examinations. The book is well and clearly illustrated by a series of very competent line drawings and diagrams.

G. B. O.

BOOKS RECEIVED.

"Journal of the Institution of Electrical Engineers." Vol. 68, No. 396, December. (London: E. and F. N. Spon.) 10s. 6d. net.

"The Law Relating to Injuries to Workmen." Fourth Edition. (Revised.) By F. G. Neave, in collaboration with Grange Turner. (London: Effingham Wilson.) Pp. xix+172. 6s. net.

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NEWS IN BRIEF.

Faraday Old Students' Dance—L.C.C. School of Engineering—Rural Supplies in Argentina—Appointments Vacant—Hull Telephone Licence.

THE Traffic Workers' Brotherhood, which includes tramway and bus men, held a church parade last Sunday at St. Mark's Church, Kennington, London.

Great Britain and Northern Ireland have 1 850 000 telephones, and New York City is only slightly behind with a total of 1 790 370. In New York, however, there are about 783 000 domestic or residence telephones, against 404 700 in Great Britain and Northern Ireland.

The Faraday House Old Students' Association and Faraday House Rugby Club have arranged to hold a supper dance on February 26th at the Hotel Russell, W.C.1. Early application for tickets should be made to the Hon. Secretary, Faraday House O.S.A., Southampton Row, London, W.C.1.

An electric traction engineer is wanted for service in the Bombay, Baroda and Central India Railway.

The Senate of the University of London invites applications for the chair of physics tenable at the East London College.

The Postmaster-General has renewed the licence for Hull Corporation's telephone undertaking for a further 30 years.

Barking U.D.C. is to obtain from neighbouring authorities particulars of conditions and cost of installing electric cookers.

The Metropolitan Asylums Board is to provide electric pumps for the sewage works at Leavesden Hospital, at a cost of £265.

St. Pancras (London) Electricity Committee recommends that the B.C. approve the principle of permitting lamp standards to be used for advertising purposes.

Employees of Glasgow Corporation transport department, including 45 men and four women, have been presented with medals in recognition of their having completed 35 years' service.

Dr. M. Luckiesh recently described, at a meeting of the American Institute of Electrical Engineers, a device known as the "sunlight lamp," which is said to be in course of being perfected by the General Electric Co. of New York and which Dr. Luckiesh predicts will reduce colds, nervous troubles and other ailments and extend the life of man by many years.

A course of five short lectures by Mr. E. T. Painton on "High Tension Transmission and Distribution of Electrical Energy" is being held on Tuesday evenings from 7 to 9 p.m., commencing on February 4th, at the London County Council School of Engineering and Navigation, High Street, Poplar, E. 12. Further particulars from the Secretary, at the School.

The Compañia Anglo Argentina de Electricidad has decided to invest considerable capital in an extensive application of electric power in the agricultural regions of the Argentine. High-tension cables will cover wide areas of the country. The raising of the necessary capital, it is stated, offers no difficulty in Europe, where unlimited confidence is felt in the future of the Republic.

Mr. Ben Turner, Secretary for Mines, expressed, to a deputation of Members of Parliament last week, the view that electrical firedamp detectors in their practical application to the daily work of mines were still in a stage of experiment and development, and that he would not yet be justified in requiring, or recommending, their general or extensive use. He promised to consider suggestions with a view to the further development of such detectors.

The annual general meeting of the Institute of Metals will take place on March 12th and 13th, at the Institution of Mechanical Engineers, London. The annual dinner and dance will be held on March 12th. Amongst the papers to be read at the annual meeting will be one by Messrs. L. Davies and L. Wright on "Protective Value of Some Electro-Deposited Coatings." Further details can be obtained from the secretary and editor, Mr. G. Shaw Scott, 36, Victoria Street, Westminster, S.W.1.

Mr. C. H. Luke, of "The Times" Trade and Engineering Supplement, addressing the London Chamber of Commerce last week, said Canadian imports during the year ended May 31st, 1929, were valued at £263 000 000, of which Great Britain sent about £39 000 000 and the U.S.A. £180 000 000. A grievance of the Canadian people was that executive men of British firms did not visit Canada often enough.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of February 7th, 1880, recorded that the price of the Edison Light Company's $100 shares had declined from $3 500 to $1 500 a share, owing to delays and adverse rumours, based apparently on the difficulty which was being experienced in maintaining a perfect vacuum in the lamp bulbs.*

Electric light (Jablochkoff candles) had just been exhibited before the Shah of Persia at Teheran by M. F. Boital.

* * *

TWENTY-FIVE years ago, it was recorded in THE ELECTRICIAN *of February 3rd, 1905, that there were 17 miles of tube railways, 7 miles of ordinary tunnel railways and 84 miles of electrically-driven surface railways in operation.*

The reply of the Postmaster-General to the deputation which had protested against the disfigurement of the country by telegraph poles had given rise to some correspondence in the daily Press. It was remarked in THE ELECTRICIAN *that "by showing a proper spirit of compromise such matters may frequently be settled, although we despair of its being possible to extend our telephone trunk lines adequately without sometimes offending the delicate susceptibilities of the Commons and Footpaths Preservation Society and others."*

An engineer in charge is required in the Hammersmith (London) electricity department.

Chester Corporation is ininviting tenders for the provision of six call boxes in various parts of the city.

Increases of pay to workmen in the engineering department of the Post Office will cost £200 000 for the first year.

Mr. George Lansbury, M.P., opened last Saturday new baths and washhouses at Bow, in which nine electrically-heated washing machines are installed.

On the Wimbledon-Hampton Court route of the London United Tramways experiments are being made with a signalling device on tramcars, to indicate when cars are about to stop.

The annual dinner of the Iron and Steel Institute will take place at the Connaught Rooms, London, on May 1st, and the annual meeting at the Institution of Civil Engineers, London, on May 1st and 2nd. Any further details can be obtained from the Secretary, 28, Victoria Street, London, S.W.1.

The trustees of Sir James Caird's Travelling Scholarships will award one senior scholarship value £250 to £600, and two junior scholarships value £50 to £150, for the ensuing year in electricity and electrical engineering. Only natives of Scotland are eligible. Forms of application and further particulars from the secretary, Mr. John Pearson, 7, Ward Street, Dundee, until March 31st.

A report by the Sub-Committee of the Science Standing Committee of the Royal Institute of British Architects on the smoke nuisance states that at least 50% of the smoke nuisance is contributed by domestic chimneys. Electricity is recommended as the best means of reducing sulphur in the atmosphere to a minimum, if its cost can be brought within the range of the ordinary householder.

Executives of the engineering trade unions met in London last week to hear reports from the various districts with regard to the failure of the unions to induce the engineering and allied employers to concede a claim of 8s. for timeworkers, and a proportionate advance to pieceworkers. It was decided to appoint a sub-committee to meet the employers again and discuss the whole situation in the light of the reports.

The International Paper and Power Co., Boston, Mass., is offering to employees of the company and affiliated companies cumulative 7% preferred stock at $80 a share. As the result of four previous offerings, commencing in 1925, employees have subscribed for 36 939 shares. Employees may pay for stock in full or by instalments spread over 1½ years. A bonus is paid to stockholding employees each year. Under the present offer bonuses increasing from $1 to $5 a year will be paid during the first five years.

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PERSONAL.

ALD. Samuels (Hammersmith B.C.) has been reappointed chairman of the District Joint Board of Employers and Members of Staff, Electricity Supply Industry, Area No. 10 (Greater London).

Mr. Laurence J. Kettle, city electrical engineer, Dublin, who has retired.

Mr. William Chamberlain has been elected a director of the International Paper and Power Co.

Stepney (London) Electricity Supply Committee has appointed Coun. Lewis chairman and Coun. Groves vice- chairman for the ensuing year, and recommends that they, with the town clerk, Mr. Wm. McCarty, shall represent the Council on the Conference of Local Authorities owning Electricity Undertakings in Greater London. It is also recommended that Coun. Lewis shall represent the Council on the British Electrical Allied Research Association.

Mr. A. H. Darker, consulting engineer of J. Stone and Co., Ltd., Deptford, London, is leaving England by the "Orontes" on February 15th for a world tour.

Mr. A. T. Bullen, now mains engineer to Bedford Corporation, has been appointed to the post of electrical engineer to the Welwyn Garden City supply undertaking.

Estate of the gross value of £10 566, with net personalty £9 505, was left by the late Mr. Gilbert Wakefield Carpenter, assistant manager of Scarborough electricity undertaking.

Plymouth Tramways and Transport Committee has received and accepted the resignation of Mr. J. W. Eunson, and resolved to advertise for a rolling stock superintendent at a commencing salary of £400 per annum.

Burnley Transport Committee has further reduced the short list of applicants for the post of manager to Mr. Frank H. Crossley (Ashton-under-Lyne), Mr. H. P. Sharpe (Rotherham) and Mr. Charles H. Stafford (Reading).

Marylebone (London) Electric Supply Committee recommends that Ald. G. B. Brooks be nominated to represent the Council as an associate member of the British Electrical and Allied Industries Research Association for the ensuing year.

Mr. E. Stopford Saunders has been appointed chief engineer and manager of the Surbiton electricity supply undertaking. He succeeds Mr. T. M. Colson, who tendered his resignation owing to ill-health, but whose services are being retained in an advisory capacity.

Mr. Alfred George Collis, chief of the switchgear section of Crompton Parkinson, Ltd., has been elected to fill a casual vacancy on the Essex County Council for the Brentwood division. Mr. Collis is a member of the Brentwood Urban Council, and a director of the Brentwood Electric Light Co., and the Brentwood Electrical Installation Co.

Hammersmith B.C. Electricity Committee proposes, in dealing with the vacancy which will arise at the electricity works upon the resignation of Mr. J. F. Sarvent, station superintendent, the promotion of Mr. A. T. Gordon-Smith (senior engineer-in-charge) to a new position of electrical superintendent (salary, £466 19s. 10d.); the promotion of Mr. G. A. Tottman, repairs engineer, to a new position of mechanical superintendent (salary, £466 19s. 10d.); and the promotion of Mr. A. C. Tedstone, engineer-in-charge, to senior engineer-in-charge (salary, £394 8s. 4d.); and to invite applications for the vacant position of engineer-in-charge (salary, £359 2s. 9d.). The General Purposes Committee reports its approval of the proposals, but, having regard to the new positions and designations suggested, is of opinion that particulars thereof should be submitted to the District Joint Board, and its approval is subject to this stipulation.

Obituary.

Mr. HENRY HOLGATE, on January 21st, aged 66 years. He was born at Milton, Ontario, and in 1894, in the service of the Royal Electric Co., built and operated the Montreal Park and Island Railway. Four years later he became manager of an electrical company in Jamaica, and built and operated the hydro-electric tramway system in Kingston. Returning to Montreal, he joined Mr. R. A. Ross, and the firm constructed a number of hydro-electric plants. The partnership was dissolved in 1911, when he became president of the Cedar Rapids Power Co., and afterwards consulting engineer.

BUSINESS ITEMS.

THE HART ACCUMULATOR CO., LTD., Stratford, London, E.15, received a visit recently from a party of students of the Insurance Institute of London, whose curriculum includes the inspection of factories of various kinds.

Included in recent orders received by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, for electrical plant destined for duty overseas, is one from the High Commissioner for India (consulting engineers, Messrs. Preece, Cardew and Rider) for four large water wheel driven alternator sets to be used in the Shanan Power Station in connection with the Uhl River hydro-electric scheme. Each alternator will be driven by a Boving water wheel and will have an output of 12 000 kW (16 000 H.P.), the rating being 13 333 kVA, 0·9 power factor, 11 000 V, three-phase, 50 cycles, 428 r.p.m. Each set will be provided with direct-coupled exciters arranged for automatic voltage regulation. For the supply of electric power to the mines of North Broken Hill, Ltd., Broken Hill, South, Ltd., and the Zinc Corporation, Ltd., Australia, a particularly notable central power station is projected, and it is interesting to record that orders have been received by the B.T.H. Co., on behalf of Messrs. Australian Ore and Metal Pty., Ltd., for the six 2 500 kVA (2 700 H.P.) alternators and the whole of the switchgear. Messrs. Robert Bruce and Sons are acting as inspecting engineers for this equipment, which is the largest where Diesel engines are used as prime movers ever installed in the world at one time. The six alternators are each rated 2 500 kVA, 0·8 power factor, 6 900/7 200 V, three-phase, 40 cycles, with neutral earthed, and will run at 160 r.p.m. They are of the protected type and the stators and rotors are split on the horizontal diameter.

Included in the B.T.H. switchgear is a control board with h.t. cubicles mounted beneath the switchboard gallery, the oil circuit breakers contained in these cubicles being remote electrically operated. In addition there is a l.t. switchboard. The total number of the panels is 36 without allowing for the automatic Tirrill voltage regulator panels, which brings the total to 45, while the high tension remote control cubicles number 18. In addition to the foregoing, the B.T.H. Co. has received orders for outdoor type transformers required in connection with the electrification scheme. Of these transformers, seven are three-phase units each of 750 kVA, 6 900/575 V, 40 cycles rating, and eleven are single-phase units of 833 kVA rating.

ELECTRICAL WOMEN.

Formation of Branch at Bradford—Details of Future Meetings.

A Bradford Branch of the Electrical Association for Women was formed last week, the inaugural meeting being held in the Mechanic's Institute, Bridge Street, on January 30th. Lady Watson, who accepted the Presidency, was in the chair, and Miss Haslett, the director, was supported in her address by Ald. Kathleen Chambers (Vice President of the Bradford Branch), Mr. Thos. Roles, city electrical engineer, Mr. Harry Moss (E.C.A. Council) and Ald. J. W. Longley, chairman of the Electricity Committee. The President of the Association, Mrs. Wilfrid Ashley, was unable to be present, but sent a message expressing her regret, and wishing the branch every success. Mrs. A. W. Brown, wife of Capt. Brown, E.D.A. Area Officer, was elected hon. treasurer, and Miss Eva Moss, who had been working for two months preparing for the formation of the Branch, was elected hon. secretary.

Miss Eva Moss, hon. sec. of the Bradford Branch of the E.A.W.

Meetings of the Bradford Branch will be held at the offices of the Corporation electricity department and the first lecture has been fixed for February 13th, when Mr. Harry Moss will speak on "Some Things you Should Know about Your Electrical Installation." The second lecture will be given by Mr. Geo. S. Francis, of London, on "Modern Tendencies in Architecture, Furnishing and Lighting Design, and the part Electricity plays Therein," and the date of this has been arranged for March 13th.

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ELECTRICAL DISTRIBUTION.

Interesting Paper Read Before the Manchester Engineers' Association.

THE electrical distribution system of Manchester was the subject of a paper given by Mr. H. C. Lamb, chief engineer and manager of the Manchester electricity department, before the Manchester Association of Engineers on January 24th. Briefly, the lecturer used the experiences of the Manchester power system to illustrate the developments of electrical supply generally. Mr. Lamb said that the public supply of electricity was commenced in Manchester in the year 1893 by direct current only to supply an area of approximately one square mile, which had now grown to 52 square miles. He referred to the acute controversy which had taken place between the advocates of the direct and the alternating current systems, some forty or forty-five years ago. Unfortunately, the views of the champions of direct current had mostly prevailed in this country. This was particularly so in the industrial towns, where the future importance of the power load was recognised, alternating current being adopted in towns where the demand was expected to be chiefly for lighting. The development of the polyphase motor made alternating current equally as suitable as direct current for motive power. The advantage of a standard system of current and a common voltage for all small consumers was obvious, but before standardising, one had to be tolerably certain regarding the best voltage and system for general use. For many years the economies of the alternating current system as compared with direct current had been apparent, and included lower capital cost in sub-stations, higher efficiency in operating them, and cheaper plant for the consumer. It was not until 1925 that there was any recognised standard, and, generally speaking, those undertakings operating at voltages of 230 240, and 250 for lighting had come latest into the field.

Twenty-one Years Ago.

The earliest low tension alternating current areas on the Manchester supply system were Audenshaw, Droylsden and Failsworth, where networks were laid down in 1908. Since then the numerous new housing areas had all been laid out for alternating current and many small districts had been detached from the direct-system: the street mains, together with consumers' installations being converted to alternating current at the standard voltage of 230. Approximately 9 000 consumers had been changed over, and were supplied at the standard voltage. No decision had yet been reached to change over the whole of the dense area in the heart of the city. To relieve the low tension mains, and also to obviate further expenditure on converting plant, it was the present policy not only to connect all large new buildings to high tension mains, but also to detach, in some cases, warehouses and blocks of offices with demands exceeding 50 kilowatts, from the low tension and connect them direct to high tension mains. Referring to overhead distribution which was usually employed in rural areas with the object of reducing costs, Mr. Lamb said that in a few cases experiments had been made with overhead systems in towns. There were two examples in Manchester, the Blakely and Gorton Mount Housing Estates, which were among the earliest to be laid out by the Corporation in the post-war period. The overhead lines were constructed in 1921 at a time when prices were at their highest, and a considerable capital sum was saved. The principle drawback to the use of overhead wires in towns was the increased cost of maintenance as compared with underground mains, chiefly due to oxidation of the constructional work, and another disadvantage of the overhead construction in towns was the length of service lines. Referring to the national "grid" he said that, as a result of legislation, it looked as though the principle of inter-connection would be carried further in Great Britain than perhaps in any other country.

THE BIRMINGHAM ELECTRIC CLUB.

There was a large attendance of members of the Birmingham Electric Club at the opening meeting of the second half session on Friday, January 24th. The occasion gained in interest from the fact that tangible recognition was made of the services rendered to the Club during the past fifteen years by Mr. R. A. Chattock, the retiring electrical engineer of the city. Mr. Chattock was presented with a cocktail set, which he acknowledged in a short speech of thanks.

INDUSTRIAL DESIGNS.

Many Prizes Offered by Electrical Firms in R.S.A. Competition.

PARTICULARS of the seventh annual open competition of Industrial Designs to be held at the Imperial Institute South Kensington, London, S.W., in June next, have now been issued, and can be obtained from the Secretary of the Royal Society of Arts, John Street, Adelphi, London, W.C.2. Intending competitors must apply to the Secretary of the Society between May 1st and May 10th for the necessary entry forms, the last day for receiving entries being May 26th. The designs will be received at the Imperial College of Science and Technology, Imperial Institute Road, S.W., between June 11th and 13th. In all scholarships and prizes amounting to nearly £1 900 are offered in connection with the 1930 Competition.

Electrical Prizes.

Hailwood and Ackroyd, Ltd., of Morley, near Leeds, offer a prize of ten guineas for a design of an electrical illuminating fitting intended to occupy the central position in a room, of which the dimensions are 25 ft. by 15 ft. by 10 ft. 6 in., and a wall bracket fitting to match, designed in modern style. Designs should be original, and the selection of materials is optional to the designer. Full-size drawings are required. The winning design shall become the property of the donor of the prize.

Blackpool Corporation Publicity Committee offers a prize of £25 for a design for a 16-sheet double crown poster (120 in. by 80 in. upright), required to advertise Blackpool during the autumn season, when the chief attraction is the scheme of illuminations covering three miles of promenade during the period September 20th to October 20th. Designs should be drawn to a double crown size (30 in. by 20 in.) upright, and should be bright and original in character with a fitting slogan. The Publicity Committee will pay an additional £10 10s. for any designs subsequently reproduced as posters. (Competitors desiring a copy of the illustrated Guide to Blackpool can receive it, post free, from Mr. W. Foster, Director of Publicity, Town Hall, Blackpool.)

The Council of the British Electrical Development Association, of 15, Savoy Street, W.C.2, offers a prize of £25 for the design of a poster advertising uses of electricity in rural districts. A pamphlet dealing with such uses will be sent to any competitor on application, in writing. The design to be suitable for reproduction as a double crown poster (30 in. by 20 in.), and reproducible by lithographic, photographic offset, or selectacine process in not more than five colours.

Celestion, Ltd., of London Road, Kingston-on-Thames, offer a prize of £30 for a design for a double crown poster 30 in. high by 20 in. wide advertising the company's loudspeakers. The subject of the poster is to be symbolical of "The Very Soul of Music," and not more than seven colours are to be used. Intending competitors should apply to the Advertising Department, Celestion, Ltd., for a descriptive pamphlet entitled "Music—its Creation and Re-Creation."

E. K. Cole, Ltd., of Ecko Works, Leigh-on-Sea, Essex, offer a prize of £25 for a design for a double crown poster (30 in. high by 20 in. wide), in not more than seven colours to advertise their "Ecko" all-electric wireless sets or "Ecko" all-power supply units. The slogans used to typify the selling points are: "Plug in—that's all"; "Worryless Wireless"; "No batteries—no accumulators"; "Ecko-Lectrify your set." Intending competitors should apply to the Advertising Department of E. K. Cole, Ltd. for a descriptive booklet, and are advised to study pages 3-5, 16-19 and 24-25.

W. T. Henley's Telegraph Works Co., Ltd., of 11, Holborn Viaduct, London, E.C.1, offer a prize of £25 for a design for a showcard 15 in. by 10 in., suitable for display on the premises of electrical contractors, to advertise to the public the Henley Wiring System. Alternatively a design for a cut-out showcard could be submitted. The design should be capable of being produced by lithography, using not more than six colours. It should be attention arresting, and not overburdened with too much wording. A simple design should be aimed at. Descriptive literature will be supplied to intending competitors on application to the Advertising Department, W. T. Henley's Telegraph Works Co., Ltd.

The next luncheon of the Engineering Section of the I.S.B.A. will be held at the Hotel Cecil, London, on February 14th, when the speaker will be Mr. E. E. Sharp, and the subject "Lessons from a Business Tour in Australia and New Zealand."

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ELECTRICAL ADVERTISING.

Manchester E.D.A. Sales Conference—Electrical Opportunities.

SALES possibilities of electricity in advertising formed the subject of an interesting lecture given by Mr. H. Lingard at the E.D.A. Manchester Bureau on January 22nd, it being the third of the present series. Mr. H. A. Prior took the chair. In opening, Mr. Lingard said that luminous advertising provided great scope for the electrical salesman, but he emphasised the necessity of introducing novel effects, upon which the success of electrical publicity to a large extent depended. The supply authorities could help matters considerably by offering attractive tariffs. The lecturer first dealt with flood-lighting in its relation to advertising. He pointed out that firms owning large and attractive buildings possessed an advertising asset in the architectural features thereof. This was greatly enhanced by the use of judicious flood-lighting, which extended the period of usefulness to the hours of darkness. It was important, however, to vary the scheme of lighting from time to time by using different colours. It should also be done on a grand scale. Another important form of advertising which could be effectively illuminated at night was that of poster hoardings. Mr. Lingard upheld that people were more likely to look at posters and electrical signs during the evenings, when their minds were unoccupied, than during the day. The slides which were shown in connection with this were certainly very striking, and indicated a field of development with great possibilities. Compared with other countries we were behindhand in the use of electricity in advertising. The lecturer next turned to the indoor electric sign which he said was the least developed of all. This type, which embraced all luminous indicator signs, could be very suitably exploited in hotels and public buildings, and the electrical salesman should find a large market in this direction. The illumination of shop faciers, which in Germany was almost standard, was overlooked here, and if taken up would greatly benefit the electrical trade. In summing up, Mr. Lingard mentioned various possible outlets for the trade in the shape of illuminated house numbers and street names, etc. The local authorities were in some cases responsible, but it was the duty of the industry to encourage the exploitation of electrical sign devices as much as possible. In the ensuing discussion Mr. R. C. Hawkins mentioned one or two interesting examples of electrical publicity and endorsed Mr. Lingard's statement that the railwayside was a field which should be developed. A number of further useful ideas were submitted by speakers and some technical details referred to in the paper were fully explained. In reply to a remark by Mr. Romero, of the Salford Electricity Department, Mr. Farthing, of the G.E.C., said the reason why lamps were cheaper in America was that they used a standard voltage. They had reduced the price as low as it was possible, and a small cut at the present time would be a serious thing. As soon as the authorities would introduce a standard voltage, say 230, then the manufacturers would be in a position to sell at a cheaper rate.

ELECTRICITY METERS.

Important Addition to B.E.S.A. Specification Regarding Terminal Connections.

ALTHOUGH a revision of the British Standard Specification for Electricity Meters was issued so recently as April, 1929, a further revision has now been published by the B.E.S.A. The new edition, however, differs from the 1929 edition only in the addition of a clause relating to the standard terminal-connections, and a series of diagrams illustrating these connections. These terminal-connections are a mandatory feature of the specification, and, therefore, constitute a very important addition which is of interest to both manufacturers and users of meters. The specified limits of error, which were appreciably reduced by the 1929 edition, remain unchanged, and it is of interest to note in this connection that meters having an accuracy within the limits laid down by the specification would be classed as Grade I if the proposals recently made by the International Electrotechnical Commission become effective, the majority of continental meters, with larger tolerances on accuracy, being classed as Grade II.

Copies of this specification may be obtained, price 2s. 2d. post free, from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W.1.

LEGAL INTELLIGENCE.

Judgment Given in the Case of Oxford Electricity Co.

ON January 29th, Mr. Justice Bennett, in the Chancery Division, delivered his reserved judgment in the case of the Corporation of Oxford against the Oxford Electricity Co., Ltd., with respect to the acquisition by the Corporation of the company's undertaking and works. His lordship said two questions had arisen between the parties, which he was called upon to decide, first, what was the proper method of ascertaining the price the plaintiffs had to pay to the defendants for the purchase of part of the defendants' undertaking; and the second, what was the date from which the plaintiffs were entitled to the profits and that part of the undertaking which they were purchasing? By virtue of the Oxford Electric Lighting Order, 1890, the local authority might, by notice in writing, require the undertakers to sell their undertaking, and on December 3rd, 1928, plaintiffs served on the defendants such a notice requiring them to sell at a price to be ascertained, in accordance with the terms of the order. The parties being unable to agree how the price was to be ascertained, the plaintiffs issued a writ asking the court to declare the true meaning of the section of the order and for a decree of specific performance. The difference between the parties was this: The plaintiffs said the purchase price to be paid by them was to be ascertained by capitalising a sum of five per cent. upon the capital of the defendants, shown by their books to have been properly expended on the undertaking, upon the footing that that sum represented the annual net profits of the defendants' undertaking. The defendants said that the purchase price to be paid to them was to be ascertained by capitalising the annual net profits of their undertaking upon a five per cent. basis. In other words, what was to be done was to ascertain what the annual net profits of the undertaking were, and then to ascertain what was the capital sum, which, if invested at five per cent., would produce those profits, and they said that sum was the sum which plaintiffs were to pay. Between these two contentions said his lordship, his judgment was in favour of the plaintiffs. There was no reason why the local authority should be interested in the capital of the defendants unless it were as possible purchasers of their undertaking, and only then if the capital was to be a factor in the calculation by which the purchase price was to be ascertained. As to the date from which plaintiffs were entitled to the profits of the undertaking, plaintiffs claimed that the date was December 3rd, 1928. on which they served the notice on defendants. The defendants counterclaimed for a declaration that the profits would not belong to the plaintiffs until completion of the transfer of the undertaking and payment of the purchase price. The obligation of the defendants to sell the undertaking arose when plaintiffs gave them notice requiring them to sell, and it was an obligation to sell the undertaking as it existed at the date of the notice, subject to all subsisting rights and contracts. It followed that from the same date plaintiffs must be entitled to the profits of the undertaking and they must be entitled to the benefit of the contracts, the burdens of which were imposed upon them. The order he would make in the action would embody appropriate declaration. Defendants must pay the costs of the action and the counterclaim would be dismissed with costs. There would be liberty to apply as to the loose plant, stores, etc., of the defendants not in the area affected by the purchase.

Mr. Tyldesley Jones, K.C., for plaintiffs, said when the matter again came before the court, on the form of the declaration to be granted, he might propose that the questions to be settled should go before a special referee.

Mr. Henderson Craig. K.C., for defendants, said he might at the same time desire to ask for a stay of execution.

Electric Furnace Sale.

In the Official Referees' Court of the High Courts on January 29th, Sir William Hansell, K.C., one of the Referees, had before him an action brought by the Electric Furnace Co., Ltd., of 17, Victoria Street, S.W., to recover £489 3s. 9d., balance of the price of goods sold and delivered from Kelloyd metals, of the Palace of Industry, Wembley. Defendant denied liability and counterclaimed for £150 and for damages.

Mr. John W. Morris (instructed by Churchill, Clapham and Co.) appeared for plaintiffs, and Mr. Claud Mullins (instructed by Sidney Smith and Son) for defendants.

Sir Wm. Hansell gave judgment for the plaintiffs on both claim and counterclaim.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

INVERNESS DISTRICT BOARD OF CONTROL, February 7th.—Rewiring of electrical installation at Inverness District Asylum, Specification from Mr. C. A. Grut, Electricity Offices, Waterloo Place, Inverness; deposit £2.

SHEFFIELD CORPORATION, February 7th.—Electric wiring and fittings; Earldom Road Council School. Specifications, etc., from the City Architect, ; deposit £1.

BASINGSTOKE CORPORATION, February 8th.—Supply and erection of two heavy oil engines, each coupled to 800 kW three-phase 50 cycle alternator; one set to be ready by September 15th, 1930, and the other by September 15th, 1931. Tenders may be for either set or both sets. Specifications, etc., from Mr. F. Swarbrick, borough electrical engineer, Electricity Works, Brook Street, Basingstoke; deposit £1 1s.

DARWEN EDUCATION COMMITTEE, February 8th.—Electric light installation in Avondale School. Specifications from the Borough Engineer.

SALFORD CORPORATION, February 8th.—Low tension, paper insulated, lead covered and armoured cable. Form of tender from the City Electrical Engineer, Electricity Department, Frederick Road, Salford.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, February 10th.—Six or 12 months' supply of electric lamps, lanterns, etc. Specifications, etc., from Mr. A. E. Darby, borough engineer, Town Hall, Cambridge Road, London, E.2.

KETTERING URBAN DISTRICT COUNCIL, February 10th.—Supply of high and low tension cables. Specifications, etc., from Mr. W. A. Walker, Electricity Works, Rockingham Road, Kettering; deposit £1 1s.

LONDON MIDLAND AND SCOTTISH RAILWAY, NORTHERN COUNTIES COMMITTEE (IRELAND), February 10th.—Twelve months' supply of telegraph ironwork, wire, electric lamps and porous pots. Tender form (No. 26) from Mr. F. J. Martin, stores superintendent, York Road Station, Belfast, on prepayment of 6d.

NORTHERN IRELAND GOVERNMENT, February 10th.—Electric light installation at Lurgan R.U.C. Barracks. Specifications can be seen at the Barracks and at the Ministry of Finance, 15, Donegall Square West, Belfast.

PORTSMOUTH CORPORATION, February 10th.—Twelve months' supplies to the tramways department, including insulating materials, lamps and motor windings (section Q); overhead line materials (section R), etc. Specification and form of tender from Mr. B. Hall, general manager and engineer, Tramways Department, Guildhall, Portsmouth.

RUGBY RURAL DISTRICT COUNCIL, February 10th.—Electric lighting installations in connection with housing schemes: Wolston, 26 houses; Brandon, 12; London Road, Dunchurch, 16; Newton, 8; and Churchover, 12. Plans, etc., from the surveyor, Mr. J. E. Weeks, Temple Street, Rugby.

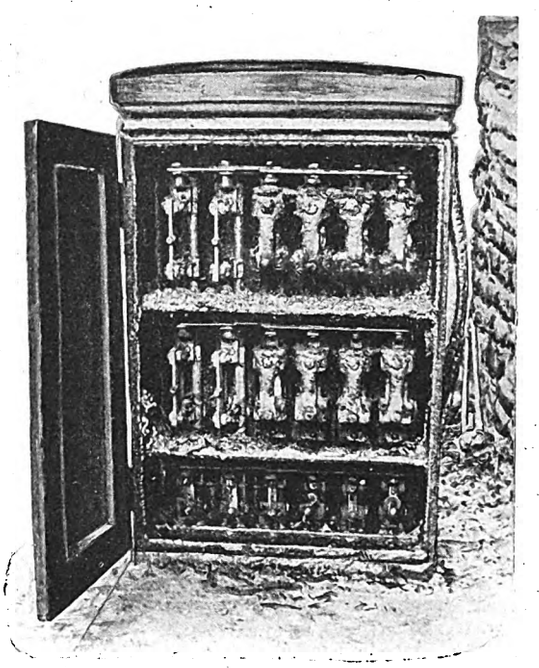
BELFAST CORPORATION, February 11th.—Supply of tramway stores for 12 months, including electrical accessories, cable insulation, carbon brushes, copper rail bonds, trolley heads, guard and span wire, overhead suspension fittings, controller fingers, commutators, coils, etc. Forms of tender from the General Manager, Tramways Department, Sandy Row, Belfast.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, February 11th.—Twelve months' supply of cables for street mains and services (tender form E.S.1); lamps (E.S.2), meters (E.S.3), creosoted cable protection boards (E.S.4); plywood meter boards and insulators (E.S.5); ironclad service cutouts (E.S.6); street lighting standards and electric fittings (E.S.7); and creosoted wood service tee boxes (E.S.8). Forms of tender from the Electrical Engineer, 37, High Street, Cheadle, Cheshire.

STOKE-ON-TRENT CORPORATION, February 12th.—Twelve months' supply of mains and cables (contract No. 3 002) and static transformers (contract No. 3 003). Specifications and forms of tender from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2 for each.

STOKE-ON-TRENT CORPORATION, February 12th.—Supply of an electric mail van (contract No. 3 001). Specifications, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

TORQUAY CORPORATION, February 15th.—Two water tube boilers, economisers, etc., for the electricity works. Specifications, etc., from the Borough Electrical Engineer and Manager; deposit £3 3s.



ONE of the few bright spots of the widespread floods in South Wales was the performance put up by the electrical distribution system. The "Henley" unit pillar shown above was for a time completely submerged but continued to function satisfactorily. Subsequently the supply was disconnected as a precautionary measure and on account of the damage done to the catenary cable lines across the river. This pillar was submerged again a week later and the silt and mud deposited on the porcelain fuse handles are clearly visible in the illustration.

BLACKPOOL CORPORATION, February 17th.—Supply of electrical sundries, etc. Forms of tender and specifications from the Borough Treasurer, Town Hall, Blackpool. Stamped addressed envelope to be sent.

EDMONTON GUARDIANS, February 17th.—Six months, supply of electric lamps, X-ray, light and massage requisites, etc. Forms of tender, etc., from the clerk, Mr. E. Ridley, Board Room, 77, Bridport Road, Edmonton, London, N.18. Stamped addressed envelope to be sent.

HARROGATE CORPORATION, February 17th.—Twelve months' supply of electric lamps, lamp columns, etc. Forms of tender, etc., from the Borough Engineer.

HULL CORPORATION, February 17th.—Twelve months' supply of stores to the tramways department, including controller and motor parts, carbon brushes, trolley gear, cable, lamps and fittings, copper wire, insulating tapes, commutators, overhead line fittings, etc. Forms of tender, etc., from the General Manager, Tramway Offices, Albion Street, Hull.

PLYMOUTH CORPORATION, February 17th–20th.—Supply of electricity meters, paper insulated cables and transformers. Specifications, etc., from the City Electrical Engineer, Electricity Offices, Armada Street, Plymouth, until February 17th. Tenders by February 20th.

WIMBLEDON CORPORATION, February 17th.—One 7 500 kW, two-phase turbo-alternator, condensing plant and auxiliaries.

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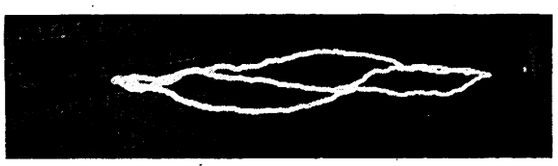
Specification, etc., from Mr. A. E. McKenzie, Electricity Works, Durnsford Road, Wimbledon, London, S.W.19; deposit £2 2s.

HOLBORN (LONDON) BOROUGH COUNCIL, February 18th.—Twelve months' supply of electric lamps, etc. Specification, etc., from the Borough Engineer, Town Hall, High Holborn, London, W.C.1.

STOCKPORT CORPORATION, February 18th.—One 60-ton electric crane and gantry. Specification, etc., from Mr. R. Lee, borough electrical engineer.



AN untouched photograph of three strokes from an artificial lightning generator of 1 100 000 V produced at the high voltage laboratory at the Hollinwood works of Ferranti, Ltd.

METROPOLITAN ASYLUMS BOARD, February 19th.—Electric light installation at Woolwich Casual Ward (contract No. 3); electric light installation at Lambeth Casual Ward (No. 4), conversion of workshop power units to electricity at Darenth Training College (No. 5); and installation of wireless receiving apparatus at Northern Hospital, Winchmore Hill (No. 6). Specifications from the Board's Offices, Victoria Embankment, London, E.C.4; deposit £1 for each.

HULL CORPORATION, February 20th.—One 1 000 000 gallons per hour, natural draught cooling tower (contract 152); cast iron circulating water pipes (contract 153); and two motor-driven, vertical spindle drainage pumps. Specifications from Mr. J. N. Waite, city electrical engineer, Electricity Works, Sculcoates Lane, Hull; deposit £2 for each.

CENTRAL ELECTRICITY BOARD, February 22nd.—Transformer oil-treating plant for 18 transformer stations in the area of the Central England Scheme. Specification (No. B.E.—P.S. 2), etc., from Mr. R. E. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CROYDON CORPORATION, February 26th.—Six months' supply of electrical fittings and appliances, etc. Specification, etc., from the Union Offices, Mayday Road, Thornton Heath. Stamped, addressed envelope to be sent.

OXFORD CORPORATION, March 1st.—Manufacture and erection of engines and pumps, including two oil-driven auxiliary engines each driving an electric generator; electric light installation, etc. Specification, until noon on March 1st, from Sir A. Binnie, Son and Deacon, Artillery House, Artillery Row, Westminster, S.W.1; deposit £10.

CENTRAL ELECTRICITY BOARD, March 3rd.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme. Specification (No. S.E.E.—P.F. 5) from the secretary and solicitor, Mr. R. H. Fox, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, March 19th.—Coal-handling plant at Ironbridge generating station. Specification (No. 8), etc., from Mr. E. F. Hetherington, Phœnix Buildings, Dudley Road, Wolverhampton.

Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., LTD., February 7th.—Supply of overhead electric travelling crane for car shed, in connection with Madras improvements. Specifications and forms of tender (5s.) from the Company's offices, 91, Petty France, Westminster, S.W.1.

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844).

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T. 151/2 025.) (Reference B.X. 5 955).

MEATH COUNTY COUNCIL, February 15th.—Electric lighting and heating installation in Trim Courthouse building. Specification, etc., can be seen at the County Surveyor's Office, County Hall, Navan.

GOTHENBURG HARBOUR AUTHORITY, March 3rd.—Supply of ten electrically operated 2½-ton portal cranes. (Reference A.X. 9 089.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, March 20th.—Supply of two 150 kVA motor alternator sets, for Durban workshops (tender No. 1 615.) (Reference B.X. 6 115.)

NEW ZEALAND POSTS AND TELEGRAPHS, March 31st.—Supply of spare parts for B.P.O. dial No. 10. (Reference B.X. 6 097.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled single-phase transformers. (Reference B.X. 6 095.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

Tenders Accepted.

DUMFRIES CORPORATION.—John Marshall, electrician's work for ensuing year.

ANGLO-PERSIAN OIL CO.—English Electric Co., Ltd., generating plant.

TAMWORTH CORPORATION.—G. R. Coles, electric light installations, £5 per house.

ABERDEEN CORPORATION.—W. Wilson and Co., one year's supply of electrical fittings.

ADMIRALTY.—Edison Swan Electric Co., Ltd., supply of pattern No. 4 590 accumulators.

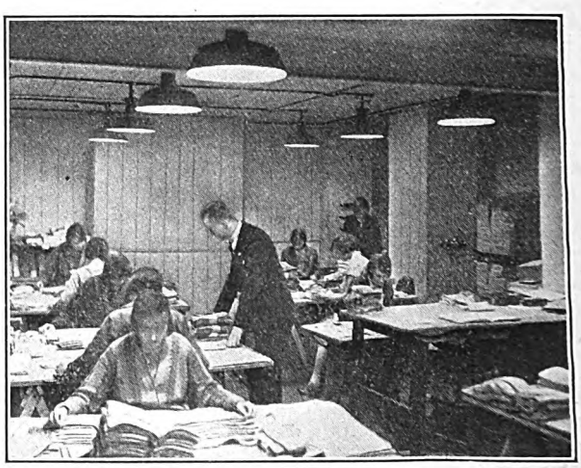
SOUTHEND CORPORATION.—Davey and Armitage 1 600 electricity meter boards, £156 13s. 4d.

CROYDON CORPORATION.—Ferguson, Pailin, Ltd., supply of works' auxiliary switchboard, £1 728 10s.

ADMIRALTY.—Edison Swan Electric Co., Ltd., supply of carbon filament lamps, patterns 1 760 and 915.

EDMONTON GUARDIANS.—Speedy and Eynon, electrical work in connection with nurses' home extension, £1 475.

CALNE CORPORATION.—Western Electric Supply Co., construction of overhead line for supplying North Street area, £312 10s.



A LONDON "soft goods" inspection room illuminated by "Geco" dispersive reflectors and Osram daylight blue lamps.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—Crompton Parkinson, Ltd., additions and alterations to main switchboard, £30.

DUNDEE CORPORATION.—Stevenson and Co., electric lighting work in connection with reconstruction of Lilybank day nursery, £47.

JAMAICA PUBLIC SERVICE DEPARTMENT.—Brush Electrical Engineering Co., Ltd., 2 000 kW Brush-Ljungstrom turbo-generator set.

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HUDDERSFIELD CORPORATION.—J. Marsden and Sons, electrician's work in 36 new houses on Lowerhouses estate, Almondbury.

SOUTH SHIELDS CORPORATION.—Tudor Accumulator Co., Ltd.; battery repairs and renewal of plates, £1 685. (Recommended.)

FULHAM (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., electric lighting of Council Chamber, £160 10s. (Recommended.)

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO.—British Thomson-Houston Co., Ltd., 11 000 Mazda gasfilled vacuum and carbon lamps.

BRIGHTON CORPORATION.—Combustion Generator, Ltd., provision of oil firing equipment at Southwick power station, £1 000. (Recommended).

Electric Pumps for Waterworks.

HEMEL HEMPSTEAD CORPORATION.—Worthington-Simpson, Ltd., two electric pumps, including provision of two ammeters, for the waterworks, £511.

LONDON COUNTY COUNCIL.—Leonard G. Tate and Co., Ltd., electric wiring and fitting at Kender Street School, Deptford, £347 10s. (Recommended.)

LEATHERHEAD URBAN DISTRICT COUNCIL.—Leatherhead and District Electricity Co., public lighting for 5½ years, with 205 lamps, £975 per annum.

STOKE-ON-TRENT CORPORATION.—Wadsworth and Son, Ltd., £144, conversion of electric lift at Hanley Town Hall from d.c. to three-phase, £144.

HAMPTON URBAN DISTRICT COUNCIL.—Twickenham and Teddington Electric Supply Co., Ltd., external lighting at sewage disposal works, £36 15s.

CONSOLIDATED MINING AND SMELTING CO. (CANADA), LTD.—International Electrolytic Plant Co., electrolytic hydrogen plant, £50 000 (approximate).

HACKNEY (LONDON) BOROUGH COUNCIL.—Ferguson, Pailin, Ltd., supply of switchgear, £44 096, inclusive of provisional sum of £2 000. (Recommended.)

FIFE EDUCATION COMMITTEE.—J. and C. Lamont, electric light installation in connection with reconstruction of Broad Street School, Cowdenbeath, £277.

GUILDFORD GUARDIANS.—A. E. Dean and Co., X-ray apparatus, £335 15s., and accessories, £32 12s. 9d., including loan of rotary convertor for one year.

NEWPORT PAGNELL RURAL DISTRICT COUNCIL.—Northampton Electric Light Co., electricity installations in houses at Hanslope, £2 16s. per house.

MAIDENHEAD CORPORATION.—Hackbridge Electric Construction Co., Ltd., 50 kVA transformer, £67; Crompton Parkinson, Ltd., 150 kVA transformer, £107.

STEPNEY (LONDON) GUARDIANS.—F. W. Smurthwaite, £1 311, and Smith and Hammond, Ltd., £600, works in connection with wireless installations at hospitals.

HASLINGTON PARISH COUNCIL.—Electricity Distribution of North Wales and District, Ltd., public lighting, with 45 lamps, £3 4s. per lamp for season (1 070 hours.)

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Ferguson, Pailin, Ltd., supply of switchgear, £44 096, and busbar connecting chambers, £2 000. (Recommended).

SOWERBY URBAN DISTRICT COUNCIL.—G. A. Cotton, electrical work in connection with repairs and renovations at Wadsworth Old Town Council Schoolhouse, £28.

STEPNEY (LONDON) BOROUGH COUNCIL.—J. Warner, Ltd., supply of 50 c.i. boxes, frames and covers, £80. (Recommended.) Also tendered: E. and F. Wright, £81.

SEAHAM HARBOUR URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., Siemens Electric Lamps and Supplies, Ltd., and Metro-Vick Supplies, supply of lamps, 1s. 2d. each.

LONDON COUNTY COUNCIL.—Marryat and Scott, Ltd., electric goods lift at Stamford Hill Stores, £864. Also tendered: Pickerings, Ltd., £880; Express Lift Co., Ltd., £888.

SOUTHWARK (LONDON) BOROUGH COUNCIL.—Alton Battery Co., Ltd., battery plates, £166 5s.; R. Hornby and Co., Ltd., slot meters, £69 12s.; Gould's Foundries, Ltd., pistol links, £87 10s.

HASTINGS CORPORATION.—English Electric Co., Ltd., supply of switchgear, £11 395. Barber and Colman, Ltd., provision of electric traffic signals, £1 387. (Both recommended.)

NEWBURY CORPORATION.—Ralph E. Smart and Co., installation of electric motors, starting gear, centrifugal pumps and ancillary works, at sewage pumping station, £816 5s. 6d. (Recommended.)

EALING CORPORATION.—Mead and Jeffery, Ltd., electric wiring of houses on North and South Roads, £1 182 1s. 6d.; W. G. Hutt, electric wiring of council houses on Northolt housing estate, £370.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., works in connection with street lighting, £1 848; Enfield Cable Works, Ltd., supply of cables, £732. (Both recommended.)

SOUTHEND CORPORATION.—Greenwood and Batley, Ltd., two 15-cwt. Greenbat trucks (type J.2), £358; two trailers, £50; one generator, £68, charging panel, £57, and spare battery, £48, in connection with pier tramway.

WEST HAM GUARDIANS.—Relay Automatic Telephone Co., installation of internal telephones at Children's Homes, £233. Other tenders: Siemens-Schuckert (Great Britain), Ltd., £133, and Shipton Automatic Telephone Co., £142 10s.

METROPOLITAN ASYLUMS BOARD.—L. G. Tate and Co., Ltd., electric lighting at Caterham Mental Hospital, £184 10s.; Solus Electrical Co., Ltd., supply of X-ray couch and stand at Tooting Bec hospital, £209 10s. (Both recommended.)

METROPOLITAN ASYLUMS BOARD.—Alpha Manufacturing and Electrical Co., Ltd., electric light alterations at South-Western Hospital, £130 10s.; Hart Accumulator Co., Ltd., replacing storage battery at St. Luke's Hospital, £258 6s.

HORNSEY CORPORATION.—Reason Manufacturing Co., Ltd., Ferranti, Ltd., and Chamberlain and Hookham, Ltd., 12 months' supply of meters; Venner Time Switches, Ltd., 12 months' supply of time switches. (Both recommended.)

LONDON COUNTY COUNCIL.—Supply of insulating materials for 12 months: L. Andrew and Co. (£410), Hammett and Andrew (£320), Macinlop, Ltd. (£76), Mica Manufacturing Co., Ltd., Mica and Micanite Supplies, Ltd., the Pomona Rubber Co. (£393), Rubber Industries, Ltd., Rykneld Mills Co. and A. A. Sample.

GENERAL POST OFFICE.—Additional loading, London-Derby cable, Standard Telephones and Cables, Ltd. Telephone Exchange equipment: Lewis Berger and Sons, Ltd., Relay Automatic Telephone Co., Ltd.; Silverthorn (Chingford), Automatic Telephone Manufacturing Co., Ltd.; Perth, General Electric Co., Ltd.

GLASGOW.—Supply of motors in connection with change of frequency: One, £355, Electric Construction Co., Ltd., two, £52 14s., L. D. and M. Co., Ltd.; 79, £2 929 2s. 7d., British Electric Co., Ltd.; seven, £119 2s., G. H. Haden; nine, £1 007, Express Lift Co.; six, £44 2s. 1d., Brook Motors; one, £131 10s., Medway Lift Co.

GENERAL POST OFFICE.—Electric lighting: Birmingham (Midland) Automatic Telephone Exchange, Reynolds and Bradwell. Telephone Exchange equipment: Bristol Central, Bristol North (Bristol multi-area), Easton, Whitchurch, Stoke Bishop, Kingswood, Westbury, Bedminster, Bristol South, and Bristol West ditto, Automatic Telephone Manufacturing Co., Ltd.; Bradbury, Agnew and Co., London, Relay Automatic Telephone Co., Ltd. Telephone repeater equipment: Bristol, General Electric Co., Ltd.

GLASGOW CORPORATION.—British Thomson-Houston Co., Ltd., 2 000 Mazda traction lamps for the tramways department; Electric Construction Co., Ltd., 15 motors (new), £1 743, and three motors (reconstructed), £375; Etchells, Congdon and Muir, two motors (exchanged), £121; Waygood-Otis, Ltd., 24 motors (exchanged), £127; A. P. Chaplin, 15 motors (new), £1 429; English Electric Co., Ltd., 79 motors (new), £2 929; Jas. Keith and Blackman, Ltd., 20 fan motors (exchanged), £121; British Thomson-Houston Co., Ltd., four motors (new), £289; Crompton Parkinson, Ltd., 14 motors (new), £636; Mather and Platt, Ltd., two motors (new), £108.

BRITISH PLANT FOR URUGUAY.

The Metropolitan-Vickers Electrical Co., Ltd., has recently secured an order for the complete machinery and plant for the new Montevideo State super power station. The order comprises two 25 000 kW, 3 000 r.p.m. turbo-generator sets, each with direct coupled exciter and 750 kW auxiliary alternator, central flow condensing plant, with motor driven circulating and extraction pumps, and full capacity air ejectors, a 750 kW, geared turbo-alternator, water-tube boiler equipment, pipe work and valves, 26 K6A and 62 K3 electrically operated circuit breakers, control equipment of double fronted desk type; auxiliary service switchboard, 7 400 kW of three phase station auxiliary transformers, accumulators and charging equipment, cable work and automatic telephone equipment. The contract amounts to nearly three quarters of a million pounds.

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ELECTRICITY SUPPLY.

Southend Extensions—Blackburn and Unemployment—Proposed Plant Extensions at Torquay—The Central Scotland Scheme—Important Developments in British Columbia—Dover and the Central Board.

BEDFORD Electricity Committee recommends extension of mains at the estimated cost of £1 383 10s.

Easebourne (Sussex) P.C. has decided to adopt electricity for public lighting, and has accepted the quotation of the Midhurst Electricity Co. for the erection, maintenance, etc., of 13 150 c.p. lamps.

Taunton Electricity Committee has decided to place the work in connection with its assisted wiring scheme only in the hands of registered contractors or members of the Electrical Contractors' Association.

Southend T.C. has been informed by the Electricity Commissioners that its application for sanction for a loan of £66 000 for the purchase and installation of three 1 200 kW land Diesel sets has been refused.

Blackburn Electricity Committee has requested the Electrical Engineer to report on the question of applying to the Government for a grant in aid of schemes for laying of mains, etc., to relieve unemployment.

240 000 V Cable.

A new electric cable, described as the largest in Italy, has just been brought into service. It is about 150 miles in length and carries current from the Cardano (Bolzano) station to the important industrial centres of Lombardy and Piedmont at a pressure of 240 000 V. The cable was laid in 10 months.

The Medway Board of Guardians has decided to use electricity in the institution and hospital at Chatham. It is proposed to obtain energy from the Kent Electric Power Co., the terms being for the first 3 000 kWh per quarter, 5d. per kWh and for the next 3 000, 4d. per kWh unit; and 2d. per kWh for power.

Torquay Electricity Committee seeks sanction to borrow £28 050 for 7 500 kW turbo-alternator; £40 700 for two 50 000 lb. boilers; £1 320 for two boiler feed pumps; £4 814 for switchgear and cables; £2 090 for circulating water pipes and valves; £2 006 for feed and surge tanks and piping, and £19 800 for extensions to buildings.

Inverurie (Aberdeenshire) T.C. has decided to apply to the L. and N.E. Railway Co. for a supply of electricity for the burgh from the locomotive works. In the event of the company being unable to supply the whole burgh, it is to be asked to consider the possibility of providing electric light for the new town hall and library buildings.

Whitby U.D.C. has adopted a scheme submitted by the electrical engineer, Mr. J. W. Piggott, for assisted wiring and the purchase and sale of fittings and appliances. The electricity department will undertake through local contractors the wiring of private premises to a maximum of six lighting points, and one iron plug, the department paying the contractor for the work.

Representatives of Edinburgh T.C. recently met Sir Andrew Duncan and Sir Archibald Page, of the Central Electricity Board, and Mr. M'Call, the representative in Scotland, to make preliminary arrangements for the joint opening of the extension of Portobello power station and the inauguration of the grid scheme for Central Scotland. It was arranged that the ceremony should take place early in May.

Brighton Electricity Committee has obtained sanction to borrow £50 000 for mains and services.—The Committee has voted £4 100 for the changing over of a portion of the network in the western area from 230 V to 460 V; for three new feeder panels for the sub-station in the western area and the changing over of the network in Little East Street.—The Committee has adopted a scheme for lighting Grand Junction Road and Madeira Drive at a cost of £1 275.

The Secretary for Scotland has been petitioned by the Scottish Central Electric Power Co., which supplies electricity in the counties of Linlithgow, Clackmannan, Stirling, and Dumbarton, for a Provisional Order authorising the company to increase its capital from £600 000 to £1 000 000. It is also proposed that the Electricity Commissioners shall have power to increase further the capital and borrowing powers, subject to confirmation by the Minister of Transport.

The regional town planning report of the Mid-Cheshire Committee, dealing, *inter alia*, with electricity, has just been published. The report states that the saving of the situation lies in the fact that it is only necessary to provide cables from the producing points, i.e., the Mersey Power Co., Runcorn, and the North Wales Power Co., Dolgarrog, and that the region may, by the aid of electricity, be able to retain its natural beauty, and still become industrial at appropriate points.

The British Columbia Electric Railway Co. has awarded to the Vancouver Engineering Works, Ltd., a contract for the construction of a steel penstock, nearly two miles in length, and costing $387 000, for use in connection with the enlargement of the hydro-electric power station from which the City of Victoria derives its supply of electricity. This pipe will have a diameter of 60 in., and will extend from the balancing reservoir to the Jordan River power house. Other contracts have been placed with an English company which will supply a 14 000 kW generator, costing $90 000, and an 18 000 H.P. water wheel, costing $70 000.

In a recent letter to Dover Electricity Committee, Mr. J. S. Highfield gave estimates for future cost of working the electricity undertaking (*a*) assuming the power station be developed so as to provide for a maximum load of 2 500 kW, and (*b*) assuming that local generation be stopped and the whole supply provided in bulk from the "grid" system, and pointed out that the Central Electricity Board had reduced the unit charge for a bulk supply from 2d. to 0·19d. The committee recommends that the whole supply be taken in bulk from the Board. The terms offered at £3 17s. 6d. per kW of maximum demand, plus 0·19d. per kWh, with a coal clause; the Board to pay £6 000 towards the cost of change of frequency.

Unemployment Grant.

In regard to the application by the Central Electricity Board to the Unemployment Grants Committee for a grant in aid of the proposed North East England Electricity Scheme, it is announced that the Committee has approved of a grant being made to meet for a time the burden of the expenditure involved in this scheme. Under the terms of this grant the whole of the interest charges will be met for a period of seven years, and half the interest charges thereafter, up to a total of 15 years from the date of expenditure. If, however, the development of electricity is sufficiently rapid for these charges to be borne partly or wholly by the industry without undue hardship at an earlier date, the State contribution will then be reduced or cease.

A further important extension of the transmission system of the Hammarforsen (Sweden) power station belonging to the Kreuger and Toll concern is announced. A new long distance 70 000 V transmission line will be added to the system. A new line, 136 km. long, will be built from Sundsvall southwards, *via* the town of Hudiksvall, to a point near Soederhamn, and from there to other lines as far south as the Vifors plant near the town of Gaevle—nearly 300 km. The combined power of the so-called Hammarforsen block, consisting of ten interconnected power plants, amounts to 60 000 H.P. The entire transmission system, when completed, will connect the large mills of the Kreuger and Toll wood and pulp combine and will enable it further to enlarge its capacity. The Kreuger and Toll wood pulp, timber and power concern, when finally linked together, will possess total reserves of water power of about 250 000 H.P.

The December production of electricity in the U.S.A. was 6% above that in December, 1928. Reports from representative companies throughout the country and covering the first two weeks in January, 1930, indicate that electric power production is running ahead of 1929, although recession in power demand by some industries is indicated. The use of electric welding in building construction in the U.S.A., instead of the nerve racking riveter, is becoming more and more popular. According to a recent announcement, the Southern California Edison Co. will erect a 13-storey structure which will be almost entirely electrically welded, and a 14-storey building to be erected by the Edison Electric Illuminating Co. of Boston will be the first electrically welded structure in that city. Another application of welding to the construction of city buildings will be made in Schenectady, N.Y., where a new $1 500 000 city hall is to be constructed by this method.

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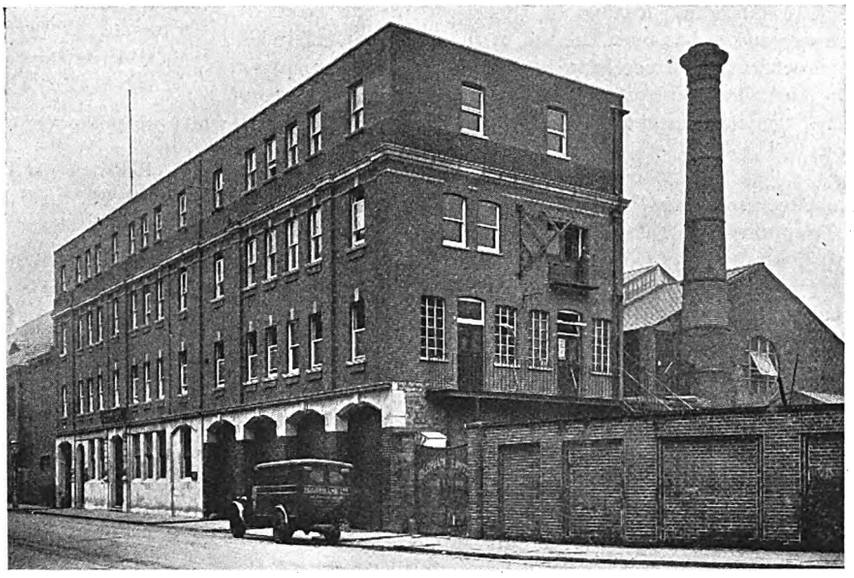
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Mr. R. M. Longman, who is leaving the Yorkshire Power Co. to become chief assistant to Mr. S. E. Fedden, engineer, Mid-East England Area. As announced in our last issue, Mr. Longman was the recipient of a special presentation on January 27th, at a complimentary concert and dance given in his honour.



Everyone in the industry is glad to hear of the progress made by firms engaged in its various branches, and so rapidly is the science of illumination developing that Holophane, Ltd., have found it desirable to add another storey to their present building. The line between the original building and the new storey is clearly defined.

Members of the Plymouth branch of the Electrical Association for Women photographed on the occasicn of their recent visit to the power station, Prince Rock.

Delegates to the annual mid-winter meeting of the National Electric Light Association. In the centre of the photograph, left to right, are Mr. G. B. McCabe (Detroit), chairman of the Underground Systems, President Hoover, and Mr. H. W. Clark, chairman of the District of Columbia Committee.

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COMPANY NEWS.

Slump in Cables and Wireless Stocks—The English Electric Reorganisation Scheme—Siemens and Halske's American Loan—Directors' Reports.

THE outstanding feature of the week in the electrical share market has been the fall in the Cables and Wireless Co.'s stocks. The cause is to be found in public recognition of the fact that the Post Office appears to be making use of foreign agencies instead of supporting Imperial Communications. The "A" stock has dropped 10 points, from 73½ to 63½; the "B" stk. 6 points, from 36½ to 30½; and the 5½% cumulative preference stock 2½ points, from 98½ to 96. American Telephone and Telegraph capital stock has been marked up 10 points, to 235. Radio Corporation of America shares are a point up, having risen to 39; Hydro-Electric Securities have receded from 44 to 43¼; and International Holdings are unchanged. International Telephone and Telegraph stock has weakened from $75 to $73.

Elsewhere there are few important movements to record. In the manufacturing section, the English Electric Co.'s shares have fallen from 5s. to 3s. 9d., on the scheme for reorganisation and reduction of capital; and Enfield Cable Works ordinary shares have weakened a further half-crown from £4 15s. to £4 12s. 6d. Associated Electrical Industries ordinary shares have also retrogressed slightly, having eased from 27s. 6d. to 26s. 6d.

Transportation shares have been quiet. Central London Railway ordinary stock is a point up at 72. Metropolitan District Railway ordinary stock at 74½ is ½ to the good, but Metropolitan Railway consolidated stock is 1 down at 64. Winnipeg Electric Co. Refunding Stock has improved from 84½ to 85½.

Among electricity supply shares, County of London have eased from 46s. 3d. to 45s. 7½d., but Metropolitans are 7½d. better at just over 38s. London Power 5% debenture stock at 99 has shed a point and Calcutta ordinary shares, at just under 47s., are 1s. 3d. down. Tokyo 1st Mortgage Bonds have hardened from 93 to 94. Adelaide Electric Supply Preference have advanced 6d. from 20s. 6d. to 21s.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	,, ,, "C" Cum. Pref. ..	21/-	20/6	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	61/3	61/3	78/-	29/9
6	,, ,, ,, 6% Cm. Pf.	23/-	23/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	46/10½	48/1½	60/-	32/6
5	,, ,, 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	36/3	36/3	41/6	26/6
8	,, ,, ,, ,, 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	45/7½	46/3	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(*g*)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	,, ,, ,, 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	47/1	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	,, ,, 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	,, ,, 4½% 1st Mt.Deb.Stk.	89	89	92	80½
—	Hydro Electric Securities.. ..	43¼	44	87	20
—	International Holdings	5⅞	5⅞	35½	6
(*c*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/6	27/6	32/9	22/10
6	,, ,, ,, 6% C. 1st. Pref.	27/6	27/6	28/6	24/9
7	,, ,, ,, 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	26/6	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	100	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
1/9⅜	Metro. Elec. Sup. Ord.	38/1½	37/6	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	28/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2⅜	N'castle-upon-Tyne Elec. Sup. Ord..	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	11¼	9¼
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(*c*)	St. James & P.M. Ord. (£1) ..	25/6	25/6	28/6	23/6
8	Scottish Power Ord.	30/-	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/-	26/-	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94	93	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	60/-	60/-	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	80½	80½	85	70½
5	British Col. Elec. Rly. Pref. Stk.	89½	89½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	,, ,, ,, ,, 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	,, ,, ,, 5% Cum. Pf.	12/6	12/6	15/9	13/-
4	Cent. Lon. Ry. Ord. Stk. (asstd.)..	72	71	74⅜	54
4½	,, ,, ,, 4½ Pf.	79½	79½	85½	78
4	,, ,, ,, 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	,, ,, 4% Perp. Deb. ..	76½	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	72½	72½	79	42½
4	,, ,, ,, ,, 4% Pf. Stk.	72	72	77	68
4	,, ,, ,, ,, 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	50½	50½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	,, ,, ,, 5% Deb. ..	70½	70½	72⅝	65½
3½	Met. Rly. Cons. Ord. Stk. ..	64	65	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	62	62	76	60½
3½	,, ,, ,, 3½% Deb. ..	67½	67½	73⅜	67½
5	Met. Dist. Rly. Ord. Stk. ..	74½	74	81⅜	52½
4½	,, ,, ,, 4½% 1st Pref. ..	80½	80½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	112½	112½	118⅜	110
5	Rio de Janeiro Trm. 50 yr. Mt.Bds.	85½	85½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	23/-	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	85½	84½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	26/6	27/6	58/6	26/3
8	,, ,, ,, 8% C.P.	51/10½	51/10½	56/9	49/6
4	,, ,, ,, 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	99/4½	56/-
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	,, ,, ,, 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153⅜	120
15	Callender's Cable Ord.	73/9	73/9	91/3	63/9
6½	,, ,, 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
5	,, ,, ,, 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	,, ,, ,, 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	,, ,, 7% C.P. ..	20/-	20/-	22/9	20/-
4	,, ,, 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	92/6	95/-	112/6	60/-
7½	,, ,, ,, 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	5/-	15/9	3/-
—	,, ,, 6% C.P.	7/6	7/6	18/9	5/-
5½	,, ,, 1st Mt. Deb. ..	86	86	103½	86
6	,, ,, Conv. Deb... ..	64½	68½	107⅞	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	17/6	92/3	17/10½
10	,, ,, 7% Partic. Pref. ..	28/9	28/9	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	46/3	81/3	26/6
6½	,, ,, "A" C.P.	24/-	24/-	26/-	22/-
7½	,, ,, "B" C.P.	25/6	25/6	27/9	22/9
7	,, ,, 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	121/3	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	,, ,, ,, Cum. Pref.	31/3	31/3	34/3	28/9
4½	,, ,, ,, Deb. Stk. ..	91½	91½	95	88¾
10	Telegraph Const. Ord. (£12) ..	27	26	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	235	225	314½	144½
4½	,, ,, ,, Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	,, ,, 6% Prefd. Stk.	102½	102½	105½	91
1½	,, ,, Deferred Stk.	24	21	27	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	63½	73½	90½	73½
—	"B" Ord. Stk.	30½	36½	104	33
—	5½% Cum. Pref. Stk. ..	96	98½	99	90
3½	Eastern 3½% Pref. Stk.	62½	62½	70½	58½
4	,, 4% Deb.	76	76	81½	73
4	Eastern Extension 4% Deb. Stk.	76	76	80½	73
22	Great Northern Telegraph (£10)	31	31	43½	26
—	International Teleph. & Teleg. ..	$73	$75	161½	48½
15	Marconi Int. Mar.	45/-	46/3	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	97½	97½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	39	38	115⅜	18½
4½	United R. Plate Teleph. 4½% Deb.	87½	87½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(*a*) 19$^{6}_{10}$d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7.181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2$^{3}_{8}$d. per share.

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Directors' Reports, etc.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—Fin. div. of 13·12d. p. sh., making 1s. 9·12d. is announced.

YORKSHIRE ELECTRIC POWER CO.—Fin. div. of 5% on ord. shs., making 8% for year (same as last year) is announced.

CITY OF BUENOS AYRES TRAMWAYS (1904), LTD.—Fin. div. of 1/3 p. sh., makg. 5% for year; to amortisatn. and gen. fund £10 000. Fwd. £501.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—A syndicate, headed by Messrs. Morgan, offered $50 000 000 of the corporation's 25 year 5% deb. bonds at 96½ last Saturday.

ST. JAMES'S AND PALL MALL ELECTRIC LIGHT CO., LTD.—Blce. divs. of 8·4d. p. sh. on £1 pref. shs. (=3½%) and 9·949d. on ord. shs., makg. standard div. for year, have been declared.

DUBLIN UNITED TRAMWAYS CO., LTD.—The directors decided on Jan. 28 not to recommend a div. on the ord. stk. Usual div. on pref. shs. will be paid. Set aside for track renewals, £20 000. Fwd. £12 037.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Int. on 4% mtge. deb. stk. for half-year endg. Jan. 31 will be paid by warrant on Feb. 1. The 4% mtge. deb. stk. register is closed until Jan. 31, inclusive.

YORKTOWN (CAMBERLEY) AND DISTRICT GAS AND ELECTRICITY CO.—Gross pft. for 1929, £15 661. After provisn. for int. and fin. div. on pref., fin. div. on ord. is at rate of 6¼% p.a., less tax, makg. 6¼% for year. Fwd. £10 429.

HALL TELEPHONE ACCESSORIES (1928), LTD.—Net pft. for 1929, £40 365, agst. £30 094. Fin. div. 6%, less tax, makg. 12% for year, agst. 10%, fwd. £4 719, agst. £4 632. Directors propose creatn. of further 150 000 10s. shs., makg. authorised cap. 500 000 10s. shs.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—A mtg. of the proprietors will be held on Feb. 14 to consider a resolution to create 200 000 new 6% cum. pref. shs. of £1 each.—The company has arranged to place, privately, £350 000 6% cum. pref. shs.

WESTERN UNION TELEGRAPH CO., INC.—Gross revs. for 1929 amtd. to $148 387 403, agst. $139 387 320 for 1928, total exes. were $129 286 765, agst. $120 310 256, and $3 610 065, agst. $3 609 405, is deducted for int. on bonded debt, leavg. net income $15 490 573, agst. $15 467 659.

METROPOLITAN RAILWAY CO.—Gross receipts for 1929 increased by £36 000. Fin. div. of 2¾% on ord. stk. proposed, makg. 4% for year, agst. 3½% for previous year. To res., £10 000; fwd., £32 016, agst. £23 888. Div. on surplus lands stk., 2⅜%, makg. 3⅜% for year. agst. 3¾%.

INTERNATIONAL MARINE RADIO CO.—The Marconi International Marine Communication Co., Ltd., states that no agreement of any kind has been arranged between it and the new International Marine Radio Co. which has been formed by the International Telegraph and Telephone Corporation.

ANDHRA VALLEY POWER SUPPLY CO., LTD.—Net pft. for year to June 30, 1929, Rs. 736 183, to wh. is added Rs. 100 082 brt. in. Set aside for depreciatn. on investmnts., Rs. 135 000; written off agst. loss on investmnts. sold, Rs. 7 777. Div. on pref. shs., 7% for year; div. on ord. shs. 2%, tax free. Fwd. Rs. 29 188.

AMERICAN COMMONWEALTH POWER CORPORATION.—Rev. for 1929, $25 593 046, agst. $17 871 714; net income, $11 322 693, agst. $7 056 828. After provision for funded debt charges and pfd. divs., blce. is $3 855 779, increase $2 579 631, equal to $2·29 p. sh. on combined class "A" and "B" stocks.

TRACTION AND GENERAL INVESTMENT TRUST.—Net rev. for 1929, £85 958, agst. £74 432, out of which int. divs. have bn. paid amtg. to £27 092. Transferred to res., £11 739, agst. £10 000. Final divs. of 2½% on pref. stk., and 11% on ord. stk., making 17% for year on the latter stk., agst. 16%. Fwd. £42 508, increase £6 710. Investmts., £2 145 099.

CIA CHILENA DE ELECTRICIDAD, LIMITADA.—The numbers are published of 40 series "A" £25 bonds, 80 series "B" £100 bonds, 44 series "C" £1 000 bonds and 6 series "D" £500 bonds wh. were drawn on Jan. 2 for redemption and will be repaid at nom. value on Feb. 28, w. int. for six months endg. on that date, at the Anglo-South American Bank, 117, Old Broad Street, London, E.C.2.

BRITISH COLUMBIA ELECTRIC RAILWAY CO., LTD.—The company has placed contracts totalling $500 000 (£100 000) for constn. of fourth generatg. unit of Jordan River plant on Vancouver Island. More than half the amt. will be spent in British Columbia, and the whole sum within the British Empire. In addition, it is estimated that about $200 000 (£40 000) will be spent in installg. the equipmt.

ALLGEMEINE ELEKTRICITATS-GESELLSCHAFT.—Rpt. for year ended Sept. 30th, 1929, shows gross pft. RM. 39 682 925, plus RM.515 195 brt. in. Taxes RM.12 113 744; written off buildings and machinery RM.5 911 668; discount on American loan RM.3 000 000; net pft. RM.19 172 708. After payment of 6% div. on pref shs., 5% on "B" pref. shs. and 9% on ord. shs., carry fwd. is RM.3 404 857.

LONDON POWER CO.—Output of stations in 1929 advanced by 23·46% to 733 238 288 kWh, and kW demand by 11·45% to 270 500. There was increase in proceeds from sale of currt. of £249 788, to £1 890 950, total income being £1 899 919, increase £252 951. Rev. blce. is £866 373, agst. £683 490, and in addtn. net interest receipts yielded £53 528, agst. £4 896. After provisn. for deb. int. and other charges, blce. is £3 000, which is applied in paying div. of 6% on sh. cap. held by the ten constituent companies.

NEW ENGLAND POWER ASSOCIATION.—This association, which is controlled by International Hydro-Electric System, a division of International Paper and Power Co., produced electricity during the year 1929 amtg. to 1 751 669 000 kWh, an increase of 27% over 1928. The associatn. has under constructn. a 200 000 H.P. hydro-electric developmt. on the upper Connecticut River at the Lower Fifteen Mile Falls site. This will be the second largest hydro-electric plant east of Niagara Falls and is expected to be in operatn. by Oct. 1, 1930. The associatn. will expend $20 000 000 for constructn. during this year.

SINGAPORE TRACTION CO., LTD.—Gross rev. for year to Sept. 30, 1929, £174 047, agst. £142 182. Net pft., £51 098, increase £13 839. Directors have appropriated £4 247 agst. £4 000, to deb. stk. redemptn., £3 000 to writg. off disct. and commissn. on same, and £15 000, agst. £10 000, to depreciatn. and renewals. It is proposed to pay div. of 7%, against 5%, on the 7% cum. pref. on acct. of arrears, leavg. arrears of 11%. This will require £14 000, and carries with it paymt. of similar sum to managers. Fwd. £3 357, agst. £2 539. At date of accounts, the 19 miles of route authorised for trolley bus operatn., under the tractn. ordinance, were completed and in use. Total length of trolley bus routes was increased to 22·31 miles by extensions constructed and equipped during year. As compared with precedg. year, number of vehicle miles run increased 26·9%, and passengers carried 19·4%. Vehicles in service consist of 108 trolley buses and 7 motor buses.

SIEMENS AND HALSKE'S AMERICAN LOAN.—The General Electric Co. of New York (which acquired a large interest in the Allgemeine Elektrizitäts-Gesellschaft, Berlin, in August last) is to take over a considerable part of a 1 000-year loan issued in America for Siemens and Halske Akt.-Ges. Messrs. Dillon Read and Co., of New York, on Tuesday invited subscriptions for the loan, which consists of participatg. debs. series "A" amounting to $14 000 000 (£2 800 000) nominal. The debs. are offered at 233%, and the actual amt. therefore will be $32 000 000 (£6 400 000). The debs. will carry int. at rate of currt. div, or not less than 6% on nom. value, and may be redeemed at nom. value any time after 75 years. They may be called in by company any time after 1942 at rate ruling on New York stock markets, provided this is not lower than issue rate. The German part of the loan will have a nom. value of M.10 000 000 (£500 000), and is to be offered to shhldrs. in proportn. of one deb. for every 10 shs. held, at 175%. The new cap. will therefore amt. altogether to nearly M.150 000 000 (£7 500 000). Messrs. Siemens and Halske have agreed to a large amt. of the loan being taken over by the General Electric Co. of New York. In the present case Siemens and Halske have not disposed of shs., and the General Electric obtains neither votg. rights nor a voice on the board.

ENGLISH ELECTRIC CO., LTD.—Particulars of a scheme to reduce cap. by about £1 755 000 and to provide £750 000 of new cap. were sent to shhldrs. on Monday. Losses disclosed in the blce. sheet for 1927 showed that new arrangements would have to be made. The substantial economies which had been effected have not enabled the company to earn the whole of the deb. int., and the letter to the shhldrs. states that it is essential, if the company's fortunes are to be retrieved, that the present cap. charges should be substantially reduced and that fresh cap. in the form of cash should be provided. Messrs. Lazard Bros. have co-operated in the preparatn. of a scheme which will ensure the provision of

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£750 000 of new cap. by the subscriptn. in cash of ord. ssh. at par. Amongst the proposals are (1) extension of period for repaymt. of 5½% debs. from 1940 to 1960, (2) conversion of 6% deb. stk. to the extent of 50% into 6½% pref. shs. and 15% into £1 ord. shs., the remaining 35% of 6% deb. stk. to become non-convertible, (3) the writing down of pref. shs. from 20s. to 12s. 6d. p. sh., of which 10s. p. sh. will be represented by pref. shs. and 2s. 6d. p. sh. by ord. shs., the reduced pref. and ord. shs. to be consolidated into shs. of £1 each (reduction of pref. shs. amtg. to £368 838), and rate of div. on pref. shs. to be raised from 6% to 6½%, (4) the writing down of issued ord. shs. from 20s. to 3s. 4d. p. sh. (a reduction of £1 386 690) and their consolidation into £1 shares. It is the intentn. to reconstruct the board and existg. directors have given undertakg. to resign if called upon to do so by Lazard Bros. and Co., and to elect the nominees of that firm in place of the directors so retiring. The control of the company will, however, remain, as heretofore, in British hands. Provided the scheme is carried through by June 30th next, Messrs. Lazard Bros. and Co. have agreed, on behalf of themselves and their associates, to subscribe at par and to pay up in cash within fourteen days of the scheme becoming operative, £750 000 of ord. shs. in the cap. of the company as reorganised. This new cap. will enable all bank overdrafts to be liquidated, and will provide a substantial sum for re-equipmt. The capitalisatn. of the company, if the scheme becomes operative, will (subject to adjustmt. in respect of fractns.) be as follows:—5½% sinkg. fund 1st mtgge. deb., £656 200; 6% deb. stk., £450 863; 6½% pref. shs., £1 135 874; ord. shs., £1 343 511. Mtgs. to consider the scheme are called for Feb. 25.

Company Meetings.

Aldershot Gas, Water and District Lighting Co.—Mr. R. W. Edwards, presiding at the meeting last week, said the electricity department had shown further development during 1929. The advance in sales was 16·2%, and in this the increase for other than lighting was 35.3%. The following apparatus has been fixed during 1929: lamps 5 690, motors 11, fires 180, cooking apparatus 23, sweepers 76, irons 57, miscellaneous 59. The price for lighting was reduced, between Christmas 1928 and Christmas 1929, by 0·9d. The price for purposes other than lighting has also been reduced by 1d. per kWh during the same period. The company will shortly make an issue of 5% perpetual deb. stk.

Traction and General Investment Trust, Ltd.—Mr. H. A. Vernet, presiding at the meeting on January 30th, said, the amount of interest and dividends received, £122 945 compared with £107 879 for 1928; and after payment of management expenses and interest on debenture stock, the balance carried to the balance sheet was £85 957, against £74 432. Deducting preference dividend, £22 206, there remained available for the ordinary stock £63 752. The directors proposed a dividend of 17%, which requires £45 302 and left a surplus for the year of £18 450. They had transferred £11 739 6s. to the reserve account, bringing that account up to a round £325 000. The balance remaining to be carried forward amounted to £42 508, the equivalent of about 16% on their ordinary stock, and compared with £35 797 brought in. He trusted that, in the circumstances, they would not be deemed extravagant in proposing an increase of 1% in the dividend on the ordinary stock. The report and accounts were adopted, the payment of interim dividends of 2½% on the preference stock and 6% on the ordinary stock (less tax) were confirmed, and final dividends of 2½% on the preference stock and 11% on the ordinary stock (less tax) were approved.

Perak River Hydro-Electric Power Co., Ltd.—Viscount Elibank, presiding at the adjourned annual meeting on January 29th, said the important matter to be considered was the increased cost which had been incurred on the original scheme, and the plan now proposed for financing both that and the extension of the Malim Nawar steam station—also the approval now sought to the loan of £850 000 by the Federated Malay States Government, secured by a charge ranking in front of the 7% participating debenture stock. It was a matter of real help and importance to the undertaking that it had been possible to obtain the offer of so large a sum of £850 000 at so low a rate of interest and without incurring the usual costs of raising capital. Until solid rock had been reached for the foundations of the massive dam superstructure it had not been possible to forecast with any certainty the probable ultimate cost. It had been the cost of the civil engineering work which had been the more largely exceeded; the electrical engineering works should not exceed by more than 10% the original estimate. The board had settled with the contractors a fixed sum for the completion of the dam and power house, and had done all they could to ensure that the estimated excess cost of £600 000 could not be further increased. The Federated Malay States Government had agreed to advance the required sum of £850 000 at the low rate of 5% ranking after the 5% debenture stock, and, naturally, prior to the 7% participating debenture stock. When completed the construction scheme would enable them to sell 160 000 000 kWh per annum, and they were already generating 75 000 000 per annum. In their concession area there was prospective business corresponding to an output of at least 400 000 000 kWh per annum which had not yet been tapped. The proposals of the board were approved.

New Companies.

Northern Rhodesia Power Corporation, Ltd.—Cap., £330 000. Electric supply company. Reg. Office: 4, London Wall Buildings. London, E.C.2.

Hilyer and Marchant, Ltd.—Cap., £2 000. Shop fitters, electrical engineers, etc. Reg. Office: 83, Lancefield Street, Queens Park, London, N.W.10.

Lacys (Leeds), Ltd.—Cap., £2 000. Manufacturers of and dealers in articles connected with electric lighting, wireless telegraphy, telephones, etc. Reg. Office: 18, St. Ann Street, Leeds.

Ryland's Electrical Co., Ltd.—Cap., £1 000. Electrical engineers, contractors and agents for and factors of electrical equipment, etc. Reg. Office: York House, 42A, Goodmayes Road, Goodmayes.

Ramsbottom Electrical Heating and Lighting Co., Ltd.—Cap., £500. Electricians, electrical engineers and contractors, dealers in electricity, wireless sets, etc. Reg. Office: 25, Bridge Street, Ramsbottom.

Light, Power and Music, Ltd.—Cap., £3 000. Electricians dealers in electricity, motive power, heat and light, wiring contractors, concert hall proprietors, etc. Reg. Office: 22 and 23, Laurence Pountney Lane, Cannon Street, London, E.C.

Chorlton Radio and Cycle Co., Ltd.—Cap., £100. Manufacturers of, agents for and dealers in electrical and other instruments, appliances, supplies and components, connected with wireless telegraphy, etc. Reg. Office: 41, John Dalton Street, Manchester.

Telephone Manufacturing Co., Ltd.—Cap., £250 000. To acquire the business carried on by Telephone Manufacturing Co., Ltd., other than shares in the subsidiary companies referred to in an agreement with F. C. T. Lane and Telephone Rentals, Ltd., and to carry on the business of makers, sellers, installers, etc., of private or other telephones and telegraphs, makers and sellers of electrical apparatus, etc. Reg. Office: Hollingsworth Works, Martell Road, West Dulwich, London, S.E.21. (Public Co.)

METAL AND CHEMICAL PRICES.

Tuesday, February 4th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£77 5 0	15s. 0d.	—
Electro Wirebars	„	£84 5 0	10s. 0d.	—
H.C. Wires, basis	per lb.	11¾d.	—	—
Sheet	„	12 1/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2¾d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet „	„	10¾d.	—	—
Wire „	„	10¾d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	—
Foreign or Colonial	„	£21 12 6	—	—
Tin—				
Ingot	per ton	£175 0 0	5s. 0d.	—
Wire, basis	per lb.	2s. 4¼d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£19 17 6	—	—
Mercury	per bottle	£23 5 0	—	—

Sulphur—Flowers, Ton £12 0 0; Roll, „ £10 10 0. *Copper Sulphate* .. Ton £25 to £25 10s. *Boric Acid* (Crystals) „ £30 0 0. *Sulphuric Acid* (168° Tw.) Ton £6 15 0. *Sodium Chlorate*—Per lb., 2¾d. *Sodium Bichromate*—Per lb., 3¾d.

Rubber—Para fine, 8¾d.; plantation, 1st latex, 7 1/16d.

*** The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

According to James Forster and Co. there was little change last week, the rise of 3s. 9d. per ton for January lead being purely a market condition owing to the belated closing of a short account.

Closing prices on January 31st were £21 15s. for January, £21 11s. 3d. for February, March and April, 3s. 9d. up to unchanged on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BARSTOW, Mr. J., 50, Star Street, Paddington, wireless and gramophone manufacturer. £16 4s. 1d. December 10th.

GREAVES AND LIDDLE, 1A, Mount Pleasant, Bootle, Liverpool, electrical engineers. £18 10s. 10d. December 31st.

GUNNER, Mr. B. A., 16B, Broadway, Hatch End (trading as GROSVENOR ELECTRICAL SERVICES), wireless dealer. £16 0s. 2d. December 4th.

HOUSE REPAIR SERVICE CO., LTD., 5, Lansdowne Crescent, Bournemouth, electrical engineers. £63 17s. 2d. January 1st; £37 3s. 8d. December 18th.

JENNINGS, H., 8, Monmouth Road, East Ham, electrical engineer. £11 13s. 9d. December 20th.

MCKERCHER AND SONS, 23, Skelton Terrace, Leeds, electrical engineers. £14 19s. 11d. January 1st.

ROBOTHAM AND PINNOCK, Spencer Street, Bognor, electrical engineers. £10 12s. 10d. December 31st.

STIRLING RADIO CO., 183, High Road, Dagenham, wireless dealers. £19 15s. 11d. December 19th.

SUTTON INSULATION CO., Oldfield Works, London Road, Sutton, electrical engineers. £11 10s. 10d. January 2nd.

TAYLOR (HAROLD) AND CO., LTD., Aldermanbury, Bradford, electrical engineers. £12 17s. 6d. December 31st.

TERRACE RADIO CO., 4, Terrace Road, Upton Manor, radio dealers. £15 17s. 4d. December 11th.

WRIGHT AND CO., 15, North John Street, Liverpool, wireless apparatus merchants. £20 3s. 1d. December 17th.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CENTRAL WIRELESS CO., LTD., London, E.C. Registered January 28th, £300 debentures; general charge.

IMPROVED WILSON MICROPHONE AND ELECTRICAL CO., LTD., London, W. Registered January 17th, £150 debentures; general charge.

UNITED ELECTRIC TRAMWAYS CO. OF CARACAS, LTD., London, E.C. Registered January 22nd, series of £75 000 debentures present issue £55 000; general charge; also registered January 27th, £3 000 debentures part of £75 000; general charge. *£112 900. December 18th, 1929.

Satisfactions.

BAYLISS, NARCH AND NEWEY, LTD., Birmingham, electrical manufacturers. Satisfactions registered January 25th, £300, registered July 14th, 1927 and £300, registered December 17th, 1928.

KESWICK ELECTRIC LIGHT CO., LTD.—Satisfaction registered January 1st, £9 550, balance of amount registered July 1st, 1901.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD., London, E.C. Satisfaction registered January 2nd, £11,526, part of amounts registered February 15th, 1906, to March 10th, 1924.

London Gazette, etc.

Company Winding-up Voluntarily.

CLEETHORPES RADIO SUPPLY, LTD. Meeting of creditors at 77, Victoria Street, Grimsby, Lincolnshire, on Tuesday, February 11th, at 3 p.m., for the purpose, if thought fit, of nominating a liquidator and appointing a committee of inspection.

Bankruptcy Information.

CAMPBELL, William Rankin, Waverley Garage, Market Rasen, Lincoln, motor and electrical engineer. Receiving order, January 27th. Debtor's petition.

HALEY, Thomas William, trading as T. HALEY, 105, West Street, Leeds, plumber and electrician. Receiving order, January 29th. Debtor's petition.

Notices of Dividends.

DEAN, Joseph, electrician, 4, Gogerddan Place, Aberystwyth. First and final dividend, 3s. 8d. per £, payable February 7th, 4, Queen Street, Carmarthen.

WOODHEAD, Titus Ernest, 26, Central Drive, Blackpool, electrical factor. First and final dividend, 5s. 5d. per £, payable January 31st, Official Receiver's Offices, 9, Cannon Street, Preston.

Notices of Intended Dividends.

GATESHILL, Harry, 113, Witham, Kingston-upon-Hull, wireless engineer. Last day for receiving proofs, February 8th. Trustee, J. E. D. Stickney, 37, Scale Lane, Hull, Official Receiver.

JONES, Thomas Ernest (trading as BERRINGTON JONES), 138, Northgate Street, Chester, electrical engineer. Last day for receiving proofs, February 17th. Trustee, W. F. Small, 5, Hunter Street, Chester.

PEOVER, Harry, electrical apparatus and tool merchant, Market Lane, Newcastle-upon-Tyne. Last day for receiving proofs, February 15th. Trustee, R. K. Clark, 81, St. Mary's Place, Newcastle-upon-Tyne, Official Receiver.

THORNTON, William Haigh, 25, Bridge Street, Burnley, electrical and wireless engineer. Last day for receiving proofs, February 8th. Trustee, J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

Partnerships Dissolved.

CASSÉ AND WALKER (Harry Herbert CASSÉ and Norman WALKER), electricians, 2, St. Jude's Place, Bradford, by mutual consent as from December 31st, 1929. Debts received and paid by N. Walker, who will continue business on his own account at 2, St. Jude's Place. H. H. Cassé will carry on business on his own account at 29, Chapel Street, Bradford.

GREENWOOD AND LISTER (Denis GREENWOOD and Allan LISTER), electrical contractors and gramophone dealers, 25, Albert Road, Barnoldswick, Yorks, as from December 22nd, 1929, by mutual consent. Debts received and paid by A. Lister.

KAY AND MORRIS (Thomas KAY and William Benjamin Woods MORRIS), electrical engineers, 176, North Road, Preston, June 14th, 1929, by mutual consent. Debts received and paid by T. Kay, by whom the business will be carried on.

C. S. MAYFIELD AND CO. (Charles Smyth MAYFIELD and Frank Maynard CRANE), electrical contractors and gramophone stores, 67, Carshalton Road, Carshalton, Surrey, by mutual consent as from December 28th, 1929. Debts received and paid by F. M. Crane.

ROSSALL-CANTY RADIO COMPANY (Michael John CANTY and Thomas Richard ROSSALL), radio engineers, manufacturers and distributors, 28, Paradise Street, Liverpool, by mutual consent as from January 20th, 1930. Debts received or paid by M. J. Canty. The business will be carried on by T. R. Rossall.

STATION (ROAD) GARAGE AND ORCHESTRON RADIO MANUFACTURING COMPANY (Alfred Graham JEFFERIES and Richard CHAPMAN), wireless and motor engineers, Station (Road) Garage, Warminster, Wilts, by mutual consent as from December 24th, 1929. Debts received and paid by R. Chapman, who will continue the business.

Winding-up Petitions.

ELECTRICAL STORAGE CO.'S PETITION.

In the Companies Court on Monday, Mr. Justice Maugham had before him the petition of the Chloride Electrical Storage Co., Ltd., of Manchester, for an order for the compulsory liquidation of British Talking Pictures, Ltd. Mr. Cecil Turner, for the petitioners, said the petition was supported by creditors for £47 508 and opposed by creditors for £94 000. A committee of creditors had been appointed, who believed that the assets of the company, which were substantial, could best be preserved by an adjournment and an arrangement.—Mr. Lionel Cohen, K.C., for the supporting creditors, said they supported the proposal for a month's adjournment and for the appointment of a provisional liquidator in the meantime.—Mr. Heckscher, for the opposing creditors, agreed to this course.—Mr. Cohen said that as the result of the scheme that had been drafted it was hoped that all the creditors would be paid in full.—His lordship assented to the arrangement for a month's adjournment and the appointment of the Official Receiver as provisional liquidator in the meantime. Mr. Cohen mentioned that among the creditors supporting the petition were the General Electric Co., Radio Instruments, Ltd., and the Plessey Co.

GRAMOPHONE CABINETS, LTD.

Mr. Justice Maugham, in the Companies Court on Monday, again had before him the petition of the London Electrical Co., of Sherborne Lane, E.C., for an order for the compulsory liquidation of Gramophone Cabinets, Ltd.—For the petitioners Mr. Swords said it had been suggested that as the result of certain actions the respondent company would obtain money, but the petitioners were not satisfied with that.—Mr. Christie, for the respondent company, said its liabilities were £5 000 and it had obtained judgment for £10 000 against another company which could not be enforced at present. The latter company had a substantial claim against another company which, if successful would result in the respondent company's creditors being paid in full. He asked for a month's adjournment.—His lordship assented.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

320 893 A. J. Stephens (M. H. Loughbridge). System and apparatus for the electrical recording and reproducing of sound. (23/7/28.)
320 875 F. Merk. Switching-apparatus, particularly applicable to automatic telephone systems. (23/7/28.)
320 876 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes. (23/7/28.)
320 895 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric fuses. (23/7/28.)
298 219 K. Schnell. Electric plug-and-socket contacts. (6/10/27.)
320 813 J. D. Hindley-Smith and S. H. Holmes. Time controlled and operated electric switches. (24/5/29.)
320 928 British Insulated Cables, Ltd., and J. G. Lauder. Extrusion of metal. (24/7/28.)
320 901 H. Weichsel and B. McCormick. Alternating-current motors. (24/7/28.)
320 902 A. L. Jennings. Illuminated signs for advertising and like purposes. (25/7/28.)
320 903 Three Star Accumulators, Ltd., and F. C. Grund. Two-position non-spill galvanic cells. (25/7/28.)
320 905 Standard Telephones and Cables, Ltd., E. P. G. Wright, J. H. E. Baker, and C. M. Colebrook. Automatic or semi-automatic telephone systems. (25/7/28.)
320 908 A. C. Johnson. Control apparatus for combined electric lighting and heating or like installations. (25/7/28.)
320 931 J. F. Gill and J. N. Chaviara. Induction dynamo-electric machines. (25/7/28.)
320 936 Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. Earthing-devices for the metallic sheathings of electric resistance elements. (26/7/28.)
320 938 Automatic Telephone Manufacturing Co., Ltd., R. Taylor and L. M. Simpson. Telephone systems. (26/7/28.)
320 942 V. E. Richards. Apparatus for forming the depolarising element of primary electric cells. (27/7/28.)
320 944 F. E. A. B. Sewell. Wireless receiving and analogous circuits, and thermionic valves therefor. (27/7/28.)
320 950 Standard Telephones and Cables, Ltd., L. C. Pocock and R. Blackburn. Telephone transmitters. (28/7/28.)
320 952 Soc. Chimique de la Seine and V. Szidon. Method of electrolytically depositing chromium. (28/7/28.)
320 953 British Thomson-Houston Co., Ltd., and E. Regis. Liquid-tight joints for connectors in liquid-filled bushings. (28/7/28.)
320 954 British Thomson-Houston Co., Ltd., and H. L. Satchell. Machines for winding tape and the like on to strip or like material. (28/7/28.)
320 955 British Thomson-Houston Co., Ltd., and H. L. Satchell. Taping and like machines. (28/7/28.)
294 939 Vreeland Corporation. Band-receiving systems for wireless telephony and the like. (1/8/27.)
299 033 Associated Telephone and Telegraph Co. Telephone systems (21/10/27.)
295 321 E. H. Norinder. Cathode ray oscillographs. (9/8/27.)
320 968 A. Reyrolle and Co., Ltd., H. Leben and N. Cooke. Electric protective systems. (31/7/28.)
320 969 A. Reyrolle and Co., Ltd., and H. Leben. Electric protective systems. (31/7/28.)
299 864 A. Lindahl A. M. V. Hultgren and S. H. Ahde. Electromagnetic couplings (3/11/27.)
320 981 S. G. Brown. Electromagnetic devices for reproducing sound from records. (10/8/28.)
295 589 A. Helbronner and E. Dutt. Manufacture of electric batteries. (11/8/27.)

Applications for Patents.

October 17th.

31 611 Telefunken Ges. fur Drahtlose Telegraphie. High potential coupling condensers. (27/10/28, Germany.)
31 589 G. V. Twiss. Overhead transmission systems.

October 18th.

31 691 A. Massy-Allen and North and Sons, Ltd. Magneto-electric machines.
31 742 Associated Telephone and Telegraph Co. Telephone, etc., systems. (30/11/28, U.S.)
31 703 Associated Telephone and Telegraph Co., and H. F. Farmer. Means for insulating studs, etc.
31 706 Associated Telephone and Telegraph Co. Electric control systems. (23/10/28, U.S.)
31 667 W. Engelke. Light sensitive apparatus.
31 716 C. C. Garrard and General Electric Co., Ltd. Protection of electrical machines.
31 684 A. Graham and Co., Ltd., and C. H. Vaughan. Electric signalling devices for ships.
31 754 Gramophone Co., Ltd. (Victor Talking Machine Co.). Volume control for wireless systems.
31 705 International General Electric Co., Inc. Insulating papers. (19/10/28, Germany.)
31 740 A. Mozer. Electrolytic separation of copper. (29/10/28, Germany.)
31 723 Siemens-Schuckertwerke Akt. Ges. Manufacture of electric cables. (23/10/28, Germany.)
31 734 Siemens-Schuckertwerke Akt. Ges. Movable dynamo. (19/10/28, Austria).
31 689 Siemens-Schuckertwerke Akt. Ges. Reducing cross talk in telephone lines. (25/9/29, Germany.)
31 701 Siemens-Schuckertwerke Akt. Ges. Glow cathode rectifiers. (27/10/28, Germany.)
31 733 Siemens-Schuckertwerke Akt. Ges. Dry batteries. (19/10/28, Germany.)
31 699 W. S. Smith and G. E. Stevenson. Telegraph and telephone system.
31 762 A. V. Summers. Electric water pipe heaters.

October 19th.

31 851 S. G. Brown. Electromagnetic devices.
31 792 C. R. Dunham, E. K. Sandeman and P. R. Thomas. Telephone systems.
31 817 International General Electric Co., Inc. Insulating tubing. (19/10/28, Germany.)
31 805 G. Isling. Galvanometers. (19/10/28, Sweden.)
31 849 Six-Sixty Radio Co., Ltd., and D. P. Wheeldon. Connecting devices for thermionic valves.
31 775 W. E. Sparks. Clock operated switch.
31 792 Standard Telephones and Cables, Ltd. Telephone systems.

October 21st.

31 919 Allmanna Svenska Elektriska Aktiebolaget. Starting electric motors. (27/10/28, Sweden.)
31 910 J. P. Annacker, and Astral Engineering Co. Electrical fuse units.
31 947 J. W. Bamfylde, and British and Dominions Ferallay, Ltd. Electrical resistance.
31 921 O. T. Banks. Portable electric lamps.
31 959 E. Berkeley. Production of electric condensers, etc.
31 930 V. Breeze, and A. West and Co., Ltd. Electromagnetic switches.
31 913 British Thomson-Houston Co., Ltd. Protective devices for induction motors. (23/10/28, U.S.)
31 914 British Thomson-Houston Co., Ltd. Electric furnaces. (23/10/28, U.S.)
31 904 W. J. Coombes. Electric lamps.
31 906 Coventry Automatic Telephones, Ltd., and C. W. Wilman. Telephone systems.
31 915 Edison Swan Electric Co., Ltd., and S. Rogers. Clips for wiring systems.
31 892 H. R. Hayden. Signal receiving system. (19/3/29, U.S.)
31 912 International General Electric Co., Inc. Devices for measuring high voltages. (20/10/28, Germany.)
31 989 R. B. Morgan. Electric discharge tube relays.
31 933 N. V. Philips' Gloeilampenfabrieken. Wireless signals. (29/10/28, Holland.)
31 952 J. W. Punter, and Tyer and Co., Ltd. Railway signalling instruments, etc.
31 883 C. T. Rhodes. Accumulator plates.
32 111 Siemens-Schuckertwerke Akt.-Ges. Draw-in or drop-out switch sets. (14/12/28, Germany.)

COMING EVENTS.

Friday, February 7th (To-day).

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Dr. R. L. Smith-Rose on "Radio Direction Finding by Transmission and Reception." 5.15 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London. Paper by Mr. G. F. Shotter on "A New Null Method of Testing Instrument Transformers and its Applications," Messrs. R. S. J. Spilsbury and A. H. M. Arnold on "Some Accessory Apparatus for Precise Measurements of Alternating Current," and Mr. A. H. M. Arnold on "Precision Testing of Current Transformers." 7 *p.m.*

North-East Institution of Engineers and Shipbuilders (Graduate Section).—Bolbec Hall, Newcastle-on-Tyne. Joint meeting with the Institution of Electrical Engineers Students' Section. Paper by Mr. W. G. Thompson on "The Electrical Propulsion of Ships." 7.15 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Paper by Mr. G. F. O'Riordan on "Co-operation between Technical Institutions and Industry." 7.30 *p.m.*

Institution of Electrical Engineers (Sheffield Sub-Centre).—Royal Victoria Hotel, Sheffield. Annual Supper-Dance. 7.30 *p.m.* to 1 *a.m.*

Monday, February 10th.

Electrical Contractors' Association (Hastings Sub-Branch).—Lewcock's Restaurant. Ordinary meeting.

Electrical Contractors' Association. (Liverpool Branch).—Ordinary meeting. 3 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. T. W. Ross and H. G. Bell on "Recent Developments in the Protection of Three-Phase Transmission Lines and Feeders." 7 *p.m.*

Institution of Heating and Ventilating Engineers (Associate Members and Graduates' Section).—Borough Polytechnic, Borough Road, Southwark. Paper by Mr. B. T. Wingfield on "Automatic Control in Heating and Air Conditioning Installations." 7 *p.m.*

Tuesday, February 11th.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting.

Royal Institution.—21, Albemarle Street, London, W. Lecture by Sir William Bragg on "X-Ray Determination of the Structure of Cellulose." 5.15 *p.m.*

Institution of Electrical Engineers (East Midland Sub-Centre).—The College, Loughborough. Paper by Mr. G. R. J. Parkinson on "Electrical Development." 6.45 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, Leeds. Paper by Dr. J. Hartmann on "The Jet-Wave Rectifier. The Experimental and Theoretical Basis of its Design." (To be illustrated by a cinematograph film.) 7 *p.m.*

Electrical Power Engineers' Association.—Junior Institution of Engineers' 39, Victoria Street, London. Paper on "Mechanical Stokers and Their Auxiliaries." By A. W. Bennis. 7.15 *p.m.*

Institution of Electrical Engineers (Students' Section of the North-Western Centre).—Engineers' Club, Albert Square, Manchester. Paper by Mr. H. Breckell on "The Layout of a Distribution Scheme for a Small Township." 7.15 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Royal Technical College, Glasgow. Paper by Mr. W. B. Hird on "The Visit of the Institution to France." 7.30 *p.m.*

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting. 7.30 *p.m.*

Institute of Metals (North-East Coast Local Section).—Electrical Engineering Theatre, Armstrong College, Newcastle-on-Tyne. Paper by Mr. W. Richardson on "Electric Heating." 7.30 *p.m.*

Wednesday, February 12th.

Illuminating Engineering Society.—Prince's Galleries, Piccadilly, London. Annual dinner.

Institution of Electrical Engineers (London Students' Section).—Visit to Messrs. Doulton's, Ltd., Porcelain Insulator Factory, Lambeth. 2.30 *p.m.*

Institution of Railway Signal Engineers.—Institution of Electrical Engineers, Victoria Embankment, London. Annual general meeting and presidential address. 6 *p.m.*

Thursday, February 13th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Paper by Dr. J. Hartmann on "The Jet-Wave Rectifier. The Experimental and Theoretical Basis of its Design." (To be illustrated by a Cinematograph Film.) 6 *p.m.*

Electrical Wholesalers' Federation.—Savoy Hotel, Strand, London. Annual dinner. 6.30 for 7 p.m.

Institution of Electrical Engineers. (Dundee Sub-Centre).— University College, Dundee. Paper by Mr. G. H. Chalmers on "Lubrication." 7.30 *p.m.*

Optical Society.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington. Presidential address by Mr. F. Twyman, F.R.S., on "Optics in Radio Transmission and in other Fresh Fields." 7.30 *p.m.*

Friday, February 14th.

Incorporated Society of British Advertisers.—Hotel Cecil, Strand, London. Luncheon meeting of the Engineering Section. Speaker, Mr. E. E. Sharp on "Lessons from a Business Tour in Australia and New Zealand." 12.40 *for* 1 *p.m.*

Saturday, February 15th.

Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Joint visit with the N.E.C. Graduates to Messrs. Dorman, Long and Co., Middlesbrough.

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place. Paper by Mr. W. A. Hutchings on "Safety and Efficiency in Mines." 6 *p.m.*

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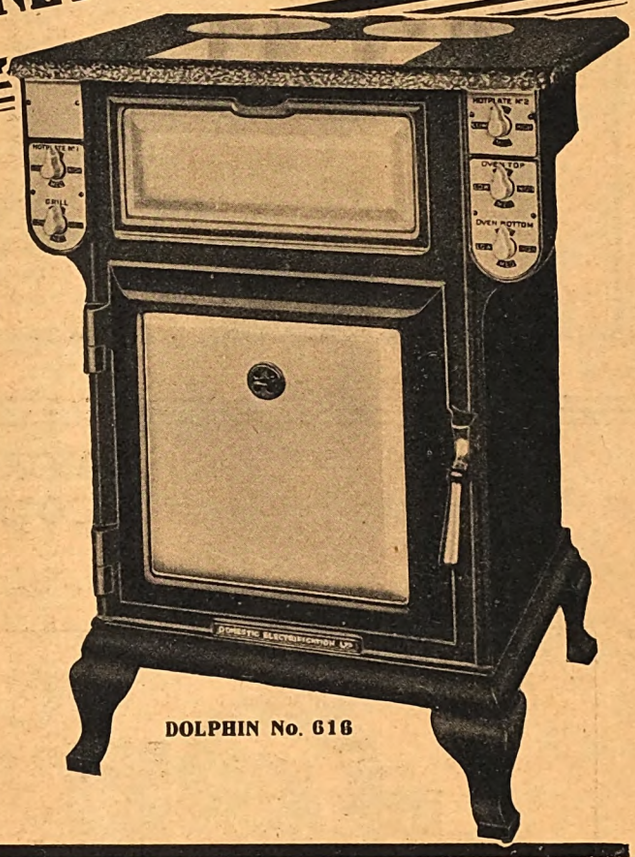

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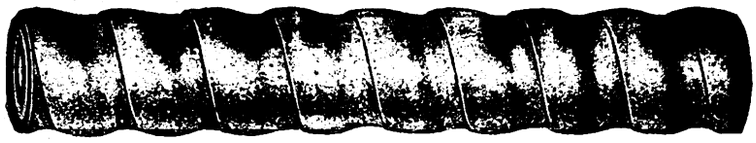

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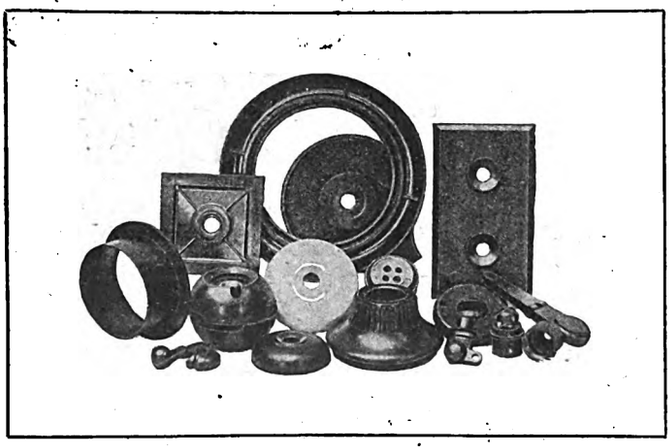

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THE ELECTRICIAN

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Coal Mines Bill.

ONE of the most difficult tasks that must be achieved before there can be a complete restoration to health of our national economy is the rehabilitation of the coal industry. The fortunes of coal mining are so closely interlocked with iron and steel and so strongly affect other branches of manufacturing, transport, foreign trade and domestic life that it is a common duty to seek diligently for a way of enabling British collieries to regain that reasonable degree of prosperity without which no industry can thrive. We are once again confronted with a governmental attempt to deal with the coal problem. Past interference on the part of the State has been disastrous—indeed, it is not too much to say that a major share of the responsibility for the industry's present condition can be fairly laid to the charge of the several administrations which have, by submitting to political pressure, caused both coal owners and miners to shirk the task of putting their own house in order and look to the State whenever they find themselves in trouble. Is there any valid reason for hoping that the latest political move in this direction will have more fortunate results?

Certainly, in its present form, the Coal Mines Bill is calculated to arouse grave misgivings. The one certain effect that can be expected from it is an increase in the price of coal for internal consumption; other consequences are altogether conjectural. It is hoped, and the hope is shared by some electrical manufacturers, that a remunerative price for coal in the home market will not only enable the collieries again to become customers for electrical machinery and equipment, but will go far towards restoring the fortunes of the iron and steel companies which are themselves large colliery proprietors. If there was a reasonable likelihood that these important results would follow we should be less inclined to quarrel with the policy of the Bill. In effect these proposals amount to a subsidy to be extracted from consumers by means of an artificial price for coal instead of being drawn from the general revenue of the country. In 1925–26 a direct subsidy was given by Mr. BALDWIN'S Government in the hope of averting trouble and many millions of public money were thrown away. Can there be any guarantee that if dearer coal enables the mines to pay their way, they will not be at once faced with fresh demands for increased wages and shorter hours which will again upset their financial equilibrium?

Unless very extensive modifications are made in the Bill as originally introduced, it is difficult to believe that it will achieve sufficient good to compensate for the harm that will be caused by an increase in the cost of fuel, much less bring about a real recovery of the coal industry. Electricity supply undertakings will have a distinct grievance. They are accused of having obtained their coal too cheaply hitherto, but it must be borne in mind that the slack which is used at power stations had no market at all before they created an outlet for it. In doing so they relieved collieries of an embarrassing accumulation of previously unsaleable material for which any price obtainable was welcome. The notion that if a prosperous business can be discovered it is a legitimate object of spoliation is far too prevalent. Electricity undertakings have not been altogether fairly treated in connection with the De-rating Act, and a second attack from Westminster will hardly find them in an acquiescent frame of mind. They will not be altogether defenceless in the face of a heavy increase in the price of coal, for they possess the financial resources to enable them to pursue fuel economy to the limit and there is always fuel oil in the background.

It is one of the avowed objects of the Coal Mines Bill to bring about amalgamations of collieries which will permit the closing of old and inefficient pits, and so allow coal extraction to be concentrated at the more modern collieries. Yet there do not appear to be any adequate safeguards to prevent the price raising that is contemplated from acting as a draught of oxygen to the moribund pits. They may succeed in prolonging a miserable existence and helping to drag down the up-to-date collieries, or they may acquire a higher, but

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fictitious, sale value, in which case any amalgamations that may be effected will start with an unduly large capitalisation. Either result will be evil. It may be said that the policy of leaving such pits to be killed by the operation of economic laws has been tried and has failed, or that at any rate the process is so slow that it is involving the whole industry in common ruin. That again may be largely attributed to the great dole of 1926. Yet in spite of the deep misgivings we entertain as to the soundness of the basic ideas upon which the Bill is built, we recognise that in the present political situation there is little likelihood that it will fail to reach the Statute Book. In these circumstances it is the duty of industry to take the broadest possible view of the situation and to endeavour to secure the introduction of amendments that will remove some of the worst features of the Bill. The Electricity Act of 1926 was an example of a measure which, in its final form, was to a great extent the result of collaboration by various branches of the electrical industry. It will be difficult to obtain the much more comprehensive collaboration needed to hammer the Coal Mines Bill into a shape that would at least secure a fair trial for the policy embodied in it. The Government will be well advised to make every effort to secure this collaboration. Its record of achievement will be coloured very strongly by the success or failure of its attempt to solve one of the most fundamental and complicated problems of British politics and economics.

Home and Export Orders.

POLITICAL uncertainty, the high money rates of the final quarter of last year, and other factors tending to check any tendency to pursue a forward policy, caused a sharp drop in electrical manufacturing for the home market last year. A fall in the index number from 92 in 1928 to 60 in 1929 was, however, counterbalanced by a rise in the export trade index number from 122 to 228. The figures for January 1930 are not yet complete, but we understand that they show a decided improvement in the home market, with export business well maintained. In the home market the grid scheme is providing a good deal of work for makers of generating plant, transformers, switchgear and cables, but the demand for industrial motors has been poor. Although export business is good it is secured in the face of intense international competition and at cut prices. The revival of the home demand is welcome, as the position that developed last year was upsetting the ratio between home and export trade that is necessary if a satisfactory margin of profit on the entire output is to be obtained.

British Industries Fair.

BOTH the Birmingham and London sections of the British Industries Fair will open on Monday to reveal much that is new in the electrical manufacturing world. By comparison with last year the 1930 Fair is larger, while the London section has the added attraction of being held in the enlarged Olympia instead of the lath and plaster pavilions of the "White City." The Birmingham section will be visited by Prince GEORGE on Thursday, and we gather that the number of overseas visitors who have arranged to view the exhibits during the show leaves far behind the known total at this time last year. One of the most outstanding features of the Fair is the fact that for the first time in history the main restaurant has been electrified and equipment is installed capable of providing luncheons for 1 000 persons every day and teas for 2 000. If the restaurant is patronised on the anticipated scale, 30 000 people will have been provided for during the run of the exhibition, many of whom will have enjoyed the benefits of electrical cooking for the first time. We give this week our first review of the stands and if the descriptions are necessarily brief, it will be appreciated that space requirements limit our review to the newest and most interesting apparatus. Should further information be desired the addresses of the exhibitors are given so that readers may communicate direct with the manufacturers concerned. The complete programme of entertainments to various associations connected with the industry and meetings is also given. It might be suggested that such functions should be more closely associated with the overseas buyer than with electrical organisations, but many exhibitors will no doubt arrange for overseas visitors to be present. The prospects are good and, favoured with better weather than that experienced a year ago, the 1930 Fair should give a substantial fillip to home and export trade.

E.D.A. for South Africa.

DR. H. J. van der BIJL, chairman of the South African Electricity Supply Commission recently read a paper before the Association of Municipal Electrical Engineers (Union and Rhodesian) in which he strongly advocated the formation of a South African Electrical Development Association. He suggested an assessment of 0·2 per cent. of the revenue of supply undertakings with a minimum annual contribution of £10 and a maximum of £500. This might yield between £5 000 and £6 000 in the first year. Support from big manufacturing corporations, their representatives, specialist firms, contractors and retailers might increase the proposed association's total revenue to about £9 000, which would be adequate for a campaign which would produce decisive results. Dr. van der BIJL paid a deserved tribute to the work done by the British E.D.A., under the direction of Lt.-Col. VIGNOLES, during the past four or five years and suggested that the South African association should base its organisation to a considerable extent on the British model. He proposed Johannesburg as the headquarters, with local branch offices in the Cape Province, the Orange Free State, Natal and Rhodesia.

Broadcasting Failure in India.

BROADCASTING in India has not proved successful and the Indian Broadcasting Company is to be wound up. The difficulty of collecting licence fees has been one of the chief obstacles to making ends meet; but perhaps the impossibility of pleasing such a multilingual community has been an equally serious obstacle. European listeners complained that too much of the transmissions was only of interest to Indians, and doubtless Bengalis, Gujeratis, Tamils, and other linguists felt that the other fellow was getting more than his share. At any rate an interesting attempt to provide India's continental medley of peoples with one of the latest Western diversions has had to be abandoned. It is but another demonstration of a fact which is far too little appreciated in this country—that India is much less a single national unit than Europe.

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MOULDED INSULATING COMPOSITIONS.

Improved Quality and Increasing Variety—Development of New Processes—Important and Flourishing Industry—Cold and Hot Mouldings.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

MOULDED compositions have an initial importance in electrical design corresponding with that of their prototypes metal castings in mechanical construction, in that they make possible and convenient the use of specially shaped pieces which would otherwise be difficult and expensive to form. It is not surprising therefore that the manufacture and use of moulded insulation have attracted considerable attention, resulting in the development of materials of improved quality and increasing variety. In recent years a considerable number of new processes have been developed, helped greatly by the fact that a very extensive market apart from electrical work has been found for many of the products, and the manufacture of moulded compositions is now an important and flourishing industry with at least one illustrated journal in this country entirely devoted to its interests.

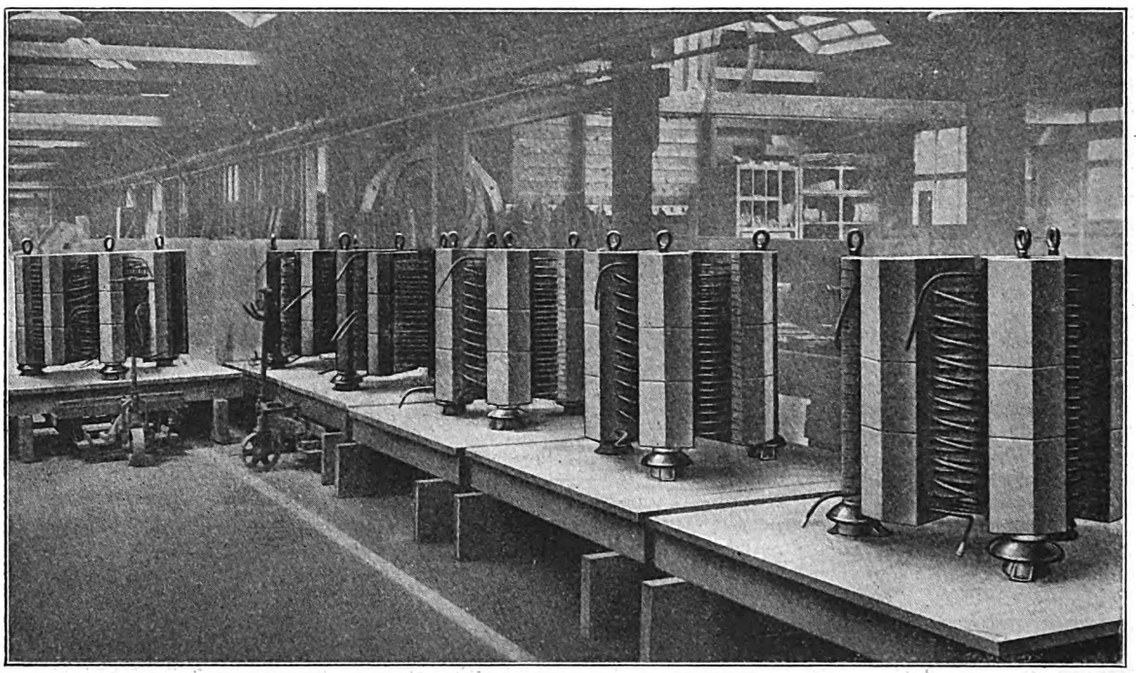

Fig. 1.—Concrete mounted reactance coils in the cement moulding shop.

The materials now available include in particular compositions of hydraulic (portland or similar) cement, bitumens, natural clays, natural resins and gums, synthetic resins, rubber, cellulose compounds, and casein. The products of these bonding materials with various other materials used as fillers constitute such a variety and are described by such a multiplicity of class names and special trade names that they must be a subject of some confusion to many electrical engineers.

At the outset it may be helpful to indicate a simple method by means of which a sample of moulded composition may usually be identified with regard to its basis or bonding material. This method consists in applying a flame—a burning match will do—to the sample and noting the result, especially the smell produced. Under this test materials with a basis of hydraulic cement or natural clays are unaffected; bitumens burn with a smell of pitch; resins and gums soften and burn with a smell somewhat like that of sealing wax; synthetic resins can be detected by the smell of phenol, which is like carbolic; cellulose burns slowly, the line of flame being preceded by blisters and bubbles in the material; casein burns with a spluttering flame and gives off a distinct smell of cheese. Since moulded composition almost invariably assumes the characteristics of its basis material, the burning test will often give an immediate and fairly reliable indication of the service for which the material may be suitable.

As regards method of manufacture moulded compositions may be divided into two classes, one class including those produced with bonds which are plastic at atmospheric temperature and solidify on exposure to the atmosphere, and the other class produced with bonds which become plastic under the influence of heat.

Cold mouldings include compositions with a basis of hydraulic cements, natural clays and sodium silicate. Plain hydraulic cement mouldings are made in moulds without pressure. The applications for such material are not many, but an example is illustrated in Fig. 1, which shows a group of reactance coils in the cement moulding shop of the Metropolitan-Vickers Electrical Co. The turns of each coil are embedded in a supporting frame of concrete. Cement compositions in which asbestos is used as a filler are generally moulded under pressure. Silicate of soda is sometimes used as a bonder for asbestos, but its use is very limited owing to its unfortunate tendency to develop a hairy crystalline growth in a damp atmosphere. Porcelains, steatite and other earthenware materials are also, of course, cold moulded compositions, but since they are not ordinarily so described and since they demand separate consideration, they are not included in this review.

The hot moulding compositions most extensively used in electrical work are those of bitumen, rubber, natural and synthetic resins, cellulose compounds and casein. In practically all cases they are pressure moulded. In some cases the pressing is done in two operations, the first in a preliminary or briquetting press and the second in a heavy power press.

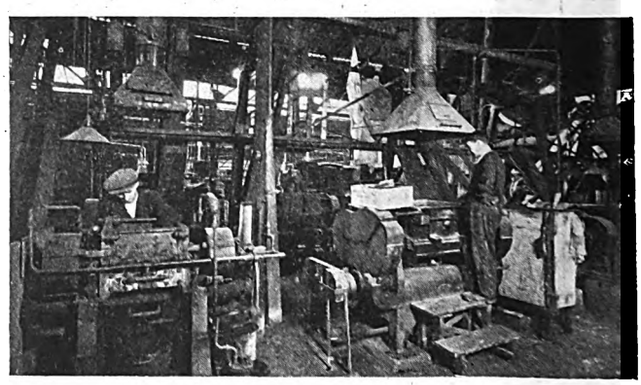

Fig. 2.—Mixing and rolling equipment.

In many cases also the process includes a curing period in heated ovens after the final pressing. Where the composition has to be cured under pressure it is often compressed in moulds which are clamped up while under the weight of the press and then removed to the ovens so as to free the presses for other work. Figs. 2, 3, 4, 5 and 6 show equipment and

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operations, typical of moulded composition manufacture, in the works of Ebonestos Insulators, Ltd.

Bitumen compositions often include fillers of wood flour, pulverised paper, cotton, asbestos, etc. The materials are mixed hot in special machines, briquetted, heated to about 100 deg. C., and pressed to shape in power presses. In most cases such materials require no further curing. Fig. 7 shows a group of moulded composition parts made by the Metropolitan-Vickers Electrical Co. Some of the items, including the meter terminal block on the left are bitumen mouldings;

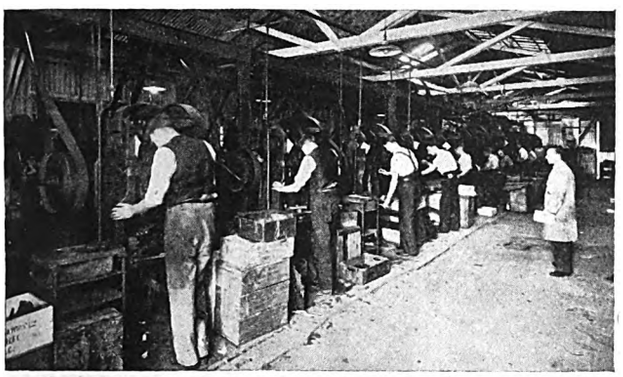

Fig. 3.—Briquetting presses.

the others are of synthetic resin basis with wood flour or asbestos fillers. In these and also in other compositions it is usually easy to incorporate metal inserts in the moulding. Some examples can be seen in the illustration.

Synthetic resin compositions are pressure moulded at a temperature of about 150 deg. C., at which temperature the resin fluxes. Unlike bitumen, however, the plastic synthetic resin changes quickly into its final solid form at the moulding temperature, and does not again soften even when raised to higher temperatures. Compositions of natural resins or gums, including shellac, are moulded at a temperature of about 80 deg. C. to 100 deg. C., and since they are permanently liable to soften if this temperature is approached they are not suitable for other than low temperature service.

Ebonite, vulcanite, stabilite and similar materials are rubber which have been subjected to a more or less extreme vulcanisation process, in which it is masticated with sulphur or antimony sulphide and subjected to a temperature of about 140 deg. C. for a period of some hours. Rubber compositions, like those of bitumens and natural resins soften if again heated even to moderate temperatures.

Regarding the newer developments of cellulose compounds and casein products it is extremely difficult to generalise, for

Fig. 4.—Power presses.

the commercial development of these materials has been very rapid and very varied, and much of the information regarding the processes is still closely guarded as trade secrets. Some indication of this state of affairs is given in connection with a description of cellulose acetate plastics published in "British Plastics" as recently as September, 1929, and regarding which an editor's note states that it is believed to be the first time such information has been published in a trade journal.

Cellulose compounds are mainly of two kinds, cellulose acetate and cellulose nitrate. Both appear to be used either with or without fillers and both materials can be obtained in the raw state for moulding, though they are more generally known in the state of finished mouldings, many of which, as also the products of casein, have an exquisitely fine appearance. Some of the trade names of the mouldings indicate their basic composition, as for instance "celastoid" and "cellastine." It is stated that cellulose acetate itself has a softening point of about 220 deg. C., but that this is lowered by the addition of certain other materials, so that the plastics can be moulded at temperatures ranging from 120 deg. C. to 190 deg. C. Cellulose nitrate, which is moulded at lower temperatures, is much used for decorative pieces of simple shape, but on account of inflammability is unsuitable for electrical work.

It may be mentioned that in the manufacture of cellulose compounds and some other moulding compositions there is a tendency to develop lower working temperatures and pressures for convenience of production. In electrical applications an opposite tendency, that is, in the direction of higher moulding temperatures and pressures, is desirable.

Casein is a product of milk. An American product, which is claimed to be the first casein composition, is known as "galalith"—the name signifying milk-stone. Among British casein compositions probably the best known are erinoid and xylonite. In cows' milk, which is chiefly used, the casein content is stated to be about 3 per cent. For the manufacture of plastic casein the milk is curdled with rennet as in cheese making. The curd is drained, pressed into cakes, ground in

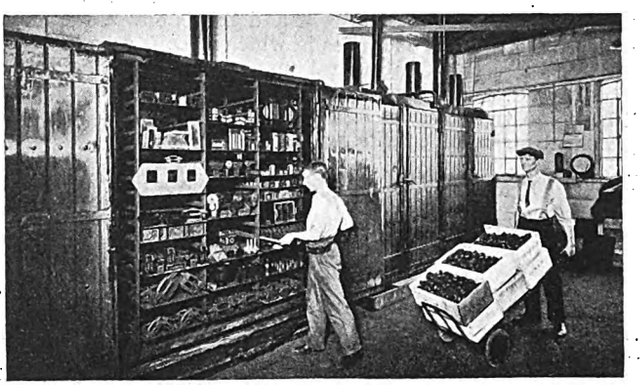

Fig. 5.—Curing ovens.

a mill and dried at a temperature of about 120 deg. F. The material is worked into rod, tube or sheet form, in which it is at first brittle but after further seasoning processes it becomes tough and usable. It should be mentioned that up to the present casein compositions are not general purpose mouldings. The sheets, rods or tubes can be softened by immersion in hot water and pressed into simple shapes but the material is not as yet suitable for thick mouldings or intricate shapes on account of its limited plasticity and the difficulty of "curing" the material in any considerable thickness.

In reviewing the various moulded insulating compositions used in the electrical industry it is convenient to classify them under the following headings according to the severity of the conditions they have to withstand :—

1. Arc-resisting materials.
2. Heat-resisting materials.
3. Hot service materials.
4. Moderate temperature service materials.
5. Normal temperature service materials.

In the absence of any British standard classification it is difficult to define the definite temperature ranges applicable to the grades above indicated, but for practical purposes the essential features may be stated as follows :—

1. Arc-resisting materials should be non-ignitable.
2. Heat-resisting materials, for such service in connectors for domestic heating equipments, should show no deformation under a bending stress of 160 lbs. per sq. in. of cross section at a temperature of 250–300 deg. C.
3. Hot service materials for safe service up to about 90 deg. C., should withstand stress as in 2 at a temperature of 120–130 deg. C.
4. Moderate temperature service materials, should withstand stress as in 2 at 90 deg. C.
5. Normal temperature service materials are for use generally at atmospheric temperatures but should show no deformation under stress at 60 deg. C.

Analysis of the requirements in regard to temperature ranges are briefly summarised in the following paragraph.

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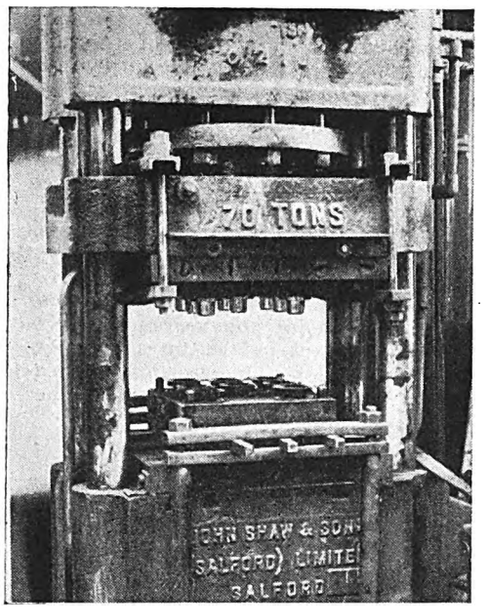

Fig. 6.—Multiple-tool power press for final hot-moulding.

In this broad classification each of the sections comprises a considerable number of subdivisions according to the characteristics which are most desirable for particular applications, as, for instance, where mechanical or electrical strength is more important, or where service in hot oil is required, or service in a humid atmosphere or in the presence of chemical fumes.

Table 1 shows a classification which has been issued by the V.D.E. after several years of work and this is now a standard service table for those countries in which V.D.E. standardisations are adopted. Continental materials usually bear the special V.D.E. mark and the appropriate class number. It will be noted that in this classification both temperature and mechanical strength considerations are taken into account. Such a classification is a valuable help in avoiding the use of materials for wrong purposes and for this reason the issue of a British specification is very desirable.

TABLE 1.

V.D.E. CLASSIFICATION OF MOULDED INSULATING COMPOSITION.

Class.	Heat-resistance.	Shearing strength.
I.	At least 150 deg. C.	At least 500 kg./sq. cm.
II.	,, ,, ,,	350–500 ,, ,, ,,
III.	,, ,, ,,	200–350 ,, ,, ,,
IV.	,, ,, ,,	150–200 ,, ,, ,,
V.	,, ,, ,,	up to 150 ,, ,, ,,
VI.	100 deg. C.–150 deg. C.	Not less than 350 ,, ,, ,,
VII.	65 deg. C.–100 deg. C.	,, ,, ,, 250 ,, ,, ,,
VIII.	45 deg. C.–65 deg. C.	,, ,, ,, 125 ,, ,, ,,
IX.	Less than 45 deg. C.	,, ,, ,, 125 ,, ,, ,,
X.	Arc-resisting materials.	

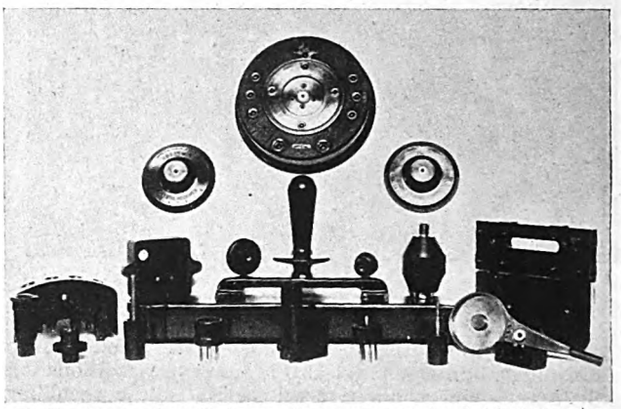

Fig. 7.—A group of moulded composition components for electrical apparatus.

(The concluding part of this article will deal with the physical and electrical characteristics of materials in the classification suggested and give some account of the methods of testing.)

ELECTRIFICATION IN AUSTRIA.

843 km. of Railways Converted Since 1923—Hydro-electric Developments—Increasing Sale of Current to Germany.

BETWEEN the beginning of 1923 and the end of 1928 about £7 000 000 was spent on the electrification of 730 km. of the Austrian Federal Railways, this representing 15% of the total length of the system. The existing programme, which includes the electrification of the railways west of Salzburg (an additional 113 km.) is practically completed.

According to a report by Mr. A. S. Phillpots, O.B.E. (Commercial Secretary to H.M.'s Legation, Vienna) on Economic Conditions in Austria, issued by the Department of Overseas Trade (Stationery Office, 2s. net), "No final decision has yet been reached as to whether the electrification has been a success in Austria from a purely financial point of view when the comparatively high rate of interest (about 10½% with amortisation) payable on the League of Nations Loan is taken into account." For this and other reasons the decision, taken two years ago, to suspend further electrification has not been changed in spite of pressure from manufacturers.

During the past two years hydro-electric works yielding an additional 55 000 H.P. (yearly mean) and more than double this amount when sufficient water is available, have been completed. More power than is required is now developed in the Austrian (the most mountainous) part of the country and the sale of current to Germany is increasing. Contracts for the export of power are limited by law to 25 years. The Ill works in Vorarlberg are in the hands of an important German company. Other provinces are less disposed to part with control of their water power to foreign interests, although American, Italian and Swiss capital has been raised by bond issues.

Between 1919 and the end of 1928 hydro-electric installations of more than 500 H.P. each to the number of 117 were installed. The mean H.P. developed is 170 809, or a maximum of 1 003 000 000 kWh. Most of these works belong to public utility companies in which the Austrian Government is interested. Federal Railways installations produce 6 600 H.P. but also buy power from the companies. Since the war the pre-war output in Austria has been almost doubled and works are now under construction which will produce an additional 113 900 mean H.P. or 667 000 000 kWh, chiefly in Vorarlberg and Tyrol.

Two large undertakings to exploit the water power of the Danube in lower Austria, one outside Vienna and the other higher up the river at Persenberg, are projected and are being examined by Government authorities. Either would yield about 150 000 H.P. and part of the power from Persenberg could probably be sold to Germany. The approval of the International Danube Commission would be required for either of these schemes. A still more ambitious project for obtaining power from the Grossglockner Mountain region is favoured by the authorities of the Salzburg province. A fall of 4 500 feet in three stages would be utilised. "Hanging canals," hundreds of kilometres in length and nearly 50 km. of tunnels would be needed. The available H.P. is estimated at 2 100 000 (6 160 000 000 kWh), equivalent to the power obtainable from 4 000 000 tons of coal. Central and Northern Germany would be the chief markets for the energy. One of the leading German manufacturing firms is said to have worked out the plans. The work might take about ten years to complete.

A syndicate of Vienna banks is likely to obtain the concession for the use of the water of the Inn, the Pitzbach and the Oetzthaler Ache to produce 67 000 H.P., in which case all orders will go to Austrian undertakings. The Zillerthal works in Tyrol, which have been begun, chiefly for the supply of current to Germany, are to be extended to produce an additional 30 000 H.P., and the German company which is exploiting the Ill may obtain a further 150 000 H.P. from the Luener Lake in Vorarlberg. Difficulties of financing are, however, likely to defer execution of some of these plans.

Austria exports large quantities of cheap radio valves and loud speaker units to Great Britain. In 1928 total exports of radio apparatus amounted to £218 000, of which Great Britain, the largest customer, took £60 000 worth, followed by Germany with £38 000. The report adds that the English lessons, given as part of the Vienna broadcasting programme by a British subject, have achieved great popularity and are doing much to spread the knowledge of the English language in that part of Europe.

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H.T. JOINTS IN MINES.

Special Features of Colliery Work—Gripping Devices to Eliminate Sweating and Plumbing—Tape and Paper Tube Insulation—Expansion of Compound.

AT a meeting of the London Branch of the Association of Mining Electrical Engineers, held in the rooms of the Junior Institution of Engineers, on February 4th, Mr. C. Grover presented a paper on the design and construction of e.h.t. joints. He said that the electrical equipment of a modern colliery in the aggregate demanded electrical energy of a bulk commensurate with the needs of a town having a population of 20 000 to 30 000 people, whilst the area over which electrical energy had to be distributed for the colliery demanded the use of long feeders. Several instances might be cited of a group of collieries covering a considerable area being fed by one, two or three generating stations linked together and delivering energy to the individual collieries of the group, thus following ordinary practice for supply of electrical energy for industrial purposes. This practice necessitated the use of transmission voltages up to 33 000, and before long higher pressures would probably be used.

The depths of shafts and the distances over which energy has to be transmitted below ground generally limited the transmission pressure to 3 300 V. The exceptional conditions under which joints and terminal boxes had to be constructed called for more than ordinary care.

Prohibition of the use of naked lights had led to the evolution of designs of fittings wherein sweating and plumbing were eliminated by the use of mechnical gripping devices. Various types of gripping devices had been marketed for jointing conductors. These fittings were usually tinned so that they could be sweated if possible, and this feature made them suitable for any class of work up to, say, 3 300 V.

Vital parts of a colliery jointing box were the glands for sealing the cable into the box and the armour grip. An efficient gland which gripped the cable without damaging it had a malleable iron casing containing a lead cone bored to suit the diameter of the lead of the cable. This was split into halves longitudinally, and an outer casting with a coned interior similar to the malleable iron casing, when drawn up by the nuts, tightly gripped the cable lead. The ends of the main cast iron box and the face of the malleable casting adjacent to one another, were machine faced and between them was fitted an annular tinned copper collar, so that when the gland was tightened up, this collar was firmly gripped. Each end of the box was fitted with these collars, which were securely bonded together with a stout copper strip, which formed the main bond between the cable leads, via the lead cones. Tests had shown that the conductivity of this system of bonding was less than that of the corresponding length of armouring between the glands. The armouring wires were gripped between the malleable iron casing and the cast iron grip so that the armouring of the cable was also efficiently bonded. The necessary longitudinal strength was, moreover, imparted to the joint and cable as a whole, relieving the interior of stress.

It was essential that at the higher voltages conductor joints should be smooth and free from sharp edges to preclude intensified local electric stresses. From three to four diameters of the conductor was an appropriate length for a conductor joint, and ¼ inch of bare conductor between the paper insulation of the core and the end of the joint on either side was adequate for working purposes, for all insulation removed had to be replaced by some means or other, so obviously the less removed, the better. Great care was necessary in cutting the cores of multi-core cables to ensure that each were of the same length, otherwise some would bulge more than others, resulting in dissymmetry of the joint as a whole. Impregnated linen tapes could be safely used for pressures up to 3 300 V, but as every bit applied had to be handled, its use for higher pressures was not generally encouraged. For 6 600 V and upwards, paper tubing insulation was mostly used instead of impregnated or prepared linen tapes. These should either be of an open construction so as to permit the free flow of the filling compound through them, or tightly wrapped as in Henley or Pirelli joints.

Standardisation.

There had, perhaps, been a greater diversity of opinion on the construction of joints for 33 000 V than those for lower voltages. Designs were now converging to a more or less standardised practice as a result of accumulated experience, for given types of cables which were now mostly the H.S.L. type, consisting of three separately lead covered cores laid up in triangular formation and armoured, and the H. type of cable—each core of which was lapped with a perforated metallised paper, the three cores being laid up and then lead covered. For the Pirelli oil-filled hollow conductor cable the jointing arrangements were very special.

Discussion.

THE BRANCH PRESIDENT (Mr. A. C. Sparks), referring to joints between generators and cable or between overhead lines and underground cables, where porcelain or some other form of insulator had to be used, emphasised that the method of bringing the conductor out through the insulator must be thought out very carefully. When the conductor heated up it lengthened slightly, and unless sufficient space was provided the compound was squeezed out. When the cable cooled down air containing moisture would enter.

MR. GROVER replied that expansion troubles had not been very great with three-core cables up to working pressures of 11 000 V. With the 33 000 V cables it was usual to adopt a trifurcating arrangement below ground. Modern designs made ample provision for expansion.

MR. LOCKWOOD asked for information with regard to expansion in straight joints, and whether there were on the market joints which would allow for the expansion of the lead as well as of the copper.

MR. GROVER said that when the cable was thoroughly impregnated the difficulty did not arise. If there were likely to be subsidence along a cable which might result in imposing excessive strain upon a joint, it was usual to lay the cable in a curve. If the cable were laid on a gradient, so that the pull was likely to be considerable, the anchoring of the cable or joint by different forms of earth anchors was effected.

MR. E. E. PICKETT asked if there were any objection to turning back the armouring over the glands. He had adopted that practice with the lower voltage cables below ground, because he had found that unless he did so the joints would pull out in the event of a fall of roof.

MR. GROVER said there was no objection to it electrically.

MR. ARTHUR E. DREW said it was gratifying, in this age of mechanisation, to note that the success of a joint depended still to a great extent upon the skill and experience of the jointer. It was not yet possible to find a compound which had not some volatile constituents. Probably, therefore, some better form of applying direct heat to the compound might be adopted. For many years there had been on the market domestic cooking utensils in which there was a steam jacket and a lightly loaded valve which slightly increased the steam pressure in the container and so increased the heat. Some form of graduated valve might be of assistance to the jointer, particularly the jointer in the colliery. Reference was made to an electrical soldering device, and one would have thought that that would have suggested an electrically heated vessel for heating the compound. Air pockets must be subjected to a great deal of pressure when the compound expanded. A good many cable joint failures might have been due to that cause.

MR. GROVER, replying, said that, with the march of progress, jointers and jointers' mates had to accommodate themselves to the new conditions. Most compounds for the 33 000-V cables were very carefully graded to give the best results. The suggestion to use a water-jacketed vessel for heating the compound was very useful, and certainly had possibilities. He believed that actually the complete equipment did make provision for electrically heating the compound. The air-jacketed vessel, although expensive, maintained its heat for a long time, and it gave good results. The breakdown strength of air followed a very definite law, with static pressure, and when a cable was hot there was a static pressure in it. The dielectric strength of the gaseous spaces was higher under those conditions than when the cable was cold, and for that reason there was a tendency for cable failures to occur when a cable was cold or cooling.

The next meeting of the London Branch is to be held jointly with the newly-formed Kent Sub-Branch, in Dover, on Saturday, March 1st.

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INSTITUTION OF ELECTRICAL ENGINEERS.

The Annual Dinner—Nearly 700 Present—Sir Thomas Purves on the Policy of the Institution—Unity with Autonomy—Value of the Engineering Mind as a Corrective to Class Consciousness.

IT is inevitable in view of the rapid growth of electrical science and engineering that the annual dinner of the Institution of Electrical Engineers should be attended by larger numbers each year. On February 6th the attendance at the Hotel Cecil was in the neighbourhood of 700, and the ever-increasing size of the assemblage must be becoming a matter of some concern both to the Secretary and the Management of the restaurant. Applied electrical science by producing the microphone and the loud-speaker has or should have removed the difficulty of making oneself heard by all present regardless of the size of the hall—there were some complaints on this score at last week's dinner—but the problem of area is less susceptible of an electrical solution. One need not look very far ahead to foresee a time when Olympia or the Albert Hall will have to be requisitioned.

The Company.

Col. Sir Thomas Purves, president of the Institution, was in the chair, and those present included :—

The Rt. Hon. Lord Monk Bretton, C.B., D.L. (Chairman, London County Council); Mr. James Swinburne, F.R.S. (Past-President); Sir J. H. Jeans, D.Sc., LL.D., F.R.S.; Sir John Rose Bradford, K.C.M.G., C.B., C.B.E., M.D., F.R.S. (President, Royal College of Physicians); Capt. J. M. Donaldson, M.C. (Vice-President); Col. Sir Charles Close, K.B.E., C.B., C.M.G., F.R.S. (President, Royal Geographical Society); Mr. W. M. Mordey (Past-President); Sir G. Evelyn P. Murray, K.C.B. (Secretary, General Post Office); Mr. Ll. B. Atkinson (Past-President, I.E.E.; Chairman, Royal Society of Arts); Sir H. Haward (Vice-Chairman, Electricity Commission); The Hon. Sir C. A. Parsons, O.M., K.C.B., F.R.S. (Honorary Member); Mons. H. Parodi (President, Société Française des Electriciens); Mr. Roger T. Smith (Past-President); Mr. H. T. Tizard, C.B., F.R.S. (Rector, Imperial College of Science and Technology); Sir Archibald Page (Past-President); Mr. A. E. L. Chorlton, C.B.E. (Vice-President, Institution of Mechanical Engineers); Mr. J. K. Bridges (President, Incorporated Municipal Electrical Association); Dr. W. H. Eccles, F.R.S. (Past-President, I.E.E.; President, Institute of Physics; President, Physical Society of London); Dr. Herbert Levinstein (President, Society of Chemical Industry); Capt. J. F. C. Bennett, J.P. (Mayor of Westminster); Mr. W. Cullen, LL.D. (President, Institution of Mining and Metallurgy); Mr. M. F. G. Wilson (Chairman, British Engineering Standards Association); Mr. H. V. Ashley (Vice-President, Royal Institute of British Architects); Prof. J. F. Thorpe, C.B.E., D.Sc., F.R.S. (President, Chemical Society); Mr. W. B. Woodhouse (Past-President); Mr. V. Watlington, M.B.E. (Chairman, British Electrical and Allied Manufacturers' Association); Prof. T. M. Lowry, F.R.S. (President, Faraday Society); Sir David Milne-Wztson, LL.D., D..L. (President, Institute of Fuel); Dr. F. E. Smith, C.B., C.B.E., F.R.S. (Secretary, Department of Scientific and Industrial Research; Secretary, Royal Society); Dr. A. Russell, M.A., LL.D., F.R.S. (Past-President); Sir Walter Raine, J.P. (President, Association of British Chambers of Commerce), Sir Joseph E. Petavel, K.B.E., D.Sc., F.R.S. (Director, National Physical Laboratory); Mr. J. S. Highfield (Past-President); Sir G. W. Humphreys, K.B.E. (Vice-President, Institution of Civil Engineers); Sir Cyril W. Hurcomb, K.B.E., C.B. (Permanent Secretary, Ministry of Transport); Mr. C. P. Sparks, C.B.E. (Past-President); The Very Rev. W. Foxley Norris, C.V.O., M.A., D.D. (Dean of Westminster); Sir R. T. Glazebrook, K.C.B., D.Sc., F.R.S. (Past President); Mr. G. M. Gillett, M.P. (Secretary, Department of Overseas Trade); Sir J. R. Brooke, C.B. (Electricity Commissioner); Col. R. E. Crompton, C.B., R.E. (Past-President); Sir Ernest Rutherford, O.M., P.R.S. (President, Royal Society); Mr. T. E. Herbert; Sir Arnold Girdley, K.B.E.; Mr. T. Roles; Sir George Sutton; Col. A. P. Pyne, R.E.; the Earl of Bective; Col. J. F. Lister, C.M.G., T.D., R.E.; Lt.-Commdr. Haydn T. Harrison, R.N.V.R.; Mr. H. Marryat; Mr. T. W. Purse; Mr. B. A. Robinson; Lt.-Col. C. B. Clay; Dr. C. V. Drysdale; Major B. Binyon; Sir Ambrose Fleming, F.R.S.; Mr. D. N. Dunlop; Professor A. Fowler, F.R.S.; Lt.-Col. N. Harrison, C.M.G., D.S.O.; Mr. R. W. Weightman; Col. William Parker, D.S.O., T.D.; Brig-Gen. Magnus Mowat; Col. D. S. Collins, D.S.O.; Lt.-Col. F. A. C. Leigh, T.D.; Col. R. K. Morcom; Viscount Falmouth; Lt.-Col. K. Edgcumbe, T.D.; Lt.-Col. A. G. Lee, O.B.E., M.C.; Mr. E. H. Shaughnessy; Dr. A. H. Railing; Col. C. E. Thompson, D.S.O.; Col. H. E. Shreeve; Lt.-Col. A. Cortez-Leigh; Col. A. S. Angwin; Mr. C. H. Mery; Mr. L. J. Kettle; Mr. R. S. Whipple; Mr. J. M. Kennedy; Mr. A. R. Cooper; Mr. H. T. Young; Mr. F. S. G. Hinings; Mr. J. Harcourt Williams; Mr. B. Welbourn; Mr. C. C. Paterson; Mr. E. E. Sharp and Mr. R. A. Chattock.

Proposing the toast of "The Institution of Electrical Engineers," Sir J. H. Jeans said that if a visitor from another planet had come to the earth at intervals of a century since the Stone Age and had made reports on our habits all the earlier reports would be as nothing in comparison with that relating to the single century ending in 1930. The largest single item in the latest report would be Faraday's discovery of electro-magnetic induction 99 years ago. As late as 1870 no one had ever dreamed that electro-magnetic induction could have anything to do with telegraphy as then understood. Until 1880 electro-magnetism was looked after by purely scientific bodies. Human life had changed more in the last fifty years than in the entire previous period since the Stone Age. Electrical development had been almost entirely beneficial to the human race. The Institution had always kept in very close touch with pure science and it afforded the strongest argument when they were asked to justify expenditure on pure science. It was the breadth of view of an early electrical engineer which had forecast modern ideas as to the electrical constitution of matter. The president, Sir Thomas Purves, had himself shown the wide range of his thoughts in a recent address when he referred to a recent estimate as to the number of universes. He (Sir J. H. Jeans) found it very difficult to picture in imagination a single universe, but the president had talked glibly of 10^{177} universes as a conservative estimate, as de Sitter had mentioned 10^{183} as the possible number. If electrical science went on expanding at the same rate as during the past fifty or sixty years how much of electricity would our descendants know in the tens of thousands of millions of years that the earth was likely to last ?

Sir Thomas Purves, replying, said that the professional activities of some of the members were still rather mysterious to him. An expert had been defined as an ordinary man away from home, and Sir Oliver Lodge had said that experts in one's own line of business required to be placated rather than informed. The Institution existed in a field of very great diversity and one that was continually branching out. It had deliberately adopted the policy of standing for the whole of that field. They had felt that a profession based on electrical knowledge was capable of being directed as one profession, and would reap advantages from keeping together. They thought that the public good and professional *esprit de corps* would be better served in that way than by several different societies. The different sections enjoyed autonomy within themselves—a kind of Dominion status. The system was working well, and the organisation was sufficiently flexible. The main body of opinion favoured development on these lines. A comprehensive institution had an excellent mental and disciplinary effect on the members. There was no better training in citizenship than the resolution of conflicting interests in an organisation under the influence of loyalty to the organisation as a whole. Their policy was to offer the ægis of the Institution to any qualified body of workers in the electrical field that wished to act together in a wider sense than the interests of one particular firm. There was the difficulty that this sometimes involved a shedding of membership by the body entering the Institution. Relaxation of qualifications was quite out of the question—any change was likely to be in the opposite direction—but he was sure they would succeed in getting rid of this difficulty in some way, and so enable the Institution to cater for certain classes that now stood outside it.

Science the Spearhead.

The wonderful technical progress of the past thirty or forty years had been accompanied by a great widening of the intellectual horizon of the whole of mankind. Science was the spearhead of engineering and its only true guide. There was no greater need to-day than the inculcation of science in the education of mankind as a whole. There were great possibilities in substituting the intellectual drive of science and the engineering mind for the miserable class consciousness and class war which was now so characteristic of the nation. What was engineering but the optimum use of the best available means to secure the desired end ? What were Rutherford or Jeans but engineers ? So was every man with ideals for the future who had a true appreciation of ultimate values.

Captain J. M. Donaldson proposed the toast of "The

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Guests," to which Sir John Brooke replied in a characteristic speech. He read a letter from the Postmaster-General, Mr H. B. Lees Smith, M.P., who was to have preceded Sir John Brooke in responding to the toast, apologising for his inability to be present owing to urgent business in the House of Commons. Mr. Lees Smith added that had he been present he would have expressed his appreciation of the high compliment paid by the election of Sir Thomas Purves as president, which was not only a compliment to Sir Thomas, but also to the Post Office which he served so well. The Post Office employed some 32 000 workers. Development in the past few years had permitted telephone subscribers to be put into touch with 90% of the telephone subscribers in the world. This forward push in recent years had been under the guidance of Sir Thomas Purves.

Continuing, Sir John Brooke said that he thought electricians had discovered certain secrets which they kept to themselves. Col. Crompton, at any rate, seemed to have discovered the secret of eternal youth, and Sir Archibald Page that of eternal work, not only for himself but for others too. Sir Thomas Purves had eulogised the engineering mind, but when he (Sir John Brooke) heard that Sir Thomas had tolerated a discrepancy of something of the order of 10^{10} in his estimate of the number of universes that seemed to him to be far beyond the limits of error that even Civil Servants permitted themselves. This explained how supplementary estimates arose. No body of men carried their responsibilities or their drinks more lightly than engineers. He had often had to rely on their courage, coolness and self-control, and had not found them wanting.

Many old friendships were renewed and new ones begun at the Reunion which followed.

ELECTRICAL RESEARCH ASSOCIATION.

Mr. Garcke's Presidential Address—Large Savings Already Effected by Work on Insulating Oils and Cable Heating—Principles of Cost Allocation—Danger of Research Getting too Far Ahead of Production.

At the luncheon following the ninth annual general meeting of the British Electrical and Allied Industries Research Association, held at the Savoy Restaurant on February 7th, Mr. Emil Garcke, president of the association, occupied the chair. Among those present were Sir Thomas Purves, Sir Richard Glazebrook, the Hon. Sir Charles A. Parsons, Colonel Crompton, Mr. P. J. Pybus, Lord Wargrave, Mr. W. B. Woodhouse, Sir J. R. Brooke, Sir B. Longbottom, Mr. Ll. B. Atkinson, Mr. C. H. Merz, Sir J. E. Petavel, Mr. R. W. Paul, Dr. F. E. Smith, and Lt.-Col. Cortez-Leigh.

Proposing the "E.R.A." Sir Thomas Purves said that fundamental research had quite definitely emerged from the condition in which it was something to be apologised for, and justified by balance sheets of a kind which were bound to leave many openings for criticism. Progress could no longer depend on the chance discoveries of science. The only way in which this country could hope to hold its own was by close fundamental research. The E.R.A. had done yeoman service in driving this lesson home. The only way to secure the necessary liaison between science and industry was for industry to reach upwards into the domains of science.

Mr. E. Garcke, replying, said that the E.R.A. was indebted in many respects to the I.E.E. and the B.E.A.M.A. and to many individual manufacturers and electricity supply companies. It was specially indebted to Sir Richard Glazebrook for the agreement that had been made between the different sections of the industry by which it was enabled to carry out the work immediately in view, also to Mr. Paul, the chairman of the Council and to Mr. Wedmore, the Director of Research.

There could be no doubt that the research work done by the Association, expressed only in terms of money, was of very considerable value. Research on insulating oils had cost about £8 500 in all, and had saved the industry at least £100 000 per annum. Researches on the heating of buried cables cost £18 500, and had saved at least £250 000, in addition to adding something like £4 000 000 to the duration value of existing cables.

Special research of benefit to only a few firms should be left to be carried out by them individually. The work of such associations as the E.R.A. should be of a kind capable of being valuable to a number of firms or to the industry collectively. The cost should be defrayed by the finished article rather than raw materials, as it was contrary to British principles of taxation to burden the initial or intermediate costs of production. It was difficult to allocate costs between people who received direct and indirect advantages from research work, but it was desirable to proceed along the present lines until wisdom came.

Collection of Funds.

The Association had made very encouraging progress in the collection of the necessary funds. This had enabled them to advance with confidence in the various stages of the work planned. Research could never end, and all organisations that were affected must still be asked to augment the financial resources of the Association. Invention was the instrument of creation as necessity was the mother of invention. We tried too often to make machines foolproof instead of trying to make ourselves competent in the use and management of machinery. Research which ran ahead and away from the common standard of utility and understanding was for the time being incongruous and inapplicable, and likely to remain fallow until work in other branches was able to come into line with it. Pioneers were necessary, but must not go so far ahead as to be out of touch with the forces they had to serve. During the last century the tendency was for research to lag behind production; now there was a tendency for research to go too far ahead. The application of pure science to practical purposes depended very largely on the environment.

His belief, based on long experience, was that the character of the worker was all right, but the system under which he was educated and working was in a large measure all wrong. The working classes were badly treated in the nineteenth century. They had an inherited suspicion of employers. The whole industrial situation called for a fresh mind and an unflinching spirit to go fully into co-operation and elaborate co-partnership. Trade unions and employers' organisation might be invited to lend valuable services to industry by co-operating with managements. We needed better direction. We were not now suffering from lack of research in most departments Some 70 research committees had been appointed to investigate problems and many other organisations were dealing with research. There were many more ideas and potential improvements to develop in the practical sense than we could tackle with the capital and resources at our command.

There was too much inclination on the part of directors when business was good and suggestions were made for the adoption of new methods and plans to say: "Why not leave well alone?" In times of adversity they thought they showed wisdom by saying: "This is not the time to spend capital on improvements."

Mr. R. W. Paul proposed the health of the chairman, who, he said, was a worthy successor to a line of worthy presidents.

STREET TRACTION VEHICLES.

Advantages and Limitations of Different Types.

Mr. R. H. WILKINSON read a paper before the Institute of Transport on Monday—it is to be repeated before the Leeds and District Section on February 28th—on the "Advantages and Limitations of the Tramcar, Railless Vehicle and Motor Bus." He gave figures of the operating and overhead costs of the three types of vehicles which indicated that the trolley vehicle was the most economical for dealing with all services up to 18 minutes' frequency, after which the motor bus became the most economical.

"In the trolley vehicle," said Mr. Wilkinson, "tramway authorities, particularly those whose rails meet but are unable to inter-run owing to differences of track gauge, have a traffic instrument in their hands that is capable of giving the most efficient and economical service between towns and on which they could have protective fares. Licenses have been granted to bus operators on account of the break in the service at the tramway termini, which might have been avoided if a through service of vehicles had existed, and the trolley vehicle can provide this. If an express service should be required in addition the motor bus would be employed for this specific purpose."

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THE BRITISH INDUSTRIES FAIR.

Arrangements for Official Visits to the Electrical Section of the Fair at Castle Bromwich—Plan of the Main Portion of the Electrical Section—Names and Stand Numbers of Exhibitors.

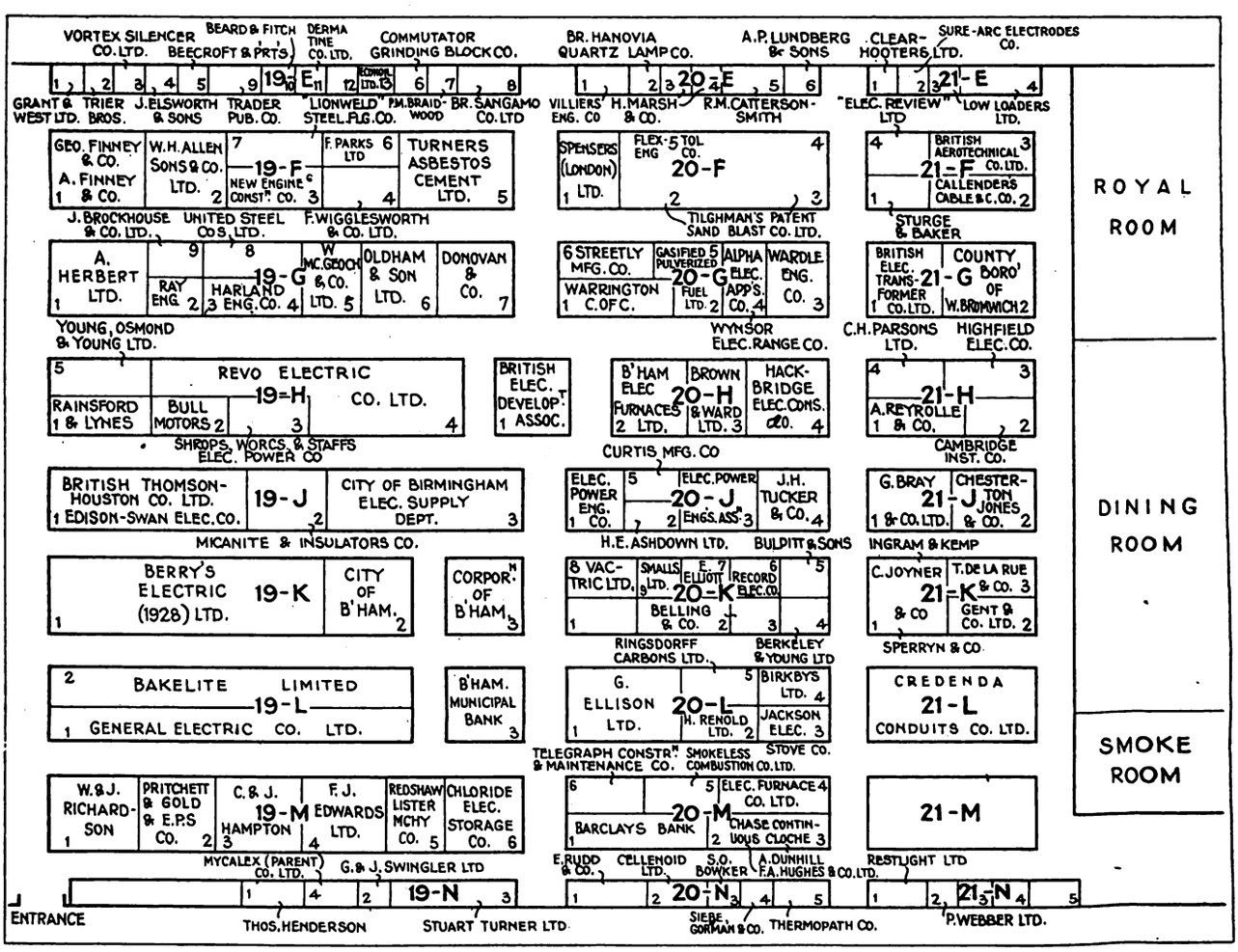
AS in previous years, arrangements have been made for a number of official visits to the electrical section of the British Industries Fair, which opens at Castle Bromwich, Birmingham, on Monday, and will continue until February 28th. On February 20th a luncheon will be attended by members of the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, the British Electrical Development Association, the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Association, the Municipal Tramways and Transport Association, and the Tramways and Light Railways Association.

A luncheon to the Electrical Power Engineers' Association will be held on February 22nd, with a conference in the afternoon. The Students' Section of the South Midland Centre of the Institution of Electrical Engineers will be entertained at tea during the afternoon.

On February 27th a luncheon will be attended by members of the South Midland Centre of the Institution of Electrical Engineers, the Association of Consulting Engineers, the Association of Supervising Electrical Engineers, the Electrical Contractors' Association, the Electrical Contractors' Association of Scotland, the Electrical Wholesalers' Federation, Ltd., the Electrical Merchants' and Manufacturers' Association, the Association of Mining Electrical Engineers, the Incorporated Municipal Electrical Association, and the Illuminating Engineering Society. A conference of members of the Electrical Contractors' Association and Electrical Wholesalers' Federation will be held in the morning. During the afternoon the Birmingham and Midland Branch of the Electrical Association for Women will be entertained at tea.

Our first review of the Birmingham section of the Fair will be found on page 200, together with a number of illustrations of equipment which has not been shown before or which is of outstanding interest.

On account of the size of the Fair it has not been possible to include descriptions of the whole of the exhibits in one issue, and it is with pleasure that we are able to give this week details of some of the stands as the result of co-operation with the exhibitors themselves and from information supplied by the organisers of the exhibition. A further review will appear in our next issue.



PLAN of the main portion of the electrical section of the British Industries Fair, at Castle Bromwich, Birmingham, showing the stand numbers and names of exhibitors. A complete list of firms exhibiting items of electrical interest at Castle Bromwich but whose stands are not necessarily in the electrical section is given on the opposite page.

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STANDS TO LOOK FOR AT CASTLE BROMWICH.

List of Exhibitors and Stands of Electrical Interest.

Name of Exhibitor.	Block and Stand No.
Accles and Pollock, Ltd.	16G-4.
Aeraspray Manufacturing Co., Ltd.	8L-1.
Aerograph Co., Ltd.	10H-6.
Allen-Liversidge, Ltd.	14J-4.
Allen, W. H. Sons and Co., Ltd.	19F-2.
Alpha Electrical Apparatus Co.	20G-4.
Ashdown, H. E. (Birmingham), Ltd.	20J-2.
Avery, W. and T., Ltd.	15L.
Bakelite, Ltd.	19L-2.
Barrett and Elers	9F-2.
Belling and Co.	20K-2, 3.
Berkeley and Young, Ltd.	20K-4.
Berry's Electric (1928), Ltd.	19K-1.
Birkby's, Ltd.	20L-4.
Birmingham, City of, Elec. Supply Dept	19J-3.
Birmingham Electric Furnaces, Ltd.	20H-2.
B.K.B. Electric Motors, Ltd.	20K-5.
Blackstone and Co., Ltd.	15H-2.
Bray, Geo. and Co.	21J-1.
British Brass Fittings, Ltd.	21K-1.
British Electric Transformer Co., Ltd.	21E-1.
British Electrical Development Assn.	20H-1.
British Electrical Repairs, Ltd.	16H-2.
British Hanovia Quartz Lamp Co., Ltd.	20E-2.
British Sangamo Co., Ltd.	19E-8.
British Thomson-Houston Co., Ltd.	19J-1.
Bromford Tube Co., Ltd.	12K.
Brown, S. G., Ltd.	16L-3
Bull Motors, Ltd.	19H-2.
Bulpitt and Sons, Ltd.	5G-1, 20K-5.
Callenders Cable & C. Co., Ltd.	21F-2.
Cambridge Instrument Co., Ltd.	21H-2.
Canning, W. and Co., Ltd.	17K-1.
Chesterton, Jones and Co., Ltd.	21J-2.
Chloride Electrical Storage Co., Ltd.	19M-6.
Clear Hooters, Ltd.	21E-1.
Commutator Grinding Block Co., Ltd.	19E-6.
Crane (Frederick) Chemical Co., Ltd.	9K-1.
Credenda Conduits Co., Ltd.	21L.
Crossley Bros., Ltd.	16M-3.
Curtis Manufacturing Co., Ltd.	20J-5.
Davey, Paxman and Co., Ltd.	17H-1.
Davidson and Co., Ltd.	17G-2.
Davis and Timmins, Ltd.	16G-5.
De la Rue, Thos., and Co.	21K-3.
Dermatine Co., Ltd.	19E-10.
Diecastings, Ltd.	2J-2.
Donovan and Co.	19G-7.
Dorman, W. H. and Co.	17L-3.
Drayton Regulator and Inst. Co.	16K-2.
Earle, Bourne and Co., Ltd.	18K-1.
Edison Swan Electric Co., Ltd.	19J-1.
Electric Furnace Co., Ltd.	20M-4.
Electrical Power Engineering Co. (B'ham) Ltd.	20J-1.
Elliott, E.	20K-7.
Ellison, George	20L-1.
Ellmar Moulding Co.	17E-3.
Ever-Ready Co. (Great Britain), Ltd.	7G-3.
Firth, Thos. and Sons, Ltd.	10F-1.
Foster Instrument Co.	11J-2.
General Electric Co., Ltd.	19L-1.
Gent and Co., Ltd.	21K-2.
Gilman, F. (B.S.T.), Ltd.	15F-5.
Hackbridge Electric Construction Co., Ltd.	20H-4.
Hailwood and Ackroyd, Ltd.	3D-2.
Hale, Thos. (Tipton), Ltd.	14H-4.
Harland Engineering Co., Ltd.	19G-3, 4.
Herbert, Alfred, Ltd.	19G-1.
Hewittic Electric Co., Ltd.	20H-4.
Highfield Electrical Co., Ltd.	21H-3.
Holden and Hunt	14L-1.
Hollings and Guest, Ltd.	18L-3.
Holmes, W. C. and Co., Ltd.	12C-3.
Hoover, Ltd.	9G.
Horstmann Gear Co., Ltd.	12G-2.
Hughes, F. A. & Co., Ltd.	20M-2.
Imperial Chemical Industries, Ltd.	9K-1.
India Rubber, G.P. and Tel. Works Co., Ltd.	8C-3.
Ingram and Kemp	21K-1.
Jackson Electric Stove Co., Ltd.	20L-3.
Johnson, Rd. and Nephew, Ltd.	17F-3.
Joyner, Chas. and Co	21K-1.
Lighting Trades, Ltd.	12G-3.
Lister, R. A. and Co., Ltd.	17G-1.
Lundberg, A. P.	20E-6.
Macinlop, Ltd.	10H-1.
McGeoch, Wm. and Co., Ltd.	19G-5.
M.C.L. and Repetition, Ltd.	17N-2.
Micanite and Insulators Co., Ltd.	19J-2.
Midland Fan Co., Ltd.	1H-2.
Mills, James	13F-2.
Monel-Weir, Ltd.	13F-1.
Mycalox (Parent) Co., Ltd.	19N-4.
Oldham and Son, Ltd.	19G-6.
Pantin, W. and C.	16L-2.
Parker, Winder and Achurch, Ltd.	5H.
Parsons, C. H., Ltd.	21H-4.
Petters, Ltd.	18J-3.
Premier Electric Welding Co., Ltd.	15C-2.
Pritchett and Gold and E.P.S. Co., Ltd.	19M-2.
Rainford and Lyles, Ltd.	19H-1.
Ransomes, Sims and Jefferies, Ltd.	9K-2.
Rawlplug Co., Ltd.	4D-2.
Ray Engineering Co.	19G-2.
Record Electrical Co., Ltd.	20K-6.
Renold, Hans, Ltd.	20L-2.
Restlight, Ltd.	21N-1.
Revo Electric Co., Ltd.	19H-4.
Reyrolle, A. and Co., Ltd.	21H-1.
Ringsdorff Carbons (England), Ltd.	20L-5
Ruberoid Co., Ltd.	10E-4.
Ruston and Hornsby, Ltd.	15H-1.
Serck Tubes, Ltd.	15K-2.
Shrops. Worcs. and Staffs. Electric P. Co.	19H-3.
Siebe Gorman & Co., Ltd.	20N-4.
Silvertown Lubricants, Ltd.	17L-3.
Sisson, W. and Co., Ltd.	15D-2.
Slingsby, H. C.	14G-4.
Smalls, Ltd.	20K-9.
Smokeless Combustion Co., Ltd.	20M-5.
Sperryn and Co.	21K-1.
Star Foundry Co., Ltd.	10E-2.
Star, J. B. and Co., Ltd.	17H-4.
Stewarts and Lloyds, Ltd.	14E-2.
Streetly Manufacturing Co., Ltd.	20G-6.
Stuart Turner, Ltd.	19N-3.
Sturge and Baker, Ltd.	21F-1.
Sturtevant Engineering Co., Ltd.	13D-3.
Sunderland Forge and Eng. Co., Ltd.	15M-1.
Sure-Arc Electrodes Co.	21E-2.
Swingler, G. and J., Ltd.	19N-2.
Tangyes, Ltd.	16J.
Taylor and Challen, Ltd.	18L-1.
Telegraph Cons. and Maintenance Co., Ltd.	20M-6.
Terry, Herbert and Sons, Ltd.	13K-5.
Thermo Path Co., Ltd.	20N-5.
Thomas, Bertram	10H-4.
Tucker, J. H. and Co., Ltd.	20J-4.
Turner Bros. Asbestos Co., Ltd.	19F-5.
Vac-Tric, Ltd.	20K-8.
Valor Co., Ltd.	14F-1.
Wakefield, C. C. and Co., Ltd.	14D-5.
Wardle Engineering Co., Ltd.	20G-3.
Watsons (Metallurgists), Ltd.	16M-2.
Wiggin, Henry and Co., Ltd.	14H-1.
Wynsor Electric Range Co., Ltd.	20G-4.
Young, Osmond and Young, Ltd.	18H-8.
Young Accumulator (1929) Ltd.	10A-2.

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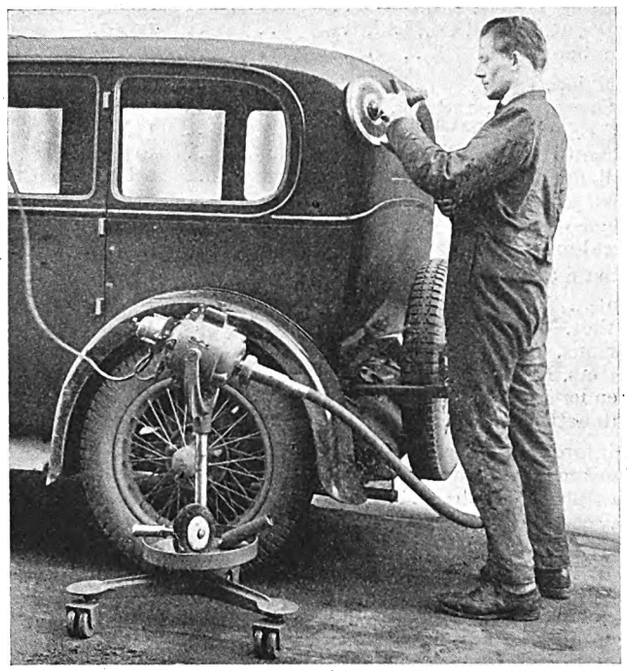
SOME OF THE EXHIBITS AT THE FAIR.

Industrial Electrical Equipment to be seen at Castle Bromwich—Machine Tools and Other Apparatus for Works and Factories.

WE commence below the first of our reviews of the British Industries Fair, dealing this week with some of the industrial exhibits at Castle Bromwich. The descriptions are necessarily brief on account of space, but should readers desire further particulars the names and addresses of exhibitors are given.

The CURTIS MANUFACTURING CO., LTD. (32, Spring Street, London, W.1), is showing a wide variety of articles in resistance



Sanding car bodies with the equipment shown by F. Gilman (B.S.T.) Ltd.

apparatus. Amongst these is the new ball slide, which eliminates the no small disadvantage of friction on the slide rod with the use of a slider resistance. These slider dimmers are used for a wide variety of purposes, the chief being for lighting effects, and it may be of interest to know that every performance of "Journey's End," in which the lighting effects illustrate the action of gun-fire and Verey lights, involves the use of these dimmers to bring about the desired effects. Other articles are new designs of dead front cinema control boards, showing the duplex dissolving resistance, by which a predetermined current from the motor generator cannot be exceeded, and which also allows dissolving effects from one arc to the other. There is also a testing board, giving very fine regulation over wide ranges of current, for meter testing. Sliding resistances of various sizes, together with some of extra large pattern, such as are used as power regulators on board ship are also exhibited. Arc welding resistances, regulating current in apparatus resistances, and a number of interesting small articles embracing resistances as their basis are also shown.

The HORSTMANN GEAR CO., LTD. (Newbridge Works, Bath). On this stand is shown a representative range of Newbridge time switches from 1·5 to 50 A for street lighting, shop window lighting, two-rate meter control, etc., including a neat unit lighting time switch, styled type "T" of 2.5 amp. capacity, as illustrated, is on view. Newbridge time switches are British made, save the Swiss escapement, at the firm's own works at Bath.

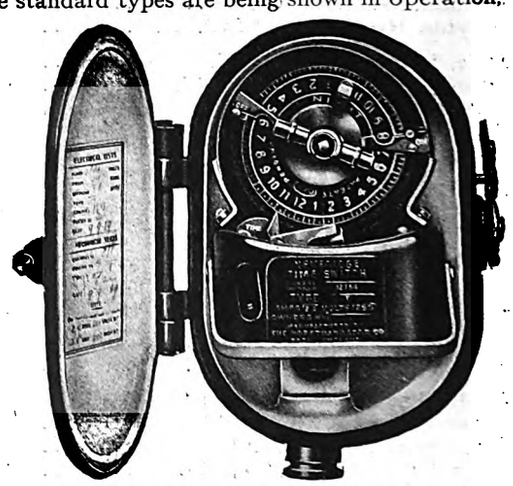
The AERASPRAY MANUFACTURING CO., LTD. (122/3, Livery Street, Birmingham). The careful attention paid to tools by modern designers is well illustrated in "Aerospray" guns, which are made entirely of duralumin with threadless stainless steel nozzles and needles. The weight of the fastest gun made by this company, the "Fanex" type, is under 13 oz. without the colour container or alternative pressure feed connection. Considerable care has also been devoted to the design of the trigger action in order to prevent finger tiredness or cramp, which is liable to occur where girl labour is employed. The compressors made by this firm are also of interest. The revolving and reciprocating parts are counterweighted and balanced both statically and dynamically. Even the smallest machine is fitted with forced lubrication and other features common to the entire range of compressors are, combined hand unloader for starting up with the air receiver under pressure and automatic unloader whereby the machine stops compressing when the guns are not using air. Another interesting item of spraying equipment made by this firm is the "self-scavenging" air purifier. This improved apparatus incorporates a "stationary scrubber," and is unconditionally guaranteed to be completely satisfactory under the most severe conditions. See page 203.

C. C. WAKEFIELD AND CO., LTD. (30/32, Cheapside, London, E.C.2), are showing specialised lubricants for all types of plant, also cutting and quenching oils. Wakefield lubricating appliances are prominent, and include all the well known patterns of mechanical lubricators for application to stationary plant, locos., etc., grease guns for machine tools, etc., and lubricators for pneumatic tools. A notable feature is the mechanical lubricator, especially designed for operation with machine and similar tools.

Messrs. E. ELLIOTT (126/8, Brearley Street, Birmingham), are showing in the Electrical Section of the Fair, mainly as manufacturers of bakelite electrical parts for the trade. They are not exhibiting articles to sell direct to contractors, as the bulk of their business is done in moulding for manufacturers articles of their own design and special registered patterns. In the background of the stand is shown a range of fancy articles made of "Birmite."

G. A. HARVEY AND CO. (LONDON), LTD. (Woolwich Road, London, S.E.7). The exhibits shown by this company will attract the engineer and those entrusted with the management of plant and equipment. Of particular interest is the array of perforated metals and woven wire in a wide variety of patterns. Many designs of ornamental metalwork for radiator and electric-heater covers, grilles and ventilator panels are shown. A large part of the company's output consists of steel plate work and constructional work, and amongst the many diverse forms of industrial equipment they produce are storage vessels, stills, condensers, cylinders, etc. Specimens of flanged steel plates up to $\frac{5}{8}$ in. thick, as well as angle sections, bent or rolled to various sizes, form an important part of this exhibit. A header of gilled tubes for transformer tanks will be of especial interest to electrical engineers.

J. B. STONE AND CO., LTD. (135, Finsbury Pavement, London, E.C.2), are showing their well-known nibbling machines. The standard types are being shown in operation, cutting sheet metal from $\frac{1}{8}$ in. to $\frac{5}{16}$ in. thick. The smallest machine is intended primarily as a bench machine for use when cutting thin stock up to 14 gauge. The principle of operation, viz., the punch and the die, is the same as in the larger machines. It is specially adapted to small work such as trimming embossed work, duplicating small parts, templet making, small stencil or sign cutting, etc. The rapid cutting speed, which is approximately 60 in. per min., makes it an ideal machine for these types of work. This small nibbler is geared directly to a motor supplied with the machine, and



The "Newbridge" time switch. (The Horstmann Gear Co., Ltd.

(Continued on page 202.)

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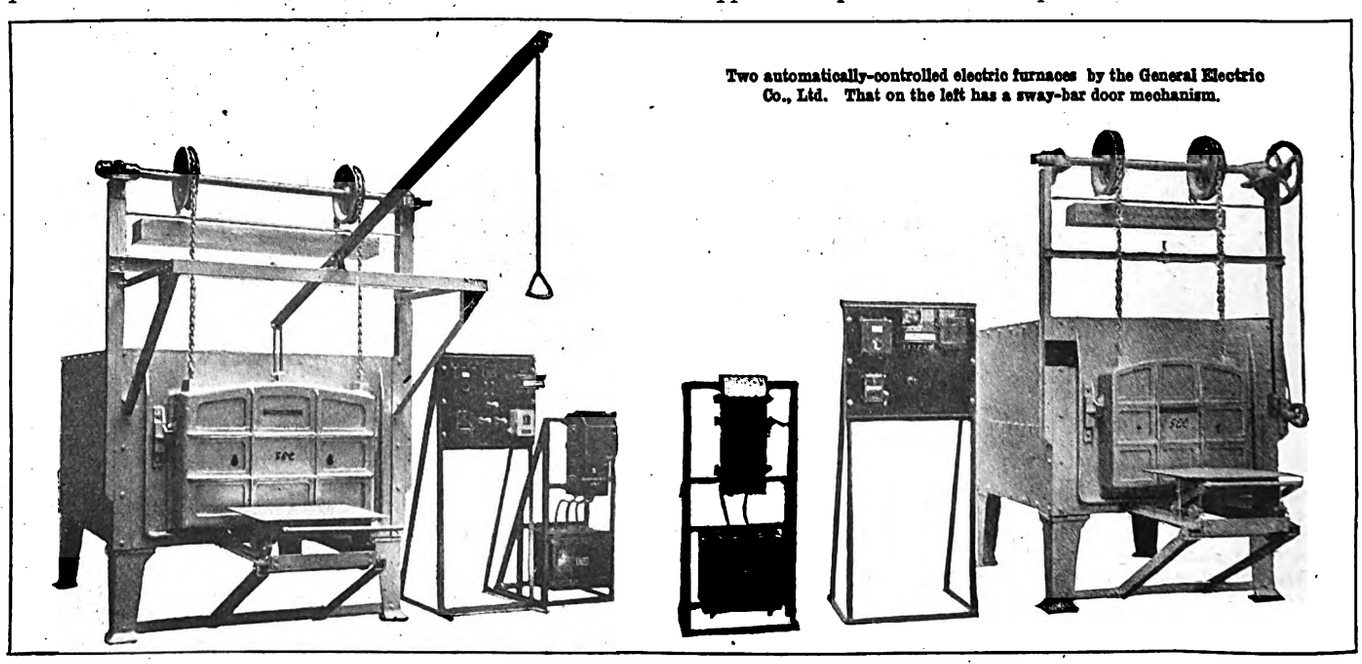
can be moved from the bench to any convenient position and then operated from an ordinary lamp socket.

The Zinc Alloy Rust-Proofing Co., Ltd. (Shakespeare Street, Wolverhampton), are again making a limited display of Sherardized products. Technical information required about the process can be obtained on the stand, and those interested in the rust-proofing of any particular product will be informed where, if possible, that product can be seen Sherardized on other stands at the exhibition. A full list of the various firms exhibiting Sherardized products will also be available.

The Gutta Percha Co. (Wharf Road, London, N.1), is again displaying high grade alloys with special magnetic and electrical qualities. By continued research into methods of production, the company claims to be able to offer alloys which are, mechanically and electrically, considerably improved in quality on last year's products. This is illustrated by the increased width of strip available in thin gauges, and improved deep stamping qualities, while the magnetic standard of the alloys has been raised and stabilised by the collection of more exact evidence on heat treatment effects. Mumetal, the high permeability, low hysteresis alloy, primarily produced for continuous submarine cable loading, is now largely employed for improved current transformers, and finds considerable application in the radio industry. It is available as bright rolled strip in all standard thicknesses, and also as ring stampings, as exhibited. To illustrate the advance that has been made in Mumetal, the company have produced test samples with an initial permeability of 19 000 and a maximum permeability of 130 000. Radiometal is another alloy which is finding general acceptance for audio frequency transformer cores, owing to its high and constant incremental permeability. This metal is exhibited in standard strip and sheet sizes, and as stampings. Pyromic, high resistivity, heat resisting alloys are also shown as castings, forgings, strip and wire.

The British Thomson-Houston Co., Ltd. (Rugby), are showing on that portion of the stand which is devoted to industrial equipment, many exhibits including standard motors for a.c. and d.c. circuits, the sizes ranging from fractional horse-power to larger ratings, as well as the newer " built-in " motors, and worm-geared motor units. For use on single-phase a.c. circuits there is also a repulsion induction motor, designed to start up easily under heavy load and to run at high power factor at a constant speed. Other industrial exhibits consist of motor generators and " Fabrioil " pinions. Among the many benefits that the machine tool industry has derived from the activities of this company, one of the most recent is the introduction of the " built-in " motors for giving direct drive to machine tools and woodworking machinery. These are complete as regards the essential electrical and magnetic portions of a three-phase a.c. motor. The stator unit consists of a core and winding in an enclosing shell, and the rotor unit a squirrel-cage rotor with centrifugally cast aluminium bars and end rings. The units are assembled by the machine tool makers and housed in frames which are designed as an integral part of the machine tool, and the machine tool makers also provide shaft, end-shields and bearings as part of their design. For certain machine tools, " vertical spindle " motors can be applied as horizontal end-shield mounted machines, the driving end-shield being bolted to a vertical surface so that the motor is overhung with the shaft horizontal. An entirely new line of worm-geared motor units is also represented. These units, with the motor mounted integral with a worm reducing gear, are shown in two forms—vertical and horizontal. The vertical arrangement is preferable where sufficient head room is available, but where this is limited, the horizontal unit offers an alternative arrangement. Permanent accuracy of alignment, together with minimum weight and space is achieved by these equipments, and the elimination of a bedplate avoids a frequent cause of trouble due to bedplate springing. These geared units form a very efficient drive and give high efficiencies over a wide range of ratios, 7½–1 to 30–1 ratios are standardised, but greater reductions can also be supplied.

Birmingham Electric Furnaces, Ltd., (55, George Street, Parade, Birmingham). A full scale half section of a large " Birlec " furnace, which illustrates the robust method of construction, and the company's special patented heating element employed, are included in the exhibits. Owing to its size, it is impossible to show a furnace of this type in operation at an exhibition, therefore, photographs of some large installations are shown, including furnaces for annealing and general heat treatment of steel and non-ferrous metals, bright annealing, carburising, hardening, etc. All these installations are in commercial operation, and full particulars including operating costs can be obtained. Among the illustrations on page 205 is a picture of a large box type " Birlec " furnace, having a usable hearth 9 ft. long by 5 ft. wide, and a maximum rating of approximately 180 kW, arranged for mechanical charging and used for carburising. A " Birlec " electrically-driven charging machine is shown in the foreground. Two standard portable " Birlec " furnaces of an entirely new range are also shown on the stand, both being in operation. The smaller one—which has a hearth 30 in. long by 15 in. wide and a maximum rating of approximately 18 kW—is shown re-heating steel parts previous to oil quenching, and the larger model, with a hearth 36 in. long by 23 in. wide and a maximum rating of approximately 30 kW, is carburising. Two furnaces similar to the larger model are illustrated on page 205. Whilst both models exhibited are similar in outward appearance to those shown by this firm at the Fair last year, the outstanding difference of this new series (which is in addition to, and does not supplant the previous series) is in the design of the heating elements which is now similar to that employed with success in the larger installations. The system consists of supporting the resistor, which is of heavy nickel-chromium strip bent into zig-zag form on heavy gauge hooks of the same metal. In this way there is no contact between the element and the refractory, and all risks of " hot spots," due to masking or of any interaction between the elements and the lining, are eliminated, with a consequent increase of resistor life. The supports are placed at such frequent intervals that with the



Two automatically-controlled electric furnaces by the General Electric Co., Ltd. That on the left has a sway-bar door mechanism.

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heavy gauge of strip employed no sagging or distortion of the elements can take place.

The RAWLPLUG Co., LTD. (Rawlplug House, Cromwell Road, London, S.W.7), is showing, in addition to the well-known Rawlplugs and bolt anchors, the new Kango hammer and flexible steel rule. With regard to the hammer, this is a heavy duty type electrically-operated tool, fitted with a totally enclosed motor and having a total weight of 14½ lb. The tool is made for all standard voltages and a variety of tool fittings such as chisels, points, chasing tools, etc., are available.

The EXECUTORS OF JAMES MILLS, LTD. (Bredbury Steel Works and Rolling Mills, Stockport), are making a special exhibit of grooved pins and studs largely used throughout the electrical industry.

The ELECTRIC FURNACE Co., LTD., and its newly-formed subsidiary company, the ELECTRIC RESISTANCE FURNACE Co., LTD., both of 17, Victoria Street, London, S.W.1, have staged a joint exhibit. The Electric Furnace Co. deals with electric melting furnaces of all types, such as the Héroult arc furnace, the Ajax-Wyatt induction furnace, the Ajax-Northrup high frequency furnace, etc. There is in operation a small Ajax-Northrup high-frequency furnace suitable for use in laboratories, and this illustrates the principle of high frequency melting. A new type of poking machine, which is used for stirring brass swarf in Ajax-Wyatt furnaces, is also shown. This machine claims to reduce labour costs, power consumption, and increase the number of heats produced in a given time by over 20%. Owing to the fact that a plant of the furnace type is too large to be shown at an exhibition, demonstration can be seen at 360, Farm Street, Birmingham. A melting pot heated by electric resistors, which is suitable for aluminium, lead and other metals of low melting point, is another exhibit, and the pot shown has a capacity of about 200 lb. of aluminium. These pots can be made in sizes varying from 20 lb. up to 5 tons. An air heater, suitable for supplying hot air for drying purposes of all kinds, such as tea, rubber latex, cores, etc., is also to be seen, the heater shown being of simple construction and of 3·4 kW rating. A number of electric furnace products are also being shown, including intricate castings of steel made in an Ajax-Northrup high frequency furnace, pottery decorated in an Efco kiln, etc.

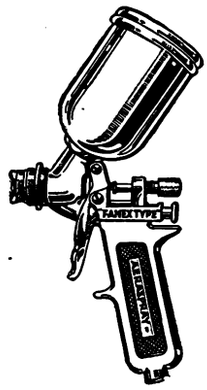
PARKER, WINDER AND ACHURCH, LTD., (Broad Street, Birmingham). New products formally displayed for the first time include Parwinac "Empire" oil burners and Sklenar's midget furnace with Parwinac industrial oil burners, the most important features of which, from the electrical point of view, are the controls.

BRITISH ELECTRICAL REPAIRS, LTD. (72, Bennett Street, Manchester), are not this year exhibiting any new electrical apparatus, but since the company has established works in various parts of the country, each built and equipped for the sole purpose of carrying out repairs to electrical apparatus, and since each works has vacuum and pressure impregnation plants installed, together with testing equipment, it claims to be the largest organisation of its kind in the British Isles, and is showing at the Fair photographs of the various works. Other exhibits comprise various types of armature, rotor, stator and field coils, shafts, commutators, bearings and all specimens of standard and special insulation.

W. AND C. PANTIN (147, Upper Thames Street, London, E.C.4) are exhibiting an installation of conveyors consisting of an inclined drag-type elevator for raising boxes, gravity roller conveyor for conveying them, and a patent inclined belt lowerator for lowering them; also a machine for wire tying boxes.

Scaling Tools.

F. GILMAN (B.S.T.), LTD. (221, High Street, Smethwick), are exhibiting a full range of scaling tools for every type of tube scaling work from ⅝ in. condenser tubes upwards, including machines and plants for dealing with evaporators, multi-tubular boilers of the Yarrow type, Clarke-Chapman type, Babcock and Wilcox type, Stirling type, Thompson type, as well as machines for economisers of every make, and special plant for scaling Lancashire boilers. In addition, machines are shown for dealing with copper tubes, for cleaning moulds, for fettling and trimming castings, for tank cleaning purposes, as well as for rust and paint removing, and other similar work. An entirely new type of machine is shown for the first time for use particularly by the motor trades. The set is an electrical plant fitted with a motor of ½ H.P. mounted in a swivel bracket, allowing both lateral as well as vertical movement. The drive from the motor is by means of flexible shafting running in a steel reinforced rubber outer covering. Various working heads can be attached to the flexible drive, and the machine will carry out such work as drilling, grinding, etc. It can be also used for sanding car bodies before painting or cellulosing, as well as for polishing and finishing off the paint or cellulose after it has been applied. Special sanding and rubbing down pads are provided for this work. Similar heads, but of cone shape, can be provided for getting into positions where the flat sanding heads cannot be applied. Wire brushes are also used with this machine for cleaning inside the mud-guards along the foot-boards, and for working into other awkward positions. The machine can be provided with wire brushes for decarbonising, and can further be used in conjunction with rotary rasps for repairing tyres, for rasping out cuts and bad patches, prior to vulcanising. The standard machine has a single spindle drive at 2 800 r.p.m., but a gear-box attachment can also be used with the motor, giving three separate drives at different speeds. In addition to the ½ H.P. plant, a second machine is marketed embodying a 1½ H.P. driving motor. The uses and details of this machine are generally the same as those already given for the ½ H.P. equipment.



The paint sprayer shown by the Aeraspray Manufacturing Co., Ltd.

BAKELITE, LTD. (68, Victoria Street, London, S.W.1) are showing both in Birmingham and London, each stand embodying bakelite laminated panels with wood-grain finishes for the walls, thus giving a practical demonstration of this new material. The display at the Birmingham Section is an exceptionally comprehensive one, showing applications of all bakelite products in many industries. At London the display deals particularly with the applications of bakelite products in the radio industry. For the first time a display of mouldings made from the new bakelite white moulding material is on view, these being particularly suitable as electric light fittings for bathrooms, etc.

TURNER'S ASBESTOS CEMENT, LTD. (Trafford Park, Manchester). This stand is again occupied by asbestos electrical insulating and arc-resisting materials manufactured and sold under the trade name "Sindanyo," but another interesting feature of the exhibition this year is that, following on the amalgamations in the asbestos industry during the past year, other familiar products appearing on this stand are "Siluminite," "Ebbinita," and "Uacolite. An important feature consists of a variety of "Sindanyo" switchboard panels fitted with electrical equipment. The infinite variety of shaped parts produced in "Sindanyo" is also shown to advantage. Asbestos paper for electrolytic work, asbestos paper tape for cable insulation and asbestos paper tubes, are displayed on this stand, together with a comprehensive grouping of insulating mouldings of "Siluminite" and "Ebbinita," products hitherto sold by the Siluminite Insulator Co., Ltd., in addition to a selection of "Uacolite" sheets and mouldings formerly sold by Bell's United Asbestos Co., Ltd.

The ELLMAR MOULDING Co. (Thimble Mill Lane, Birmingham). Here is shown a comprehensive exhibit of bakelite mouldings, specially suitable for the manufacture of wireless parts, magneto fittings, motor cycle and motor car accessories, general, electrical, insulating parts, etc.

SERCK TUBES, LTD. (Warwick Road, Greet, Birmingham), are showing thermostatic control of electric currents at any distance. This apparatus is intended to control directly the switch gear at a pre-determined temperature. Its power is obtained by the rise or fall in temperature of a hollow vessel; this force is conveyed any distance to the operating mechanism by a small diameter tube, the movement so set up can be of the usual thermostatic rate, so much power per degree rise, or if desired can be made to operate with a snap action. Another exhibit is a snap action thermostatic device, which prevents any movement until the pre-determined temperature is reached in rise and also fall, and is particularly useful in domestic and hot water appliances, such as kettles, hot water systems, etc.

ACCLES AND POLLOCK, LTD. (Oldbury, Birmingham), are displaying every type and quality of weldless steel tube. A year or two ago Accles and Pollock claimed to have introduced chrome molybdenum steel into this country for aircraft tube work, and it has been adopted by many firms in that industry. Many other uses have now been found for this

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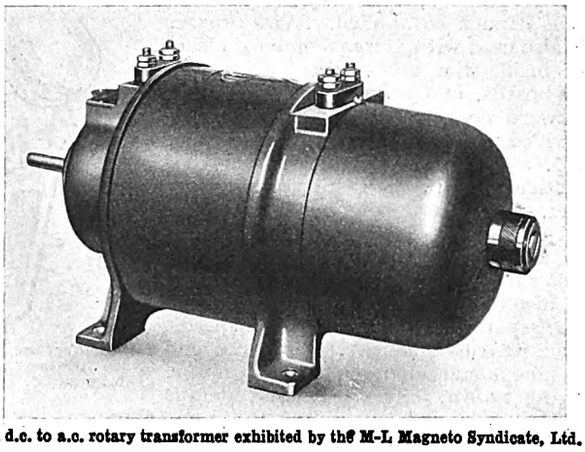
material, and examples of its application may be seen on the stand.

Earle, Bourne and Co., Ltd. (Birmingham Rolling and Tube Mills, Heath Street South, Birmingham), have on view a comprehensive range of manufactures, including cold rolled brass of various alloys, and copper; solid drawn brass and copper tubes for condensers, etc.; brazed brass and copper tubes, plain, ornamental, round, square, oval, flat, twisted and reeded. Light copper tubes and fittings for domestic water services and a selection of tubes, metal and step-edging chromium plated, are also included.



A d.c. to a.c. rotary transformer exhibited by the M-L Magneto Syndicate, Ltd.

The Bromford Tube Co., Ltd. (Birmingham). Here is exhibited the new seamless steel lighting standards with fluted colums, both spiral and vertical. The claims made for these are: (1) made from special quality seamless steel; (2) high tensile strength; (3) freedom from structural weaknesses such as blowholes, cracks, etc.; (4) lighter in weight than cast iron, therefore easier to handle and cheaper to transport; (5) are not brittle; (6) if bent, can be re-straightened and put into use again. For electric lighting a new type of box has been designed which encloses the time switches and fuses and also combines the cable sealing boxes. This box is so designed that the enclosed apparatus is very nearly flush with the lines of the standard, but still easily accessible. Other exhibits include tram and transmission poles.

The Drayton Regulator and Instrument Co., Ltd. (West Drayton, Middlesex), are exhibiting a range of switches and contact devices operated by temperature, humidity, pressure and level impulses. A number of new patterns have been standardised over the last twelve months and are exhibited for the first time. A particularly interesting item is the H.C. humidity contactor, which actuates relay switches on valves through a three wire circuit. The contact arm is actuated by the deviation from a set wet-bulb depression. The H.C. contactor can be applied to the control of humidity in automatic sub-stations, work-rooms, stores and air conditioning generally. The R.C. temperature contactor operates in the same way, the contact arm being actuated by a bi-metal thermostatic coil.

Clear Hooters, Ltd. (79–81, Lombard Street, Birmingham), are again featuring their electrically operated sirens and hooters, a special feature being a new high frequency "Clarion" electric horn.

Henry Wiggin and Co., Ltd. (Wiggin Street, Birmingham), are showing examples of the uses of "Silveroid," together with photographs of the equipment, in addition to a number of electric fires of various makes with "Brightray" elements, a range of sample reels of "Brightray" and "Glowray," both nickel chromium resistance materials, "Ferry" for motor startors, etc. Various small resistances and rheostats are also exhibited. There are also photographs of heavy electrical equipment using the company's resistance materials.

S. G. Brown, Ltd. (Western Avenue, North Acton, London, W.3). The exhibits here include the "Brown" electric megaphone for use where a loud speaking telephone is required, and it is interesting to note that these instruments are used in large numbers by the navies of the world, and the mercantile marine. The amplification obtained with the instrument is said to be some three times the normal voice; articulation is distinct, and "howling" absent. It is water-tight and the instruments are doubly protected against climatic conditions. As many as six receivers can be operated from one transmitter without loss of volume, or any increase in current consumption. Extraneous noises are eliminated from the transmission by the Brown's patent differential anti-howling microphone. Thus, side-tone cannot occur. Speech can be transmitted over ten miles of line without appreciable loss of volume. The supply to the transmitter can be from either a.c. or d.c. mains, or from storage batteries, the working voltage being 12 V.

Oldham and Sons, Ltd. (Denton). This exhibit is representative of all three branches of the firm's activities under the following headings: (1) Storage battery manufacture; (2) mining specialities; and (3) hatting machinery. In the battery section may be seen specimens of low tension accumulators in glass and celluloid including the range of slow discharge cells with laminode plates, and a full range of unspillable accumulators for use with portable wireless receivers. Air-spaced high tension accumulators, which can be assembled on the expanding bookcase principle, are shown together with examples of h.t. and l.t. auto-power units and h.t. battery chargers, all of which are fitted with Westinghouse dry metal rectifiers. In the Mining Section there are electric safety lamps, together with lamp-room equipment for cleaning, charging and maintaining an efficient lamp service at the colliery.

Herbert Terry and Sons, Ltd. (Redditch), are again displaying every form of press work of interest to the electrical industry.

Messrs. H. C. Slingsby (Kingsway, London, W.C.2) are featuring their well known trucks, handcarts, etc., all of which are so well known and used in the electrical industry as to warrant no further description. Electric trucks include load-carrying trucks; elevating platform trucks for loads up to 2 tons; lifting-tiering trucks up to 75 in. for loads up to 2 tons; trackless-tractor-trailer-truck trains; industrial engines, trackless and for railways.

Ringsdorff Carbons (England), Ltd. (Colindale Avenue, Hendon, London, N.W.9), display carbon brushes for slip rings and commutators of electric motors and generators; brushes for heavy switch gear; for rotary convertors, turbo-generators, railway and tramway motors; automobile brushes for startors and lighting sets; carbon contacts; carbon discs; carbon rings, plates and rods. A new exhibit is an "R.B." spring steel flexible connection for carbon brushes.

W. Canning and Co., Ltd. (133–137, Gt. Hampton Street, Birmingham). The exhibits here include a range of "Canning" low voltage dynamos and motor generators, especially designed for electro-deposition. Resistance boards; control panels; shunt regulators; voltmeters; ammeters, and other electrical instruments for electro-deposition, are also to be seen. In addition, examples of plating barrels, a lacquer spraying cabinet, and a large collection of plating, polishing and finishing materials are included, embracing chemicals, compositions, brushes, wheels, bobs, felts, mops, and bronzing and lacquering supplies.

The City of Birmingham Electric Supply Department is displaying electric power equipment with a range of portable tools; electric paint burners and branding irons, drills, grinders, mops, etc.; small electrical furnaces and welders; industrial heating apparatus; oven and cooking apparatus suitable for canteens, cafés, etc.; water heating apparatus, industrial lighting fittings, etc.

Lifting Magnets.

The Rapid Magnetting Machine Co., Ltd. (Magnet Works, Lombard Street, Birmingham). This exhibit comprises five examples of magnetic drum and pulley type separators, two types of chute separators, a representative magnetic clutch, two types electro-lifting magnets of gantry with hoist blocks, and a spring cable drum, a foundry sand separating and sieving plant, and a sundry small magnetic apparatus. Some of the exhibits are at work. The high intensity "Waterfall" chute type separator has not been exhibited before, and is of an improved type with stepped trough surface. The coil windings are connected with the control switchgear in such a way that in the event of intentional or accidental current interruption, not only does a collapsible bridge turn and divert the released accumulated iron, but also a mechanically coupled feed door turns and stops the flow, and when accidental stoppage occurs an alarm bell rings. The apparatus is suitable to treat powders, granular materials, and products, coal before pulverising, etc. With regard to the foundry sand plant this is another new exhibit and the plant on the stand is electric motor driven. This equipment combines a hopper fed short conveyor-type magnetic-pulley separator

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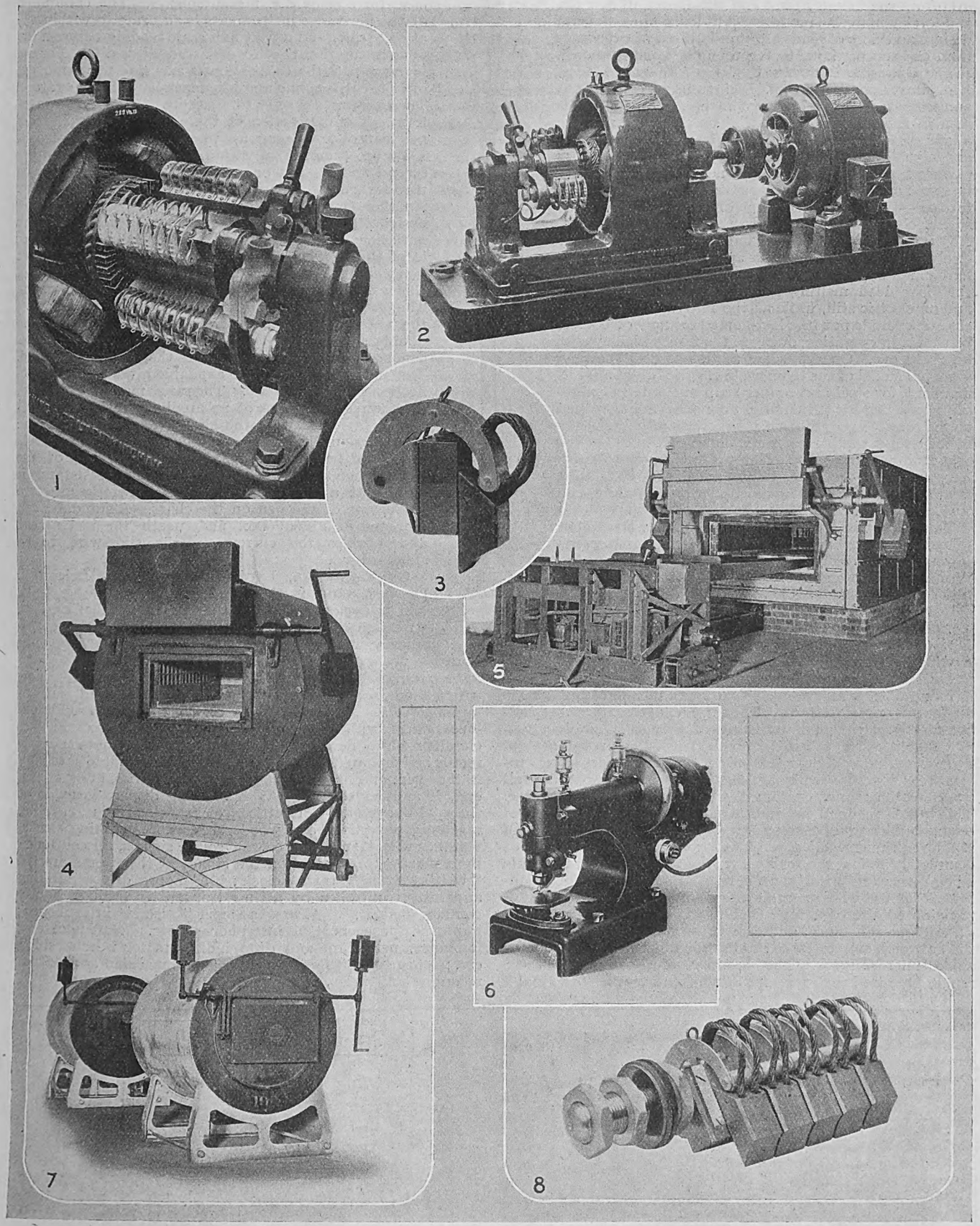

SOME INDUSTRIAL EXHIBITS.

AMONG the exhibits of W. Canning and Co., Ltd., are special dynamos used for electro-deposition, incorporating the brush spindles shown in (1), *a 250 A. generator coupled to a 5 h.p. d.c. motor is seen in* (2), *while detailed views of the brush holder and improved spindle are given in* (3) *and* (8). *The Birmingham Electric Furnaces, Ltd., are displaying the 30 in. by 15 in. model H.C.P.2 illustrated in* (4), *portable furnaces of the same make and a large "Birlec" machine being illustrated in* (5) *and* (7). *The nibbling machine of J. B. Stone and Co. is shown in* (6).

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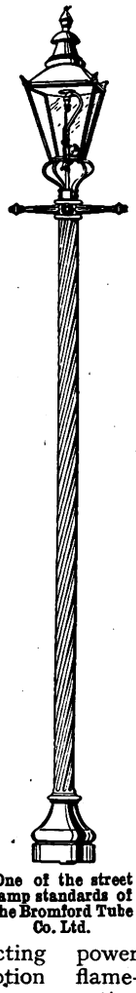
with a mechanically jig shaken sieve, removing the iron from the foundry sand and sifting out all oversize and foreign material, rendering it fit for re-use. Several designs and sizes of plant are standardised of capacities from one ton per hour to ten tons per hour or more.

The GENERAL ELECTRIC CO., LTD. (Magnet House, Kingsway, London, W.C.2). This stand is sectionalised and so far as industrial equipment is concerned this is seen in the left-hand section. The chief features are a standard Magnet type electric furnace actually annealing brass stampings, spinnings, etc. Two other electric furnaces are also shown near it—viz., a muffle furnace and a high temperature steel hardening furnace—the former serving to pre-heat high speed steel tools before they go into the hardening furnace. At the other wing of the stand another Magnet type electric furnace, designed for annealing steel and case-hardening steel is shown in operation. Adjacent to this is a lead melting pot with its contents molten, and an electric still, while at the rear will be seen an electric cyanide pot (the last-named cannot, of course, be shown in operation, owing to the fumes which would be given off). On this same section is also shown a sectional model of the Grunewald electric bright annealing plant, for steel and copper strip and wire in coils—samples which have been bright annealed are displayed on the stand. The exhibitors point out that the efficiency of the Grunewald process, for which the G.E.C. have the sole manufacturing and selling rights for the British Empire, should make this exhibit one of the outstanding features at the Fair. The remainder of the exhibits on this stand will be dealt with in our next issue.

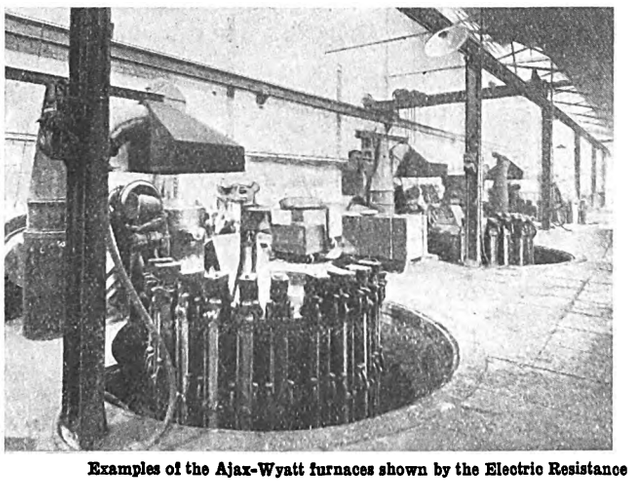
The CAMBRIDGE INSTRUMENT CO., LTD. (45, Grosvenor Place, London, S.W.1) Among the new instruments shown here is an a.c. microammeter (incorporating Westinghouse metal rectifiers). The construction of these instruments enables the sensitive moving coil galvanometer to be adapted for the measurement of a.c. down to a few microamperes. Another advantage is that the torque weight ratio is smaller than for a moving-iron instrument, with the result that the deflecting forces need only be small and hence the power consumption is reduced to a minimum. Two types of microammeter are made, in various patterns. The lower range patterns are self-contained instruments consisting of a type L unipivot galvanometer with a moving coil having a resistance of 250 ohms, and giving full scale deflection for 50 microamperes, together with a Westinghouse copper-oxide full wave rectifier unit contained within the instrument case. This type is made in two ranges only, from 0 to 100, and from 0 to 200 microamperes respectively, and cannot be used with range multipliers. In these lower ranges, the scales does not completely follow the linear law, the lowest 7% of the scale being rather less open than the rest. Each instrument is calibrated for use with its particular rectifier. The higher range patterns consist of a type L unipivot galvanometer with coil of 10 ohms resistance, and a separate rectifier unit, enabling the galvanometer to be calibrated for ranges to 500, 1 000 or 2 000 microamperes. The rectifier units covering these ranges are fitted with tags for attachment to the "thermal" terminals of a four-terminal galvanometer which may be used for a.c. or d.c. measurements. The calibration of the low-range instruments is accurate to within 1% at full scale, and 2% at half scale reading between the temperature limits of 10 deg. and 23 deg. C. For the higher ranges the calibration is accurate to within 1% of full scale reading and is independent of temperature. These accuracies refer to a supply of sinusoidal waveform. The calibration of these instruments is independent of frequency up to 2 000 cycles per second. They are accurate to within 1% at 4 000 cycles per second and 2% at 6 000 cycles per second, and may be used for rough comparison purposes at radio frequencies. Another new instrument is a recording potentiometer designed to give continuous, accurate records of small variations in electro-motive force. The potentiometer is of the slide-wire type, but instead of the contact being adjusted by hand until balance is obtained, this is done automatically by the recorder mechanism. The galvanometer, which is connected in series with the unknown e.m.f., is of the moving coil type with double suspension. Slide-wires of various resistances can be supplied, depending on the range required. The most sensitive range available gives full scale deflection for 6 milli-volts. The range may be extended, as required, by means of an auxiliary resistance connected in series with the slide-wire. Alternatively, a fraction of the voltage may be tapped off by means of a volt box. The maximum sensitivity of the galvanometer with a coil of 1 700 ohms resistance is such that a change of 0.25 microampere produces a movement of the pen on the chart. A standard cell mounted in a small box underneath the instrument case enables the current in the slide-wire to be standardised.

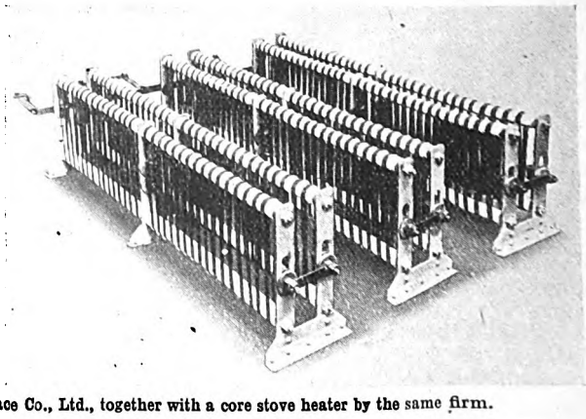


One of the street lamp standards of the Bromford Tube Co. Ltd.

GENT AND CO., LTD. (Faraday Works, Leicester). On this stand is displayed improved mining bells, and relays, suitable for working in parallel on bare wire signalling, and passed by the Home Office, also improved tapper keys, mining pushes, heavy duty power pushes, telephones, all incombustible and flame-proof. Water level indicators and alarms for indicating and recording step by step the rise and fall of liquid level. A new "Tangent" high and low liquid level alarm with diversion relay suitable for a.c. or d.c. circuits; also new model float switches. A new electric motor bell operated by a 1/10th H.P. motor suitable for fixing in the open, and for use at landing stages, ferries, fire stations, etc., is another exhibit. An interesting display is made of the "Pul-syn-etic" electric clocks, clocks in bakelite, cast-iron, watertight and wood cases, process timing clocks, together with "start and cease" sound signals, all controlled by a master transmitter on the stand. Other items are the "waiting train" turret clock; a motor driven striking apparatus, controlled by a time transmitter through hourly contact maker; "Parsons-Sloper" secret interphones; improved push button interphones, etc.; staff locaters; luminous, pendulum and drop indicators for hotels, ships, etc.; pneumatic bells and pushes; idle machine and output recording apparatus, etc.

MORE INDUSTRIAL PLANT.





Examples of the Ajax-Wyatt furnaces shown by the Electric Resistance Furnace Co., Ltd., together with a core stove heater by the same firm.

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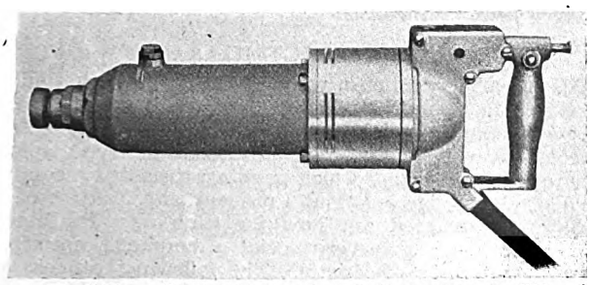
HOLLINGS AND GUEST, LTD. (Thimble Mill Lane, Birmingham). The stand of Hollings and Guest, Ltd. comprises several interesting exhibits, which may be seen working. Of these may be mentioned a hydraulic four column press fitted with three steel hot plates giving two daylights, specially designed for the manufacture of artificial horn, fibre, bakelite mouldings and insulating materials of all kinds. The working table of the press is of cast iron 36 in. by 502, recessed for the ram and guided on the four columns. The press head is also of cast iron, machined on the underside to receive the hot plate. The three steel hot-plates are 36 in. by 30 in. by 2 in. thick, one being fixed to the underside of the head, one bottom plate attached to the press table and one intermediate hot plate being suspended between the top and bottom plates. The distance or daylight between the hot plates is 6 in. The cylinder of this press is of cast steel, bored for the ram and gland. The ram is of cast iron machined and polished and spigoted into the table with a stroke of 12 in. The four press columns are of mild steel machined all over. The steam supply is connected to the hot plates by flexible steam pipes. These presses can, of course, be made in various sizes and pressure according to the work required to be done. As regards the method of operation. Single presses can be worked by a hand pump, or power pump, and a battery of presses is more conveniently worked by means of a low-pressure water supply for closing the press, and the final high pressure being applied by means of a hand pump.

The COMMUTATOR GRINDING BLOCK CO. (16, Sugarhouse Lane, Greenock). Here are shown special blocks which the makers state should be regarded by every user of d.c. electrical machines, alternators, or slip-ring motors, as an essential part of his equipment. In the case of large users who maintain their own plant it shows a great saving in time and money. The blocks are formed with an abrasive compound which will neither load nor glaze through a wide range of speeds, but a clean cutting surface of large areas is presented to the surface of the work.

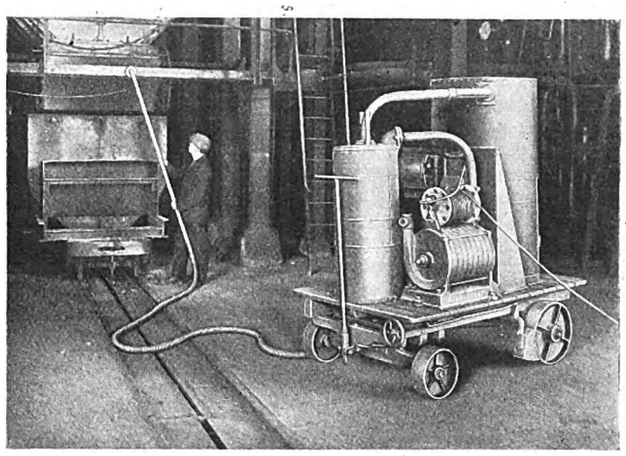
BLACKSTONE AND CO., LTD. (Stamford), present a comprehensive exhibit of their oil, petrol and paraffin engines, lighting sets, and "unchokeable" pumps. Five slow-running horizontal "Spring Injection" engines, from 14 B.H.P. single cylinder up to 130 B.H.P. twin are shown. This twin cylinder engine and a single cylinder engine of 55 B.H.P. are working light. An opportunity of seeing an engine working fully loaded is provided by a 76 B.H.P. twin-cylinder "Spring Injection" engine direct coupled to a dynamo and generating current for the stands. Two small self-contained totally enclosed "Spring Injection" oil engines, of 5 and 8 B.H.P., are also exhibited. This type of engine forms a handy and compact unit for contractor's or farm use. Three examples of the Blackstone "no trouble" petrol and petrol-paraffin engines are shown. There is a petrol engine of 2½ B.H.P. with hopper cooling tank; a 3½ B.H.P. petrol-paraffin engine on skids, and one of 6 B.H.P. on a concrete base. The petrol-paraffin engines are started up on petrol, and when, after a few minutes' running they are warm, the change over to paraffin fuel is made by a small hand lever. The engine



The "Kango" electric hammer shown by the Rawlplug Co., Ltd.

speed is governed, the governor operating on the carburettor and controlling both quantity and quality of the mixture. A 1½ kW petrol electric lighting set, complete with batteries, will be of interest to owners of country houses not yet reached by a public electricity supply. An interesting exhibit of an "unchokeable" pump at work is provided by a 3 in. horizontal pump, driven by a "Bull" motor, and handling spheres 2½ in. in diameter. Other "unchokeable" pumps on this stand are a 3 in. pump direct coupled to an electric motor; a 6 in. vertical pump suitable for handling unscreened sewage, storm water, etc.; an 8 in. horizontal gravel pump; and a portable set comprising a 4½ B.H.P. petrol-paraffin engine direct coupled to a 3 in. "unchokeable" pump.

THE RAY ENGINEERING CO. (Waterdale Works, Southmead, Bristol). On this stand are many examples of the now popular enclosed switchboard, not the least of these being an entirely new production in the form of an enclosed lighting plant switchboard in an aluminium and black enamelled case. The outstanding feature of this board is that all the switching functions of the plant are controlled by the turning of a single knob, making for the utmost simplicity in control. Interest



A vacuum cleaning equipment for factories, works, etc. (The Sturtevant Engineering Co., Ltd.)

will no doubt be shown in the new all-steel enclosed type switchboard which is being shown for the first time on this stand. The switchgear conforms, in the main, with the company's standard design of quick break knife type, the switches being built up in individual units and mounted behind sheet steel panels. The switches are mounted on bakelite bases, and operated by means of bakelite insulated toggle links, terminating in an insulated handle passing through an escutcheon plate in the sheet steel panel front. The makers state that there promises to be a large demand for this new type of switchboard, as all classes of switchgear, such as battery regulating, booster, starting and change-over switches, can be supplied similarly mounted, thereby obviating the necessity of special switchboard enclosures. Open type switchboards, battery charging resistances, and a new type of telpher are also shown.

(*To be continued.*)

THE ELECTRIC FITTINGS COMMITTEE.

Second Report for the Year ended March 31st, 1929—Changes in Personnel.

THE Committee held two meetings during the session 1928-9, the later one towards the close of 1928. Further meetings were deferred owing to the serious illness of the chairman. The committee was not called upon during the session for the exercise of its chief function—that of settling questions which might be raised as to "recognised" prices. The committee perfected its internal machinery during the session so that any party desirous of presenting a complaint, on calling upon the committee for the exercise of its statutory functions, can be assured of prompt action. For this purpose lists have been drafted of those authorities which had vested powers of sale, either full or with limitations, previously to the passing of the Act, thus obviating delay in answering enquiries. In regard to the committee's second function—that of "advising and assisting the persons concerned as to the method of giving effect to the section": During the session, the committee submitted to the Electricity Commissioners, at their request, a report on the general run of prices of "fittings" most likely to be in demand in rural areas. The committee also enlarged its sub-committee on installation work, as a result of which a unanimous report is about to be submitted to the committee. Though the committee and the conference committee, known as "Committee D," have no statutory connection, it is felt (the present membership of both bodies approximately corresponding) that this report would be incomplete without the short reference to it which appears as a "first annexe" to this report. The following changes in the committee's personnel were made during the year:—Mr. J. A. Crabtree, representing the B.E.A.M.A. Accessories Section, instead of Mr. F. J. Collis; and Mr. A. Albrecht, representing the E.W.F., instead of Mr. A. G. Beaver.

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E.D.A. CAMPAIGN.

Half the Premises in Leeds Now Supplied. —Encouragement of Wiring Extensions.

MR. C. F. Wells, A.I.E.E. (sales engineer, Electrical Distribution of Yorkshire, Ltd.), gave an address before the British Electrical Development Association (North Midland area), Leeds, on February 4th, on "Domestic Electrification," with special reference to the E.D.A. Electric Homes (Outlet) Campaign.

Mr. Wells said that the consumption of the average domestic consumer was probably not much higher than 400 to 500 units per annum, and this figure could easily be increased tenfold with suitable tariffs, hiring facilities, and more efficient selling organisations. Most households were still prevented from using more apparatus because of the scarcity of plug points, and the present inadequacy of domestic wiring represented an enormous loss of business to our industry. There were in this country about 2 600 000 electricity consumers. If each of these consumers could be persuaded to spend £4 on extensions and improvements to their wiring installations, business to the extent of over £10 000 000 would result in wiring alone.

Last year, according to the report of the Electricity Commissioners to March, 1929, the electrical industry showed an increase in units sold by authorised undertakers of 11% on the previous 12 months. Even making allowance for trade depression, this result must be regarded as quite modest. There were several undertakings in the north Midland area whose annual increase in units sold was as low as 2%. On the other hand, there were undertakings such as Leeds which were now supplying 50% of the possible premises. The undertaking with which he was associated connected over 7 000 new consumers last year, and the increase in units sold was 30%.

The Red Seal campaign in America and Canada promoted by the Electric Service League had been successful in getting a very large number of builders to sign an agreement under which they undertook to wire every house they built to the Red Seal standard. In 1928 nearly 80% of the new houses built in Toronto were wired to this Red Seal standard, and there was no doubt that the campaign had increased enormously the market for electrical appliances in North America. At the end of 1929 there were nearly 20 000 000 houses (7 out of every 10) in America wired for electricity, with the following domestic appliances :—

	Millions.
Irons	14½
Vacuum Cleaners	6
Washing Machines	5
Fans	5
Toasters	4½
Coffee Percolators	3½
Refrigerators	0¾

They must all agree that houses wired for lighting only were deprived of the greatest service electricity could give. As much expert attention must be given to the wiring installation of a house as was given to the building construction, drainage system, and the water supply. No house could be considered up to date that lacked a sufficient electrical installation. The saving on domestic labour and the diminished cost of decoration renewals alone often represented economies beside which the cost of installation and current played but a minor role.

With electricity as cheap as it was to-day (over 22 000 000 people lived in areas offering a two-part tariff with 1d. or less as the unit price of electricity) all new houses should be wired in accordance with nothing less than the E.D.A. Electric Home Wiring, which provided for adequate electric lighting in accordance with modern requirements and, in addition, ensured a sufficient number of plug points, so that electrical appliances could be conveniently plugged in and used freely in every room.

THE "BLUE BOOK."

Messrs. Robert Hornby and Co., Ltd., whose advertisement appears on the "Meters" Guide Card, have asked us to draw the attention of subscribers to the "Blue Book" to the fact that, owing to a printer's error in their advertisement, the Watt loss is shown as 0·¾ watt. This should read 0·5 watt. Subscribers are asked to be good enough to make this correction to the advertisement.

TELEPHONE DEVELOPMENT.

Record Increase in Number of New Subscribers Obtained During Year.

SIR Alexander Roger, presiding at the fifth annual general meeting of the Telephone Development Association on Tuesday, said the subject of the development of the telephone habit was one of national interest and importance. They knew from the figures which were published that there had again this year been a record increase in the number of new telephone subscribers obtained. The late Chancellor of the Exchequer announced that some 5 000 post offices and 1 600 railway stations, all in rural areas, were to be equipped, for the most part during the six months following the date of the announcement, with telephone call boxes at ordinary rates—a total of between 6 000 and 7 000 additional call offices. They hoped they would see all these 6 000 or 7000 new rural call offices in full activity before long. The latest available figures, up to September 30th, 1929, showed the following increases over the figures at the end of September, 1928: Exchanges, 156; call offices (including telephone kiosks), 3 579; exchange stations, 126 988. The revenue from telephone rentals and calls, as shown by the latest commercial accounts, was well over £20 000 000, a gain of £1 500 000 over the previous year, the operating profit was £4 280 000, and the net surplus for the year £525 000. The business interests of this country were calling for the appointment of a committee to inquire into the practicability of transferring telephone and telegraph administration to a public statutory authority which would be constituted on similar lines to analogous authorities, such as the Central Electricity Board, the British Broadcasting Corporation, and others. The Association had gone into this question carefully, and the results of their investigations would be available shortly.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Technical Abbreviations.

[TO THE EDITOR.]

SIR,—In reply to your correspondent, "H. H.," may I give my opinion on the abbreviation "kWh," namely, that "k" and "h" stand for the Latin "kilo" and "hora" respectively, and that these should therefore be written with small initial letters, like most other technical expressions of Latin or Greek derivation.

As for the argument put forward by "H. H." concerning the German application of the abbreviation, I wish to state that frequently "kWSt" is used in Germany instead of "kWh," in which case "St" is the German abbreviation of "Stunde," i.e., hora, or hour (heure in French); and, being a noun, is written with a capital "S" in accordance with the rules of German grammar.—I am, etc.,

F. F. C. BERKELEY.
(Dipl.-Ing.)

Monkseaton.

BRISTOL ELECTRIC CLUB.

THE annual general meeting of the Bristol Electric Club was held at the Crown Hotel on January 31st, and there was a very good attendance of the members. The President, Mr. A. H. Dowson, was in the chair, and reports were received from the treasurer and secretary, which gave a satisfactory condition of the Club's progress. The President also addressed the meeting, and pointed out how the Club was fulfilling its meaning in breeding a very social atmosphere among the electrical fraternity of Bristol. The following officers were elected for the coming year: President, Mr. A. H. Dowson; Chairman, Mr. W. L. Richards; Hon. Treasurer, Mr. A. C. Baker; Hon. Secretary, Mr. F. R. Ashmead. Committee: Messrs. Nichol, Rogers, Denman, Walker, Wallis, Porter, Skinner, Cutler, Hodge, Lovell, Murphy and E. A. Davies. The Secretary's address is 75, Victoria Street, Bristol.

In the summary communicated by the I.E.E. of the discussion at an informal meeting on January 26th, which appeared in THE ELECTRICIAN of February 7, Mr. A. F. Harmer was reported to have asked "why Mr. Twiss was erecting 33kV lines which must shortly become obsolete?" We are informed that Mr. Harmer's question actually referred to 3 000 V lines.

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NEWS IN BRIEF.

Overseas Trade Returns—Electric Railways in Sweden—Stoke-on-Trent and the E.C.A.—Autumn Meeting of the Iron and Steel Institute—Burnley and the Wireless Listener.

THE annual general meeting and the annual dinner of the Institution of Heating and Ventilating Engineers took place on Wednesday. At the meeting Mr. E. R. Jones delivered his presidential address, and a paper by Mr. Sam Fox, on "Half a Century of Boiler Making," was read.

The electrification of the Government railway, 285 miles in length, between Stockholm and Gothenburg has produced such satisfactory results that the Swedish Railway Board is submitting a preliminary scheme for the electrification of the Stockholm–Malmoe–Traelleborg main line, 391 miles in length, and certain branches, at a cost of £305 332.

Glasgow Health Committee has decided to provide X-ray equipment at the Bellefield Sanatorium, at a cost of £470.

Glasgow Corporation Health Committee has asked the electricity department to renew the power and lighting cables within Ruchill Hospital grounds, at an approximate cost of £2 500.

Many tenants on Accrington municipal housing sites are unable to meet their electricity bills, and a system whereby they may pay 1s. per week extra in rent towards the accounts is being adopted.

A meeting of the American Electrochemical Society will take place at St. Louis, Miss., from May 29th to 31st, inclusive. A meeting of the society is also to be held at Detroit from September 25th to 27th, inclusive.

A meeting of the Association of Mining Electrical Engineers, South Wales Branch, will be held at the South Wales Institute of Engineers, Cardiff, to-morrow (February 15th). Mr. W. A. Hutchings will read a paper on "Safety and Efficiency in Mines."

Mr. C. H. Yeaman, city electrical engineer, Stoke-on-Trent, has submitted to the Electricity Committee a schedule showing the fixed prices at which members of the local branch of the Electrical Contractors' Association are prepared to carry out installations under the assisted wiring scheme, and he has been authorised to arrange with the Association to carry out installations at the prices submitted.

"Electricity your Servant" was the title of a talk given last week by Mr. L. Burdes to members of the Bristol Branch of the Women's Electrical Association. With regard to the heating of rooms, it was stated that electrical panels behind walls or in the ceiling were a satisfactory means of regulating temperature, the current being switched off automatically when the desired temperature is reached.

The Iron and Steel Institute will hold an autumn meeting at Prague, Czechoslovakia, from September 15th to 20th next. The sessions for the reading and discussion of papers will take place in the new building of the Society of Czechoslovakian Engineers. Banquets and visits to places of interest are included in the programme. Further particulars from the Secretary, 28, Victoria Street, London, S.W.1.

Mr. M. Wadeson, chairman of the Sheffield Section of the Junior Institution of Engineers, spoke, at a recent meeting of the Section, on matters affecting the electricity supply industry. It had been asked, he said, why electricity tariffs were not uniform. Electricity tariffs were based on much the same system as the telephone, where the charges were lower during the periods when the telephones were least used.

It is reported in the "Record," the journal of the Transport and General Workers' Union, that 14 members of the union, formerly employed at the Stroud generating station of the Kent Power Co., have collectively been awarded £3 500 compensation for loss of employment due to the closing of the station in June, 1928. The Electricity Commissioners awarded compensation in sums ranging from £422 to £93.

In the Irish Free State over 21 000 000 telephone calls were registered last year. Dublin has one telephone user to every 25 of the population. Following a trial period and vote of telephone users, the Dublin telephone service is being transformed to the automatic system. No less than 90% of the subscribers who voted gave a verdict in favour of automatics. At the present rate of progress, Crown Alley, which is the exchange for almost half the telephone subscribers in Dublin, will be entirely automatic by the end of February.

Glasgow Health Committee is considering the installation of an automatic fire alarm system at Knightswood Hospital.

Leafield, Oxon, Baptist Church has been provided with an electric lighting installation as a memorial to the late Mr. J. W. Abraham.

The number of stations in the Post Office telephone system at the end of last November was 1 837 045, an increase of 14 055 on the total in the previous month. London's share was 657 304.

Blackburn Council has discontinued the practice of requiring domestic consumers to pay a deposit of £1 per house, and such sums already paid are to be returned, with interest.

According to the Board of Trade returns for the month of January, the total United Kingdom exports were valued at £58 262 478, a decline of £8 617 129 on January of last year. The total imports were valued at £101 853 658, a decrease of £14 692 030 on January, 1929.

In view of the general practice now in operation of installing electricity for lighting and gas for cooking and heating in all new dwellings, London County Council has not seen its way to agree to a suggestion put forward by representatives of the Co-partnership Committee of the South Metropolitan Gas Co. that dwellings erected by the Council should be carcassed for gas lighting in addition to being wired for electric lighting.

A suggestion has been made that Burnley Corporation should consider the question of relieving wireless licence holders of expenditure which they will have to incur to readjust their sets through the Corporation changing over from d.c. to a.c. The Electricity Committee is of opinion that any attempt to make them responsible for such expenditure would not be reasonable. They were not consulted about installations fixed, and no privileges were given.

The Government has decided to increase its grant to the British Engineering Standards Association. The Board of Trade will make an appropriation to the Association of £3 000 a year for 1930-31 and for the four succeeding years, and in the second year it will increase the grant by giving £1 for every £3 that the Association may raise from industry in excess of £13 000, the maximum total grant being limited to £5 000 in any one year. The grant by the Government to the Association has hitherto been £105 per annum.

The Leipzig Fair, at which about 10 000 firms exhibit, has become both an international and universal world market. It has been divided into two separate sections, known as the great engineering and building fair and the samples fair. Lighting fittings and art and artistic handicraft are amongst the branches of the samples fair, and the engineering and building section includes power and driving machinery, transport plant, and electrical engineering. The samples fair will be open from March 2nd to 8th and engineering and building from March 2nd to 12th.

LOOKING BACKWARD.

FIFTY years ago, THE ELECTRICIAN *of February 14th,* 1880, *briefly described a primitive hydro-electric installation at a chemical works in Greenwich, where a neighbouring waterfall furnished power for a turbine which drove a "Siemens machine," the current being conveyed* 150 *yards to a second Siemens machine in the workshop, this, in turn, driving the belting.*

In order to compare the light of gas and that of electricity a gentleman offered to provide the necessary apparatus to illuminate the bridge at Maidstone.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of February 10th,* 1905, *the receipt of wireless messages over distances up to* 600 *miles, transmitted by ships with* 1 *kW sets, was regarded as meriting attention.*

It was stated that the sum total of the capacities (including accumulator capacities) of all the German generating stations, on April 1st, 1904, *was* 531 000 *kW.*

A rough model of the Kearney-Thom mono rail was exhibited at an Arts and Industrial Exhibition in Battersea Town Hall.

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PERSONAL.

MR. C. C. Rattey, chairman of the Alton Battery Co., Ltd., has returned from his tour abroad, having visited British Columbia, Japan, China, the F.M.S. and Ceylon.

Wolverhampton T.C. has appointed Mr. T. A. G. Margary, distribution engineer, as borough electrical engineer, at a salary of £1 000 a year, rising by annual increments of £50 to a maximum of £1 200.

At the request of the Turton U.D.C. Mr. A. J. Hutchinson, chief electrical engineer and general manager to the Farnworth U.D.C., has been permitted to act as consulting engineer, with regard to a large extension scheme for the above Council.

Out of 33 applicants, Mr. C. H. Stafford, deputy-manager and assistant engineer of Reading Tramways, has been appointed manager of Burnley Corporation tramways and transport department in succession to Mr. H. Mozley, who retires on superannuation.

Mr. David Maxwell Buist has been appointed as district engineer for North East England. Mr. Buist up to this appointment has been in charge of the electrical work at the Billingham factory of Imperial Chemical Industries. Prior to that he was at Hull, having gone to there from Edinburgh Corporation. See page 213.

At a meeting of Exeter City Council last week, the Electricity Committee recommended that Mr. H. D. Munro, whose retirement is pending, be engaged for 12 months from April 29th next as consulting engineer at a fee of 200 guineas, and that Mr. A. L. Keet be appointed to perform the duties of electrical engineer from March 29th, at a salary of £700 a year, that position to be reviewed at the end of 12 months.

A presentation took place at the Crompton Parkinson, Ltd., works at Chelmsford on January 31st, to Mr. H. Church and Mr. S. E. Collis on the occasion of their leaving the company, to start an electrical engineering business in Chelmsford. The presentation took the form of an oak desk, a fountain pen and a framed photograph of the management and foremen to Mr. Church, and a wristlet watch and pipe to Mr. Collis. The gifts were handed to the recipients by Col. Hardie, general manager at Chelmsford, before a large gathering of employees, and in doing so he wished them the very best of success.

Leading members of the electrical and heavy engineering trades met on February 3rd at the Zetland Hotel, Middlesbrough, when a complimentary dinner was given to Mr. O. S. Nichols, the Tees-side representative of the British Thomson-Houston Co., Ltd., who has left to take up a similar appointment in Liverpool. The chair was taken by Mr. Percy Glover of the Furness Shipbuilding Co., Ltd., and the health of Mr. Nichols was proposed by Mr. D. J. E. Richards, of Synthetic Ammonia and Nitrates, Ltd. Mr. R. N. Crawford, of British Insulated Cables, Ltd., endorsed the sentiments expressed, and made the presentation of a suitably engraved silver salver and a Jensen cigarette lighter. Mr. H. Sanderson, of Arthur Jones and Co., proposed the health of Mr. A. D. Mackinnon, who is succeeding Mr. Nichols.

At a meeting of the newly elected District Council for the North-Western Area, on February 4th, Ald. T. E. Higham (Accrington) was again appointed chairman for the eleventh year in succession; Mr. J. T. Watkins was reappointed vice-chairman. A welcome was extended to the two new members on the employers' side, i.e., Aldermen Billington (Salford) and Freemen (Oldham). A similar meeting took place (on the same day) of the District Joint Board for the area. Ald. T. E. Higham was appointed chairman, and Mr. G. E. Smith (Barrow) vice-chairman. A welcome was extended to the new member on the employers' side, i.e., Ald. E. Porter (Blackburn). After the conclusion of the Board meeting, Mr. J. W. Thomas having been invited to join the meeting, was presented with a reading lamp as a mark of good feeling.

Obituary.

MR. ARTHUR GREENHOW-LUPTON, aged 79 years, on February 8th, a promoter and for many years chairman of the Yorkshire Electric Power Co.

MR. SYDNEY W. BAYNES, on February 6th, who from 1895 until December, 1927, was chief electrical engineer of the St. Pancras (London) B.C. Mr. Baynes was one of the pioneers of the electricity supply industry and in the early days was the electrical engineer to the Forth Bridge works, afterwards carrying out contracts with the Central Argentine Railway and the Kensington and Knightsbridge Electric Lighting Co. For seven years he was chief engineer to Bradford Corporation electricity department and took up his position with the borough of St. Pancras in 1895. See page 213.

BUSINESS ITEMS.

NEW premises in the Parsonage, Manchester, have just been taken by the REVO ELECTRIC CO., LTD.

The Liverpool branch of the BRITISH THOMSON-HOUSTON CO., LTD., has been transferred from South Castle Street to 27–29, Stanley Street. Tel.: Bank 5 700.

The address of COMBUSTION STEAM GENERATOR, LTD., Southampton Row, London, W.1, has been changed to Africa House, Kingsway, W.C.2. Tel.: Holborn 2 002.

The electrical work for the extensive model dairy established at Oswaldtwistle by BLACKBURN, ACCRINGTON AND OSWALDTWISTLE CO-OPERATIVE SOCIETY has been carried out by Mr. JOHN WALSH, of Blackburn.

We are informed that the ALTON BATTERY CO., LTD., supplied the battery equipment for the £6 000 000 hydro-electric scheme recently put into commission at Lochaber for the North British Aluminium Co., Ltd.

BRITISH INSULATED CABLES, LTD., of Prescot, have in the last few days secured an order for the supplying and laying of 66 000 V cables for one of the large power companies operating in London. The value of the contract is in the neighbourhood of £250 000. The company has also secured the contract for the supplying and laying of the new G.P.O. trunk telephone cable from Manchester to Chester, a distance of 42 miles. Large orders have also been received for telephone cables for shipment abroad. These include 96 000 yards of underground cable and a short length of submarine cable for Shanghai, and 20 080 yards of underground cable for Australia. An order has also been received by the Southern Railway for 40 000 rail bonds.

The BRITISH GENERAL ELECTRIC CO. LTD., of Wellington, N.Z., has received a number of interesting orders, amongst them being one from the Auckland Electric Power Board for two 1 000 kW 750 r.p.m. motor-started rotary convertors (each with its 1 100 kVA 3 phase transformer) and fully automatic switchgear for the convertors and four track feeders; the whole equipment is arranged for supervisory control if required. This order follows closely on the recent order for tramway motors, so that G.E.C. plant will be used in Auckland not only for the conversion of power but also for the propulsion of the trams. For the interconnection of the Waitaki (110 kV) and Lake Coleridge (66 kV) power schemes in the South Island, the B.G.E.C. has received an order for seven 5 500 kVA 63 500/38 100 V outdoor type single phase auto-wound transformers. The stations are about 160 miles apart and the G.E.C. transformers will form two 16 500 kVA three-phase 110/66 kV banks (with one spare) for their interconnection. The transformers are of the oil-immersed type fitted with detachable cooling radiators, and an unusual feature is the 11 kV tertiary winding, which allows each bank to supply power to a 10 000 kVA synchronous condenser. An order has also been received for auxiliary generating plant and switchgear for the Waitaki power station; this includes two 315 kVA 420/410 V 3-phase 50-cycle alternators and two 120 kW 230 V d.c. generators (all running at 750 r.p.m. and coupled in pairs to water turbines), an 8-panel 420 V a.c. flat back switchboard, and a 6-panel 220 V d.c. flat back board.

THE NATIONAL REGISTER.

List of Registered Electrical Installation Contractors Further Extended.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on February 7th, fourteen applications for registration were received from electrical installation contractors. Of these, ten were accepted, two declined, and two withdrawn.

The names and addresses of the successful applicants are as follows:—

Hulton and Hinchliffe, Ltd., 42, Bottom o' th' Moor, Oldham.
Brandrick, James, 18, Middleton Road, Royton.
Ward and Co. (Dewsbury), Ltd., 15, Northgate, Dewsbury.
Calligan, Tom, Carlton Place, Greenfield, near Oldham.
Hutt, Wilfrid George, 26, South Ealing Road, London, W.5.
Cooper and Sellers, 28, High Street, Wellingborough.
Barnsley Corporation, Electricity Department, Queen's Road, Barnsley.
Rigby and Partners, Ltd., 53, Victoria Street, Westminster, London, S.W.1.
Farrar, Marmaduke F., 14 and 16, Crossley Street, Halifax.
Kettering Urban District Council, Electricity Department, Rockingham Road, Kettering.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BEXLEY URBAN DISTRICT COUNCIL.—Manufacture and supply of 1 400 kVA Scott-connected transformer bank; and switchgear and cables for same. Specification, etc., from Mr. A. J. Abraham, Electricity Department, Broadway, Bexleyheath, Kent; deposit £1.

DUNDEE CORPORATION.—Electric lighting work at 3, Fleuchar Street, Dundee. Particulars from the City Engineer, 91, Commercial Street, Dundee.

SALFORD GUARDIANS, February 15th. — Electric lighting of lodge and new roads, Eccles New Road, Pendleton. Specification from Mr. E. H. Inchley, Poor Law Offices, Eccles New Road, Salford; deposit, £2 2s.

TORQUAY CORPORATION, February 15th.—Two water tube boilers, economisers, etc., for the electricity works. Specifications, etc., from the Borough Electrical Engineer and Manager; deposit £3 3s.

BLACKPOOL CORPORATION, February 17th.—Supply of electrical sundries, etc. Forms of tender and specifications from the Borough Treasurer, Town Hall, Blackpool. Stamped, addressed envelope to be sent.

EDMONTON GUARDIANS, February 17th.—Six months' supply of electric lamps, X-ray, light and massage requisites, etc. Forms of tender, etc., from the clerk, Mr. E. Ridley, Board Room, 77, Bridport Road, Edmonton, London, N.18. Stamped, addressed envelope to be sent.

GLASGOW EDUCATION AUTHORITY, February 17th. Electric lighting installation in temporary school at Baird Street, Govan. Specifications, etc., from the Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s.

HARROGATE CORPORATION, February 17th.—Twelve months' supply of electric lamps, lamp columns, etc. Forms of tender, etc., from the Borough Engineer.

HULL CORPORATION, February 17th.—Twelve months' supply of stores to the tramways department, including controller and motor parts, carbon brushes, trolley gear, cable, lamps and fittings, copper wire, insulating tapes, commutators, overhead line fittings, etc. Forms of tender, etc., from the General Manager, Tramway Offices, Albion Street, Hull.

PLYMOUTH CORPORATION, February 17th–20th.—Supply of electricity meters, paper insulated cables and transformers. Specifications, etc., from the City Electrical Engineer, Electricity Offices, Armada Street, Plymouth, until February 17th. Tenders by February 20th.

WIMBLEDON CORPORATION, February 17th.—One 7 500 kW, two-phase turbo-alternator, condensing plant and auxiliaries. Specification, etc., from Mr. A. E. McKenzie, Electricity Works, Durnsford Road, Wimbledon, London, S.W.19; deposit £2 2s.

HOLBORN (LONDON) BOROUGH COUNCIL, February 18th.—Twelve months' supply of electric lamps, etc. Specification, etc., from the Borough Engineer, Town Hall, High Holborn, London, W.C.1.

LEEDS CORPORATION, February 18th.—One year's supply of stores to the electricity department, including i.r. covered cables, mains boxes and fittings, jointing and insulating materials, fittings and sundries (section N). Forms of tender, etc., from Mr. C. Nelson Hefford, Electricity Department, 1, Whitehall Road, Leeds.

Tramway Stores.

MANCHESTER CORPORATION, February 18th.—Supply of stores to the transport department, including parts of electrical equipment of tramcars, overhead equipment, power and lighting cable, bell wire, lamps, tramcar axles, tyres, etc. Schedules, etc., from the General Manager, Transport Department, 55, Piccadilly, Manchester.

STOCKPORT CORPORATION, February 18th.—One 60-ton electric crane and gantry. Specification, etc., from Mr. R. Lee, borough electrical engineer.

HULL CORPORATION, February 19th.—Supply of electricians' material, etc. Forms of tender from the City Engineer.

LEEDS EDUCATION COMMITTEE, February 19th.—Electrical work in connection with repairs to buildings. Further particulars from the Architects' Section, Education Department, Calverley Street, Leeds.

METROPOLITAN ASYLUMS BOARD, February 19th.—Electric light installation at Woolwich Casual Ward (contract No. 3); electric light installation at Lambeth Casual Ward (No. 4), conversion of workshop power units to electricity at Darenth Training College (No. 5); and installation of wireless receiving apparatus at Northern Hospital, Winchmore Hill (No. 6). Specifications from the Board's Offices, Victoria Embankment, London, E.C.4; deposit £1 for each.

WEST RIDING EDUCATION COMMITTEE, February 19th.—Electric light installation at Rawmarsh New Senior School, Mining Centre and caretaker's house. Specifications, etc., from the Education Officer, County Hall, Wakefield.

Street Lighting Equipment.

BANGOR (CO. DOWN) CORPORATION, February 20th.—Manufacture and supply of steel electric lamp standards, with boxes, brackets and lanterns. Specification, etc., from the Borough Electrical Engineer, 19, Bridge Street, Bangor, Co. Down.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, February 20th.—Electric lighting installations in four blocks of tenement buildings. Specification, etc., from Mr. D. J. Keep, town clerk, deposit £2 2s.

HULL CORPORATION, February 20th.—One 1 000 000 gallons per hour, natural draught cooling tower (contract 152); cast iron circulating water pipes (contract 153); and two motor-driven, vertical spindle drainage pumps. Specifications from Mr. J. N. Waite, city electrical engineer, Electricity Works, Sculcoates Lane, Hull; deposit £2 for each.

SALFORD CORPORATION, February 20th.—Electric light installation at Tootal Drive School. Further particulars from the Secretary, Education Offices, Salford.

CENTRAL ELECTRICITY BOARD, February 22nd.—Transformer oil-treating plant for 18 transformer stations in the area of the Central England Scheme. Specification (No. B.E.—P.S. 2), etc., from Mr. R. E. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, February 24th.—Supply of prepayment meters. Specification from Mr. D. J. Keep, town clerk, Town Hall, Cambridge Road, London, E.2; deposit £2 2s.

BRENTFORD GUARDIANS, February 26th.—Provision of central switchboard and laying of electric mains at West Middlesex Hospital, Isleworth. Specification, etc., from Messrs. Dodge and Reid, 120, High Street, Brentford; deposit £1 1s.

CROYDON CORPORATION, February 26th.—Six months' supply of electrical fittings and appliances, etc. Specification, etc., from the Union Offices, Mayday Road, Thornton Heath. Stamped, addressed envelope to be sent.

HAMMERSMITH (LONDON) BOROUGH COUNCIL, February 26th.—Twelve months' supply of electric lighting sundries, insulated wires, ordinary and prepayment meters, insulating compound; h.t. and l.t. concentric, paper insulated cables, etc. Forms of tender, etc., from the Borough Electrical Engineer, 85, Fulham Palace Road, London, W.6.

WEST RIDING EDUCATION COMMITTEE, February 28th.—Electric light installation in Southowram Withinfields Council School. Specification, etc., from Mr. G. Dodgson, Education Office, Huddersfield Road, Elland.

OXFORD CORPORATION, March 1st.—Manufacture and erection of engines and pumps, including two oil-driven auxiliary engines each driving an electric generator; electric light installation, etc. Specification, until noon on March 1st, from Sir A. Binnie, Son and Deacon, Artillery House, Artillery Row, Westminster, S.W.1; deposit £10.

BELFAST CORPORATION, March 3rd.—Twelve months' supply of materials to the electricity department, including electrical accessories, lamps, carbon brushes, bitite strip, tapes, joint box compound, street box frames and covers, feeder and section pillars, copper cable connectors, electricity meters and instrument transformers, maximum demand indicators, automatic time switches, cut-outs, transformers, cables, wires and flexibles, etc. Forms and tender, etc., from Mr. F. H.

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Whysall, city electrical engineer and manager, East Bridge Street, Belfast.

CENTRAL ELECTRICITY BOARD, March 3rd.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme. Specification (No. S.E.E.—P.F. 5) from the secretary and solicitor, Mr. R. H. Fox, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

DOVER HARBOUR BOARD, March 3rd.—Twelve months' supply of electric cables, electrical sundries, etc. Schedules, etc. (2s. 6d.), from the office of the Register, Castle Street, Dover.

HALIFAX CORPORATION, March 3rd.—Electrician's work at public conveniences. Specification, etc., from the Borough Engineer, Crossley Street, Halifax; deposit £1 1s.

SOUTHEND CORPORATION, March 3rd.—Twelve months' supply of stores, including meters and instruments, electrical fittings, cables and steel conduits, joint boxes, earthenware conduits, etc. Specification, etc., from the Borough Electrical Engineer and Manager, Electricity Works, London Road, Southend-on-Sea.

BEDFORD CORPORATION, March 10th.—Supply during one year of e.h.t., h.t. and l.t. underground cables; and incandescent lamps. Specifications from the Borough Electrical Engineer, Prebend Street, Bedford. Tenders from British manufacturers in the United Kingdom only are invited.

PRESTWICH URBAN DISTRICT COUNCIL, March 10th.—Twelve months' supply of lamp standards, electric lamps, etc. Forms and tender, etc., from Mr. H. T. Ainsworth, surveyor, Town Hall, Prestwich, Lancs.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, March 19th.—Coal-handling plant at Ironbridge generating station. Specification (No. 8), etc., from Mr. E. F. Hetherington, Phœnix Buildings, Dudley Road, Wolverhampton.

Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, February 15th.—Supply of 1 771 metric tons of telegraph wire. (Reference A.X. 9 047).

LOUIS TREICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of distribution system poles, conductors, transformers, meters, sub-station equipment, etc.). (Reference B.X. 6 003.)

LOUIS TREICHARDT (SOUTH AFRICA) MUNICIPALITY, February 18th.—Supply and erection of two 60 kW sets, comprising two boilers, one economiser, a steel chimney, two engines, two alternators, and accessories, or, alternatively, two 100 kW sets. (Reference A.X. 8 997.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (schedule C. 541). (Reference B.X. 5 940.)

CHILEAN STATE RAILWAYS, February 19th.—Supply of apparatus and material for a signalling service between Maipu and Cartagena stations and between San Fernando and Talca stations. (Reference A.X. 9 008.)

JOHANNESBURG MUNICIPALITY, February 20th.—Supply of transformers. (Reference B.X. 6 043.)

JOHANNESBURG MUNICIPALITY, February 20th.—Supply of switchgear (contract 322). (Reference B.X. 6 044.)

ROYAL YACHTS, ALEXANDRIA, EGYPT, February 20th.—Supply of electrical materials. Specification, etc., can be seen at the Department of Overseas Trade, London. (Reference B.X. 6 133).

SOUTH INDIAN RAILWAY CO., LTD., February 21st.—Supply of wood sheet separators for train lighting cells. Specifications, etc. (5s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 11th.—Supply of bells and buzzers (schedule C. 552). (Reference B.X. 6 043.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, March 13th.—(extension of time).—Supply of electric tube butt welder. (Reference B. 6 116).

EGYPTIAN MINISTRY OF THE INTERIOR, March 20th.—Steel water tank, on steel tower, with piping and fittings; and electric water level indicator. (Reference A.X. 9 073.)

CAPE TOWN MUNICIPALITY, April 2nd.—Supply of five sets of electrically-driven pumps and accessories, including motors, switchboard, etc. (specification No. 485/29). (Reference A.X. 9 096).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

Tenders Accepted.

EALING CORPORATION.—W. G. Hutt, wiring houses on North and South Roads, £1 182.

BIRMINGHAM GUARDIANS.—Reynolds and Bradwell, electrical works at Western Houses.

SOUTHEND CORPORATION.—Davey and Armitage, supply of 1 600 electric meter boards, £156.

BOLSOVER COLLIERY.—Edison Swan Electric Co., Ltd., supply of standard lighting lamps.

BARKING URBAN DISTRICT COUNCIL.—A.C.E.C. Co., supply of cable, £1 177 2s. (Recommended.)

CHIPPENHAM GUARDIANS.—Western Electric Supply Co., motor for driving washing machine, £37.

WANDSWORTH (LONDON) GUARDIANS.—H. R. Soutter, 18 electric sterilisers, loading 1 kW each.

YORK CORPORATION.—Barber and Colman, provision of traffic signals, £528 16s. (Recommended.)

SALFORD CORPORATION.—Barber and Colman, Ltd., supply of traffic signals, £144 5s. (Recommended.)

BANGOR CORPORATION.—Owen and Palmer, installation work in houses to be wired on instalment plan.

BIRKENHEAD CORPORATION.—Express Lift Co., electrification of lift at Art Gallery, £70. (Recommended.)

SANDBACH URBAN DISTRICT COUNCIL.—North Wales Power Co., electric light installation at town hall, £89 7s. 6d.

GRIMSBY CORPORATION.—Foster Engineering Co., Ltd., supply of testing equipment, £295 4s. (Recommended.)

EAST HAM CORPORATION.—Hart Accumulator Co., Ltd., control battery and switchboard, £265. (Recommended.)

METROPOLITAN WATER BOARD.—Edison Swan Electric Co., Ltd., supply of 2 640 yds. of cable, £90. (Recommended.)

MARTLEY RURAL DISTRICT COUNCIL.—J. Leeming and Co., electric wiring of 21 cottages, £82, and 11 bungalows, £39.

FULHAM (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., provision of ceiling lights in the Council chamber, £160.

BELFAST EDUCATION COMMITTEE.—G. R. Craig and Co., electric lighting at Hardcastle Memorial Elementary School, £264.

BEXHILL CORPORATION.—H. W. Elsworth, electric lighting and power installation at isolation hospital, £149 (all recommended).

LOWESTOFT CORPORATION.—New Destructor Co., Ltd., fan blast apparatus at refuse destructor works, £275. (Recommended.)

SWANSEA CORPORATION.—Relay Automatic Telephone Co., £260, provision of internal telephone system at Hill House hospital.

MANCHESTER CORPORATION.—British Thomson-Houston Co., Ltd., installation of 33 000 V feeder reactors at Barton power station.

BRIGHTON CORPORATION.—British Separators, Ltd., supply of electric heater for raising temperature of oil at Southwick power station, £135 15s.

HACKNEY (LONDON) BOROUGH COUNCIL.—Tudor Accumulator Co., Ltd., supply of 200 positive plates for main battery, £120. (Recommended.)

OLDHAM EDUCATION COMMITTEE.—Charlesworth and Co., electrical installation at Freehold school and wiring at Electrical Engineering Laboratory.

EARTHED PLUGS AND SOCKETS.

A revision of B.S.S. No. 196 has been issued by the B.E.S.A., one of the differences between the new (1930) and the 1927 edition relating to the dimensions of the lug on the non-reversible plug and socket. It has been found that, with slight irregularities in manufacture, there was a risk in some cases of being able to force the lug (the non-reversible device) into a hole in the socket not intended for the reception of this lug. A slight modification to the dimensions has, therefore, been made in order to remove this possibility.

Copies of the Specification, No. 196, 1930, may be obtained from the Publications Department, 28, Victoria Street, S.W.1.

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ELECTRICITY SUPPLY.

The Yoker Power Station—Proposed Main Extensions at Battersea—Walthamstow and Unemployment—Dnieper River Hydro-Electric Developments—Lightning and Overhead Transmission Lines.

HORNSEY Electricity Committee is to extend mains at a cost of £1 200.

The Clyde Valley Electrical Power Co. is to extend its Yoker power station.

Glasgow Electricity Committee has authorised mains extensions at a cost of £8 100.

A resolution that all new streets be lighted by electricity has been passed by Clitheroe T.C.

Lancaster T.C. has decided to carry out mains extensions to a number of surrounding villages.

Stretford and District Electricity Board is having a scheme prepared for the electric lighting of the Irlam district.

Application for a loan of £10 000 for mains and services for the ensuing three years has been made by Taunton T.C.

Walsall Electricity Committee recommends an expenditure of £15 500 on mains, sub-station equipment and buildings.

The London Power Co. has submitted to London County Council notice of intention to lay mains along a number of routes from Battersea.

The Ministry of Transport has refused the application of the Grampian Electricity Supply Co., Ltd., for permission to use overhead lines in the Borough of Doune.

Guildford Corporation has received the assent of Shere P.C. to the erection of overhead lines at Shere. The Electricity Committee has decided to carry out the extension.

Mr. G. Sommerville has been requested to draw up for Faversham T.C. a scheme of assisted wiring. An application is to be made for an extension of the area of supply.

The Holywood electricity scheme, which will cost £10 000, is nearing completion. Energy is to be taken from the Ballymacarett sub-station of the Belfast electricity department.

The East Devon Electricity Co. has entered into an agreement with Exeter Corporation for a supply of electricity in bulk for distribution throughout Devon and part of Somerset.

Walthamstow T.C. has adopted a scheme in connection with the relief of unemployment, for laying electric cables in all roads where a supply is not at present available, at an estimated cost of £134 867.

The Shropshire, Worcestershire and Staffordshire Electric Power Co. seeks authority to include the borough of Stratford-upon-Avon in its area of supply as well as certain areas in the county of Hereford.

Stoke-on-Trent Electricity Committee has received sanction to borrow sums amounting to £20 952 for electricity services; re-laying and extension of mains and provision of a sub-station in Lichfield Street, Hanley.

Tynemouth Electricity Committee seeks sanction to borrow £15 000 for further installations under the assisted wiring scheme; £5 000 in respect of supplying prepayment meters and £5 000 for general extensions.

Bermondsey (London) Electricity Committee reports that it will be necessary to run two new feeder cables to positions near Rothsay Street and near Crucifix Lane and White's Grounds, at a cost of about £6 000.

Birkenhead Electricity Committee has decided to proceed, in stages over a period of years, at a cost of £10 100, with the work of substituting an a.c. supply for the existing d.c. supply in Grange Road, Cavendish Drive and Bebington Road.

It is understood that the Governor of Northern Ireland has been invited to perform the ceremony of switching on the Holywood electricity supply. Already a large number of shopkeepers and residents have had their premises wired, and a large demand for power is anticipated.

Grantham R.D.C. has been informed by the Commissioners that it is proposed to grant an order to Mr. R. Borlase Matthews for the supply of electricity in the area. The Council has approved the scheme. Bourne U.D.C. has approved of a similar scheme put forward by Mr. Matthews.

Luton T.C. has decided to give a supply of electricity to Ascott House, Wing, the residence of Mr. Anthony de Rothschild, and to the parish and neighbourhood. An additional 6 000 V feeder cable is to be laid for augmenting the supply of the Lee Ward at an approximate cost of £2 600.

Electricity Distribution of North Wales and District, Ltd., has informed Ellesmere U.D.C. of its application, under the Development Act, for assistance to enable it to carry out the construction of lines from Nantwich through Whitchurch and Ellesmere. The Council has decided to support the application.

Four 77 500 kVA hydro-electric generators, which it is said will be the largest in the world, are being manufactured by the General Electric Co. of New York for the Dnieper River development at Kichkas, near Zaporozhe, in the Ukraine. The weight of each generator will be approximately 786 tons.

London County Council has consented to a proposal of Chelsea Electricity Supply Co. to change its system and pressure of supply from d.c. at 200/400 V to a.c. at 230/400 V, and to a proposal of Battersea B.C. to instal an a.c. distribution system in that part of the borough in which a d.c. supply is now given.

Bridlington T.C. has applied for a loan of £3 000 for mains and for £1 000 for services. The Commissioners are to be approached with a view to the elimination of certain parishes from the draft Order of the Holderness Trust, Ltd., and their inclusion in a Special Order to be applied for by the Corporation.

Stoke-on-Trent Electricity Committee has accepted a tender amounting to £710 for the erection of a sub-station in Garner Street.—The Committee has authorised mains extensions at a cost of £2 000.—Sanction has been obtained to borrow £2 442 in connection with the bulk supply of electricity to Leek U.D.C.

Eastbourne Electricity Committee has discussed the question of the use of inferior lamps, and has decided to bring the matter to the notice of the I.M.E.A., with a view to their considering the advisability of issuing a statement on the question of the use of cheap lamps and which might be suitable for insertion in the local papers.

Carrickfergus U.D.C. decided last week to apply for an Order to authorise an electrical scheme for the district, and that Mr. J. Scott be retained to prepare a scheme. Mr. Scott estimates the cost at £25 000, covering three years. He suggests that the Council should add the Ballynure district to the proposed supply area.

An inquiry has been held by the Electricity Commissioners for Northern Ireland into applications by the Dungannon Gas Co. and the Dromore Electrical Lighting Co., for Orders to carry out electric lighting in Dungannon. A point advanced against the Gas Co. was that it reduced its prices from the time the U.D.C. applied foran Order to light the town electrically.

An application has been made by Basingstoke T.C. for a loan of £12 785 for an 800 kW Diesel alternator set, and a 500 kW motor-generator set, with transformer, switchgear, etc. The Council is also to obtain tenders for another set of plant of similar capacity, to enable the Corporation to consider the advisability of replacing the three 150 H.P. Diesel engine generator sets at present in the station.

It has been decided by Hull Streets Committee that Savile Street be lighted with 750 W gasfilled lamps, and that in cases where separate standards are to be fixed they be supplied by the committee. The City Electrical Engineer quoted £20 per 1 000 W lamp or £15 per 750 W lamp per annum if lamps are fixed on the tramway standards, with an extra £2 per lamp, in either case, if mounted on separate standards.

A Ministry of Transport inquiry has been held in regard to the proposal of the Thames Valley Electric Supply Co. to erect overhead lines on the Sonning estate at Woodley. The application was opposed by Wokingham R.D.C., who said the lines would constitute a danger to the Reading aerodrome. Mr. Spencer Hawes, managing director of the company, said it was not their intention to have high tension wires, but only distributing wires of 230 V.

A report made to the American Institute of Electrical Engineers by sixteen power engineers and electrical research experts, states that lightning now presents the only serious remaining problem to the continuity of electric power service. Of the various instruments available to assist in the fight against the menace of lightning, the hypersensitive cathode-ray oscillograph with its swift-acting electron beam appears to be most in favour. It can be adjusted to show surges lasting only a few millionths of a second and will photograph the wave forms of voltages set in operation by a lightning stroke on an overhead electric wire.

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COMPANY NEWS.

Fluctuation of Cables and Wireless Prices—London Power Co.'s Progress—Underground Railways Development Scheme—Directors' Reports and Dividends.

SINCE our last number went to press there has been a temporary recovery in prices of the stocks of Cables and Wireless, Ltd., followed, however, by a reaction which has left the quotations much the same as a week ago. It is suggested in some quarters that the first year's dividend on the 7½ per cent. "A" ordinary stock may not be much above half the maximum figure its name implies. At the end of November this stock stood at over 80, and was not considered over-valued.

Radio Corporation of America shares have been bought, and have risen from 39 to 43¼, approximately the quotation a month ago. American Telephone and Telegraph capital stock has maintained the higher level reached on the recent announcement of the details of the proposed agreement between these two companies. Hydro-Electric Securities have further receded from 43¼ to 42¼, and International Holdings from 5¾ to 5⅜. International Telephone and Telegraph stock has dropped further from $73 to $70, and Marconi International Marine shares have also shed another 1s. 3d. from 45s. to 43s. 9d. Eastern Telegraph 3½% preference stock is a point up at 63½.

In the equipment group, the ten-shilling shares of the National Electric Construction Company have changed hands at 23s., and the price in the official list has been raised 2s. 6d. from 20s. to 22s. 6d. English Electric convertible debenture stock is up a point to 65½. Callender's Cable ordinary shares have risen from 73s. 9d. to 75s., but the 6½% preference have fallen from 25s. to 23s. 9d.; Enfield Cable Works ordinary have improved from 92s. 6d. to 93s. 9d. Ever Ready participating preference shares have shed threepence, from 28s. 9d. to 28s. 6d.

Among the electricity supply companies, Fife 6% preference are marked up from 15s. to 16s. 3d., Metropolitan ordinary shares have improved from just over 38s. to 38s. 9d., and South London from 26s. to 26s. 6d. Clyde Valleys are down from 36s. 3d. to 35s. 7½d., and Lancashire ordinary and first preference from 27s. 6d. to 27s. Whitehall debentures are ½ easier at 103½, and Victoria Falls Power have shed 7½d.

Last Annl. Divd.%	Description.	Last Week.	This Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6*	20/6	22/6	19/9
6½	" " "C" Cum. Pref. ..	22/-*	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	61/3	61/3	78/-	29/9
6	" " 6% Cm. Pf.	22/6*	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-*	20/-	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95⅝	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " 4½% C.P. (£1)	17/-*	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	35/7½	36/3	44/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	45/7½	45/7½	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp.7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	22/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	" " 6% C.P. ..	16/3	*5/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	89*	89	92	80½
—	Hydro Electric Securities.. ..	42½	43½	87	20
—	International Holdings	5⅜	5⅜	35½	6
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/6	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/6	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	26/6	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	99	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
1/9⅜	Metro. Elec. Sup. Ord.	38/9	38/1½	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	28/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec.Sup.Ord..	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅝	10¼	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(c)	St. James & P.M. Ord. (£1) ..	25/6	25/6	28/6	23/6
8	Scottish Power Ord.	30/-	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/6	26/-	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94	94	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	59/4½	60/-	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70⅝
5	British Colum. Elec. Rly. Pref. Stk.	90½	89½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	" " " 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	" " 5% Cum. Pf.	12/6	12/6	15/9	13/-
4	Cent. Lon. Ry. Ord. Stk. (asstd.)..	71	72	74⅜	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. .	69	69	65½	52
4	" " 4% Perp. Deb. ..	76½	76½	81¼	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	72½	79	42½
4	" " " " 4% Pf. Stk.	72	72	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	50½	50½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " " 5% Deb. ..	70½	70½	72⅝	65¼
3½	Met. Rly. Cons. Ord. Stk. ..	64⅜	64	81	54⅜
3½	" " " 3½% Pf. Stk. ..	62	62	76	60⅜
3½	" " " 3½% Deb. ..	67½	67½	73⅜	67¼
5	Met. Dist. Rly. Ord. Stk. ..	74⅜	74⅜	81¼	52½
4½	" " " 4½% 1st Pref. ..	80½	80½	84	74¼
6	" " " 6% Perp. Deb. ..	112½	112½	118⅜	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	85½	85½	95¼	80
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	23/-	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	85½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	26/6	26/6	58/6	26/3
8	" " " 8% C.P.	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb. ..	73⅜	73⅜	79⅜	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	99/4½	56/-
6	" " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153⅜	120
15	Callender's Cable Ord.	75/	73/9	91/3	63/9
6½	" " 6½% C.P. ..	23/9	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " 1st Deb. Stk.	84½	84⅜	92	81⅜
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	20/-
4	" " 1st Mt. Deb.	69⅜	69⅜	75	68
20	Enfield Cable Works Ord. ..	93/9	92/6	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb.	65½	64½	107¼	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	17/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/6	28/9	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	46/3	81/3	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	121/3	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	20/-	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91⅛	91⅛	95	88⅜
10	Telegraph Const. Ord. (£12) ..	27	27	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	235	235	314½	144⅛
4½	" " " Conv. Gd. Bds.	110*	110	105	102
3⅜	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56⅛
6	" " 6% Prefd. Stk.	102½	102½	105½	91
1½	" " Deferred Stk.	24	24	27	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	63	63½	90½	73½
—	"B" Ord. Stk.	30½	30½	104	33
—	5½% Cum. Pref. Stk. ..	96	96	99	90
3½	Eastern 3½% Pref. Stk.	63½	62½	70⅛	58½
4	" 4% Deb.	76	76	81½	73
4	Eastern Extension 4% Deb. Stk.	76	76	80⅜	73
22	Great Northern Telegraph (£10).	31	31	43½	26
—	International Teleph. & Teleg. ..	$70	$73	161½	48½
15	Marconi Int. Mar.	43/9	45/-	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	97½	97½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	43½	39	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	87½	87½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(a) 19⅜d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7.181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅜d. per share Ex dividend.

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Directors' Reports, etc.

SMITHFIELD MARKETS ELECTRIC SUPPLY CO., LTD.—Fin. div. of 5%, less tax, is announced, making 8% for year.

FIFE ELECTRIC POWER CO.—An applicatn. has been made for a Provisional Order to authorise company to increase issued cap. from £600 000 to £1 000 000 and to issue deb. stk. up to £500 000.

POWER SECURITIES CORPORATION, LTD.—Gross income for 1929, £112 392, agst. £123 159; net rev. £79 424, agst. £85 239; pref. div. £28 000; to res., £20 000, agst. £30 000. Ord. div. 7% (same), less tax. Fwd. £18 293, agst. £14 869.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Stk. div. of 1% is now payable. Shs. comprising the stk. div. will rank for regular cash div. as from March 1. London agents: Canadian and General Finance Co., 3, London Wall Buildings., London,E.C.2.

WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD.—Accts. to Sept. 30, 1929, show pfts. available, after deductg. income tax, £115 519 (includg. £13 227 brt. fwd.). To reserves £30 000, agst. £27 000. Div. 8%, less tax, at 3s. 10¼d., agst. 10%. Fwd. £13 033, agst. £13 227.

YORKSHIRE ELECTRIC POWER CO.—Net pft. for 1929, after paymt. of int. and deb. stk. disct. charges, £341 084, agst. £310 070, plus £78 233, agst. £74 096, brt. in. Directors recommend div. on cum. pref. cap. at rate of 3%, less tax, of which 3% was paid in Aug., and div. of 8%, less tax, on ord. cap., of which 3% was paid in Aug. To gen. res., £100 000. Fwd. £81 413.

METROPOLITAN RAILWAY CO.—A special mtg. of the proprietors will be held on Feb. 20 to consider a Bill to authorise the company to construct new railways, acquire lands, raise further moneys, etc.; and, so far as it relates to the Metropolitan Railway Co., a Bill to authorise certain works to be carried out by the London Electric, Metropolitan District, Central London and City and South London Railway Companies.

ST. JAMES' AND PALL MALL ELECTRIC LIGHT CO., LTD.—Net pft. for 1929, £75 339, plus £112 377 brt. in. Intm. divs. were paid in August last at rate of 8·4d. p. sh. (3½%) on pref. shs. and 9d. p. sh. on ord. shs., leavg. £159 091. It is proposed to pay a div. of 8·4d. p. sh. on pref. shs for second half-year and blce. div. on ord. shs. of 9·949d. p. sh., makg., with intm. div., standard div. for year of 1s. 6·949d. p. sh. To res. (ord. shhldrs' benefit under sliding scale), £22 361; appropriation to co-partners, £4 993; fwd. £100 462.

GERMAN MANUFACTURERS' COMBINE.—Commerz- und Privat Bank announced on Monday the sale to Standard Electrizitaets Gesellschaft of the control of Telephonfabrik Berliner A.G. The reason given for the sale is that the tendency towards concentration in the weak current industry in Germany has made it advisable for Telephonfabrik Berliner to seek connection with a more powerful institution. The Commerz- und Privat Bank will accept delivery of further shares in Telephonfabrik Berliner at the rate of 70%, up to Feb. 28.

NEW CANADIAN INVESTMENT COMPANY.—The European Electric Corporation, Ltd., a public utility holdg. and managemt. company, has been organised under Canadian laws by a group of American, Italian, and Swiss business men. It will be interested in enterprises in Germany, France, Italy, Austria, Spain, Poland, and Greece. Count Giuseppe Volpi, former Italian Minister of Finance, will be president. It is stated that the company will commence operatns. with over $10 000 000 in cash, and that the value of the stocks to be acquired in Italy is over $26 000 000.

CABLES AND WIRELESS, LTD.—The company is sendg. to stkhldrs., who have made inquiries, a reply that it has already been announced that it is not possible for the company to publish its audited blce. sheets and rev. accs. to Dec. 31 in each year until about the followg. Midsummer, owing to the time which must elapse before it can get in the accts. to the close of the year from its branches and subsidiary companies all over the world. The directors cannot give individual stkhldrs. informatn. which they do not give to the general body of stkhldrs., whilst to publish any anticipatn. of results, based on incomplete data, would be undesirable.

BRISTOL TRAMWAYS AND CARRIAGE CO., LTD.—Rev. for 1929, £1 199 554, workg. and general exes. and renewals, £1 043 817, leavg., with blce. brt. fwd. net rev. of £167 352 9s. 9d. After payg. int. for year on 4% mtge. deb. stk. and deposits, and bank and other int., div. on the 4% pref. shs., and intm. div. on ord. shs. at 4%, absorbg. £93 075, it is now proposed to pay fin. div. on ord. shs. at 6% (makg. 10% for year), and to add to res. for contingencies and renewals, £10 000, leavg. £4 278 to carry fwd. With the addition of £10 000 now proposed, res. fund will total £433 002. Receipts of tramways dept. show decrease £3 296, and those of carriage dept. increase of £46 551. The number of passengers carried in the company's cars and motor buses was 117 838 722, compared with 112 168 239 in previous year. Option of Bristol Corporation to purchase company's tramways undertakg. again occurred during past year, but was not exercised, and does not now recur for a further seven years.

Company Meetings.

HALL TELEPHONE ACCESSORIES (1928), LTD.—Major O. M. Guest, presiding at the meeting on Monday, said a substantial sum had been expended on an additional building to cope with the growth of the business. The gross profit from trading was £61 996, after providing about £1 000 as a bonus to the staff and employees. The total volume of the company's business had been considerably increased, and the net profits amounted to £40 365, compared with £30 094 for the previous year. In July last an interim dividend of 4% (less tax), was paid, and the directors now recommended the payment of a final dividend of 6%, less tax, with a bonus of 2%, making a total distribution of 12%, less tax, for the year. During the year under review important contracts from several new customers had been received for types of automatic vending machinery other than the telephone coin collectors and stamp vending machines which they supplied to the British Post Office and to other Governments and concessionaires. The general growth of the business compelled the directors to consider another increase in the company's capacity. It was for this reason that, at the extraordinary general meeting which would follow that meeting, they would ask the shareholders to authorise the increase of the company's capital up to 500 000 shares of 10s. each and to issue 42 000 new shares by the offer to shareholders of one new share at the price of 11s. for every eight shares now held. The report was adopted and the resolutions to increase the capital were carried.

LONDON POWER CO., LTD.—Mr. W. F. Fladgate, presiding at the general meeting last Friday, said capital expenditure during 1929 had amounted to £1 586 000, the greater part of which had been expended upon the completion of the first section of the Deptford West station, which was now in operation, and had proved to be most economical in working. A considerable amount had also been expended on the Battersea station and the completion of the 22 000 V mains. The company was, by its constitution, precluded from making any profit, so the criterion of their success was diminution in cost, and this had been most satisfactory. The output had increased 23·46% over 1928, and amounted to some 733 000 000 kWh, a total only exceeded in this country by the associated group of power companies operating on the North-East Coast of England. Operating cost per kWh for 1928 averaged 0·278d. For 1929 this figure was reduced to 0·240d. The saving in money which this reduction represented to the companies was £675 000, taking the year 1924 as the datum. The control room at Horseferry Road had been completed, enabling the staff at that centre to control the whole of the stations of the company. Progress had been made with the foundations and river work for the Battersea station. It was no exaggeration to say that it was the aim of all concerned to make this station the last word in efficient power stations, as it would form one of the most important links in the chain of stations dealing with the generation of electricity in the southern district of England. The report and accounts were adopted.

SINGAPORE TRACTION CO., LTD.—Mr. L. W. Hawkins, presiding at the meeting last week, said the statements in the report showed a continuation of the progress which had characterised the company's undertaking since the effects of the boycott of 1927 began to pass away. They had run more car miles and carried more passengers in a greater number of vehicles than ever before, and, so far as the current year was concerned, the same tendency was maintained. They could not escape the adverse effect of the prevailing depression in the markets for rubber and tin, which, so long as it lasted, was bound to affect the prosperity of Singapore and reduce the spending power of its population. They did not escape its effect in the past year, and it was a healthy sign that, in spite of it, the travelling public availed itself as largely as it did of the additional carrying capacity which was provided by the company. The profit for the year showed an increase of £13 840, and the allocations made permitted of the division of £28 000 in equal shares between the preference shareholders and the managers, and of the addition of some £800 to the

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balance carried forward. The preference shareholders thus got for the first time a full year's dividend, which must, however, be regarded as on account of arrears, which would remain at 11% after payment of the dividend now recommended. This meant that holders of the old company's debenture stock who still held the shares allotted in exchange for it would receive £4 18s. in dividend on 70 preference shares, as against the £5 which was due, but for many years unpaid, on £100 of old debenture stock. The 70 preference shares and the 40 ordinary shares which went with them in exchange for £100 debenture stock had together a market value of approximately £90. The report was adopted.

UNDERGROUND GROUP.—Special general meetings of proprietors of the underground railways of London, on February 6th, approved the Bills now before Parliament empowering the companies to carry out improvements and extensions. Lord Ashfield, who presided, pointed out that the companies could not contemplate the carrying out of their improvements and extensions unless they received adequate assistance by way of grant from the Treasury, The major work for which the London Electric Railway Co. sought powers was the extension of the Piccadilly section from Finsbury Park to Cockfosters. Another important development was through Hammersmith to Northfields on the Piccadilly line. It was proposed to connect with a disused Southern Railway line at Ravenscourt Park. Escalators and other station improvements were proposed at King's Cross, Hyde Park Corner, Knightsbridge, Dover Street, and Russell Square. It was proposed to remove the Dover Street Station to the corner of Green Park, near the Ritz Hotel, and to reconstruct Knightsbridge Station, with surface stations in Brompton Road and the top of Sloane Street. One of their problems was the "speeding up" of the whole system. This could not be done while stations were situated closely together, involving frequent stops. The Metropolitan District Railway were seeking powers to widen the line from Ravenscourt Park to Northfields and to reconstruct the stations at Turnham Green, Chiswick Park, Acton Town, South Ealing, Northfields, Hounslow East, and Hounslow West. The construction of four lines west to Hammersmith would greatly accelerate services to Hounslow, Ealing, and Uxbridge. On the Central London Railway it was proposed to build a new station at Marble Arch, with escalators. The present interchange at British Museum with the Holborn station was unsatisfactory, and it was proposed to construct a new deep level station. The City and South London Railway were seeking powers to construct a subway connecting the Bank station with the Monument station. The estimated cost of the whole scheme for which powers were sought in the Bills was approximately £12 000 000, of which extensions would account for £8 000 000.

METAL AND CHEMICAL PRICES.

TUESDAY, February 11th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£78 10 0	£1 5 0	-
Electro Wirebars	,,	£84 5 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	,,	11⅛d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	—
Foreign or Colonial	,,	£21 10 0	—	2s. 6d.
Tin—				
Ingot	per ton	£175 7 6.	7s. 6d.	—
Wire, basis	per lb.	2s. 4½d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 15 0	—	2s. 6d.
Mercury	per bottle	£23 5 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2½d
Sodium Bichromate—Per lb., 3½d.
Rubber—Para fine, 8½d.; plantation, 1st latex, 7⅛d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

Demand everywhere remains quiet with a declining consumption, and according to James Forster and Co. closing prices on February 7th were £21 10s. for all positions, 1s. 3d. per ton lower on the week.

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BEASLEY, Mr. S., 16, Stafford Road, Handsworth, wireless dealer. £13 8s. 10d. December 21st.

COOPER, Mr. R. A., 17, Sevington Road, Hendon, wireless dealer. £13 19s. 4d. December 17th.

GALPIN, Mr. A., W., 112, Poole Road, Bournemouth, wireless agent. £25 14s. 7d. December 18th.

HALES, W. T., Commercial Street, Pontypool, wireless dealer. £10 13s. 9d. January 1st.

LADLOW, W., The Arcade, Newark, wireless agent. £19 16s. 4d. January 1st.

MELVILLE, JAMES, AND CO., Dudley Chambers, Angel Row, Nottingham, electrical engineers. £13 17s. 10d. January 3rd.

NORTH DEVON ELECTRICAL ENGINEERING CO., 28, West Street, South Molton. £25 17s. 10d. January 8th.

PEWCO ELECTRIC CO., 38, Broadway Parade, Crouch End, radio dealers. £18 8s. 8d. December 13th.

SHORTHOUSE, F. A., AND CO., 35, Evelyn Road, Sparkhill, electrical engineers. £17 17s. 10d. December 10th.

SINCLAIR, Stafford, Norfolk Mews, Praed Street, Paddington (trading as ALBANY ELECTRICAL CO.), electricians. £73 18s. 3d. December.

SWEET, Robert C., 107A, High Street, Uckfield, wireless and electrical engineer. £24 7s. 6d. December 10th.

THICK, G. F., Church Steps, Frome, radio engineer. £26 17s. 8d. December 18th.

UPHILL, S. G., 1 337, London Road, Leigh-on-Sea, wireless dealer (trading as WEST LEIGH WIRELESS CO.). £14 13s. 10d. December 20th.

Receiverships.

CITY AND GENERAL RADIO CO., LTD.—R. R. Goding, of 46, Watling Street, E.C., was appointed receiver and manager on January 30th, 1930, under powers contained in debentures dated April 6th, 1926.

CORONA LAMP WORKS, LTD.—W. W. B. Jackson, of 65-66, Chancery Lane, W.C.2, was appointed receiver in place of the late V. G. Teale, on November 23rd, 1929, under powers contained in trust deed dated April 10th, 1919.

Deeds of Arrangement.

HOLT, Clifford, 26, Winter Hey Lane, Horwich, electrician and radio engineer. Dated February 6th, filed February 7. Trustee, R. Gerrard, 71, Lee Lane, Horwich. Secured creditors, £250; liabilities unsecured, £769; assets, less secured claims, £462.

HUTTON, Lawford Carr, trading as SPORTS AND RADIO STORES, 21, Queen's Parade, Friern Barnet. Dated January 30th, filed February 5th. Trustee, C. Latham, 78, New Oxford Street, W.C. Secured creditors, £23; liabilities unsecured, £1 545; assets, less secured claims, £837.

London Gazette, etc.

Winding-up Petition.

"PHANTESTRA" (RENNS GRAMOPHONE AND WIRELESS) LTD.—A petition for winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, W.C., on February 24th.

Companies Winding-up Voluntarily.

HAROLD TAYLOR AND CO., LTD.—By reason of its liabilities, January 29th. E. Haggas, 68, Great Horton Road, Bradford, accountant, nominated as liquidator.

RADIELLE CO., LTD.—By reason of its liabilities, January 31st. F. J. Parsons, chartered accountant, appointed as liquidator.

Notice of Dividend.

WRIGHT, Ronald Reginald, trading as WRIGHT BROS., 30, Normanton Road, Derby, wireless dealer. First and final dividend, 5s. 7d. per £, payable February 21, Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham.

Notice of Intended Dividend.

MARSH, Basil, 17, Victoria Road, Brighton, Sussex, electrician. Last day for receiving proofs, February 21st. Trustee, A. E. Orbell, 6 and 7, Old Steine, Brighton.

PEACE, Ernest Everitt, trading as PEACE AND CO., rear of 230, High Street, Erdington, manufacturing electrical engineer. Last day for receiving proofs, February 28th. Trustee, C. Hoult, 191, Corporation Street, Birmingham, Official Receiver.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

309 401 Wico Electric Co. Magnetos. (9/4/28.)
320 992 O. G. Culverwell. Devices for the electrical treatment of poultry. (24/8/28.)
320 993 D. N. Sharma. Television system incorporating transmitting and receiving apparatus with cathode rays. (24/8/28.)
296 781 Westinghouse Lamp Co. Method of introducing highly-active metals into sealed containers. (9/9/27.)
320 999 J. S. Shinton. Television. (28/8/28.)
321 003 J. Harden. Mercury lamps. (4/9/28.)
321 006 Drysdale and Co., Ltd., and J. Young. Electrical heating and mixing apparatus. (10/9/28.)
296 996 Akt.-Ges. Brown, Boveri et Cie. Transformers for use in rectifier installations. (10/9/27.)
321 025 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Method of and arrangements for transmitting wireless signals. (26/9/28.)
321 032 E. R. Grote. Tubular electric incandescent lamps. (1/10/28.)
321 037 W. Holt. Thermionic valves or vacuum electric devices. (4/10/28.)
321 039 T. J. Digby and A. O. Gibbons. Apparatus for projecting light. (5/10/18.)
321 043 S. F. Warren. Combined television and sound-reproducing apparatus. (12/10/28.)
299 325 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valves. (21/10/27.)
321 052 Coventry Automatic Telephones, Ltd., and E. P. L. Westell. Devices for the generation of audio-frequency electric currents. (23/10/28.)
299 784 Siemens and Halske Akt.-Ges. Graphite and depolariser plates for galvanic cells. (31/10/27.)
299 886 Siemens-Schuckertwerke Akt.-Ges. Polyphase asynchronous motors. (4/11/27.)
321 065 S. Thompson. Electrical heating-device. (7/11/28.)
301 827 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valves and the like discharge devices. (6/12/27.)
301 041 British Thomson-Houston Co., Ltd. Wire-feeding mechanism for weiding machines. (23/11/27.)
301 389 General Electric Co., Ltd. Manufacture of electric incandescent lamps or the like. (28/11/27.)
316 536 Dr. A. Just. Cathodes for electron-discharge devices. (30/7/28.)
301 332 S. K. Olsen [trading as L. Poulsen and Co.]. Reflector arrangement for incandescent lamps. (21/11/27.)
321 083 P. Locori. Cable projectiles with parachute, to be fired against aircraft. (30/11/28.)
301 833 British Thomson-Houston Co., Ltd. Refrigerating-machines. (6/12/27.)
321 088 W. Brown. Fluid-filled paper-insulated electrical cables. (7/12/28.)
302 917 G. Main. Incandescent electric lamps. (23/12/27.)
321 104 A. Carpmael (Telefunken Ges. fur Drahtlose Telegraphie). Picture and the like telegraph systems. (22/12/28.)
303 450 A. Stuppock and G. Hager. Electric switches. (3/1/28.)
303 860 International General Electric Co., Inc. Safety devices for steam-power installations. (11/1/28.)
315 384 Magneto Belge. Electric motors. (13/7/28.)
316 281 J. G. Daloz. Miners' electric lamps. (27/7/28.)
321 118 St. Helen's Cable and Rubber Co., Ltd., and H. C. Harrison. Twin and multi-core electric cables. (16/1/29.)
305 039 International General Electric Co., Inc. Steam plants employing intermediate superheating. (28/1/28.)
321 124 W. D. Verschoyle. Electric lamps for the production of ultra-violet rays. (6/2/29.)
307 340 F. Merk. Relay and selector arrangement in telephone installations. (5/3/28.)
307 826 Telefunken Ges. fur Drahtlose Telegraphie. Electric discharge devices. (14/3/28.)
306 099 British Thomson-Houston Co., Ltd. Dynamo-electric machines. (15/2/28.)
320 909 J. L. Baird and Television, Ltd. Television apparatus. (25/4/28.)
321 131 J. B, Taunton. Electric-lamp holders. (22/2/29.)
307 080 Siemens and Halske Akt.-Ges. Process for the production of metal-wound copper wires. (3/3/28.)

Applications for Patents.

October 22nd.

32 072 British Thomson-Houston Co., Ltd. Electric furnaces. (24/20/28, U.S.)
32 037 M. S. Dick and W. Tonkinson. Electric driving sets.
32 044 Ferranti, Ltd., and S. Z. de Ferranti. Electric radiator fires.
32 036 Fluor Light, Ltd., and H. H. A. Wolfe. Electric discharge luminous tubes.
32 064 W. T. Henley's Telegraph Works Co., Ltd., and J. H. Savage. Means for locating breaks in electric circuits.
32 060 J. H. Kendall. Radio receiving, etc., apparatus.
32 004 R. J. Mott. Electric water heaters.
32 077 N. V. Philips' Gloeilampenfabrieken. Devices for charging batteries. (24/11/28, Holland.)
32 078 J. E. Pollak (Associated Telephone and Telegraph Co.) Telephone systems.
32 006 E. H. Roberts. Control of radio and sound reproducing apparatus, etc.
32 092 P. A. Sporing, and Telegraph Condenser Co., Ltd. Electrical condensers.

October 23rd.

32 146 Abba Electrical Co., Ltd., and E. Denholm-Young. Microphones.
32 242 C. J. Beaver, and W. T. Glover and Co., Ltd. Electric cables.
32 243 C. J. Beaver, and W. T. Glover and Co., Ltd. Sheaths for electric cables etc.
32 189 H. Bernstein. Means for disinfecting telephone instruments.
32 237 C. H. Bingham. Electric furnaces.
32 140 E. E. Bonvalet. Electrical apparatus for waving hair. (23/10/28, France.)
32 241 British Insulated Cables, Ltd., and S. C. Bullock. Metallic joints.
32 188 British Thomson-Houston Co., Ltd. Control of dynamo electric machines. (24/10/28, U.S.)
32 158 J. A. Crabtree. Electric switch mechanism. (3/8/28.)
32 159 J. A. Crabtree. Electric switch mechanism. (1/3/29.)
32 157 J. F. Grimbley, S. J. Smith, and Telephone Manufacturing Co., Ltd. Electric clocks, etc.
32 245 J. H. Hammond. Wireless transmission, etc., systems.
32 232 H. C. Holmes, J. A. A. Taylor, and A. Warwick. Radio receivers.
32 117 W. F. Jones. Vacuum electric furnaces.
32 210 C. Lorenz Akt.-Ges. Electric induction furnaces. (25/10/28, Germany.)
32 208 J. S. C. Salmond, G. Shearing, and W. Ure. Wireless transmitters.
32 207 W. L. W. Schallreuter. Electric-gas discharge vessels.
32 144 T. Standley. Accumulators.
32 185 D. S. S. Steuart. Transmitting and receiving apparatus for use in telephones, etc.
32 182 W. H. A. Taylor. Oil pressure controlled automatic switch.
32 249 Telefunken Ges. fur Drahtlose Telegraphie. Radio gramophones. (25/10/28, Germany.)
32 250 Telefunken Ges. fur Drahtlose Telegraphie. Oscillation generating systems. (2/11/28, Germany.)
32 141 W. A. Waddington. Electrical illuminating machine.
32 226 32,227, 32 228 Waygood-Otis, Ltd. Elevators. (28/9/27, U.S.)
32 229 Waygood-Otis, Ltd. Electric switches. (28/9/27, U.S.)

October 24th.

32 351 W. Broertjes. Maintaining secrecy in transmission of wireless telegraphic messages.
32 335 R. Collier. Detecting electric currents.
32 388 G. E. Condliffe, F. Ellington, Gramophone Co., Ltd., and A. Whitaker. Electron emitting cathodes.
32 389 G. E. Condliffe, Gramophone Co., Ltd., and F. Tedham. Electron emitting cathodes.
32 281 Dunlop Rubber Co., Ltd., and J. Healey. Tapes for insulating cables. etc.
32 355 Electroacustic Ges. Subaqueous sound apparatus. (3/12/28, Germany.)
32 381 Electro-Textile. Electrical singeing of fabrics. (26/10/28, France.)
32 326 E. Gallizia, and General Electric Co., Ltd. Vapour-electric rectifiers.
32 327 General Electric Co., Ltd., and G. R. Polgreen. Manufacture of cores for electro-magnets, loading coils, etc.
32 387, 32 390 Gramophone Co., Ltd., W. F. Tedham, and A. Whitaker. Electron emitting switches.
32 268 E. H. Hill. Electric lamp holders.
32 336 International General Electric Co., Inc. Electrical distribution systems. (24/10/28, Germany.)
32 271 W. E. John. Arc lamps.
32 385 H. J. Kuchenmeister. Electrostatic loud speakers.
32 391 A. Kunze. Electric batteries.
32 291 A. Low and Sons, Ltd., and D. W. Low. Electric water heater.
32 356 S. A. Mabey. Interconnection of connecting wires of electrical apparatus.
32 395 Maschinenfabrik Oerlikon. Converting d.c. into a.c. (9/11/28, Switzerland.)
32 366 H. Milliken. Circuit breaker.
32 383 G. Rosenquist. Manufacture of articles by electrolytic deposition of galvano-plastic metal.
32 301 T. A. Smith. Automatic cut-outs for ignition circuit of motor vehicles.
32 357 Telefunken Ges. fur Drahtlose Telegraphie. Mains for supplying energy. (25/10/28, Germany.)
32 319 R. N. Wellington. Inductance coils, etc.

COMING EVBNTS.

Friday, February 14th (To-day).

Incorporated Society of British Advertisers.—Hotel Cecil, Strand, London. Luncheon meeting of the Engineering Section. Speaker, Mr. E. E. Sharp on "Lessons from a Business Tour in Australia and New Zealand." 12.40 *for* 1 *p.m.*

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington. Paper by Mr. F. D. Smith on "The Magnetostriction Constant for Alternating Magnetic Fields." 5 *p.m.*

Saturday, February 15th.

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place. Paper by Mr. W. A. Hutchings on "Safety and Efficiency in Mines." 6 *p.m.*

Monday, February 17th-Friday, February 28th.

British Industries Fair.—London and Birmingham.

Monday, February 17th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "The Nickel-Iron Battery and its Uses" (Opened by Mr. M. E. Fox and Mr. W. E. Warrilow), and "The Lead Battery and its Uses" (Opened by Mr. E. C. McKinnon). 7 *p.m.*

Institution of Electrical Engineers (Mersey and North Wales—Liverpool—Centre).—The University, Liverpool. Faraday lecture by Capt. P. P. Eckersley on "Broadcasting by Electric Waves." 7.30 *p.m.*

Institute of Wireless Technology.—Engineers' Club, Coventry Street, London. Discussion on "Aerial Design for Short Wave Transmission." 7.30 *p.m.*

Electrical Association for Women (Bristol and District Branch).—Lecture on "Colour Lighting for Home Decoration," with experimental demonstrations by Mr. L. E. Buckell. 8 *p.m.*

Tuesday, February 18th.

Royal Institution.—21, Albemarle Street, London. Lecture by Sir William Bragg on "X-Ray Determination of the Structure of Cellulose." 5.15 *p.m.*

Illuminating Engineering Society.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Paper by Mr. W. H. Villiers on "Modern Incandescent Lighting in Kinema Studios." 6.30 *p.m*

Institution of Heating and Ventilating Engineers (Associate Members and Graduates Section, Manchester and District Branch).—Milton Hall, Deansgate, Manchester. Paper by Mr. F. C. Lant on "Kitchen Equipment." 7 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, 17, Albert Square, Manchester. Paper by Messrs. J. G. Wellings and C. G. Mayo on "Instrument Transformers." 7 *p.m.*

Association of Supervising Electrical Engineers.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. F. Selly on "H.T. Heating of Water and its Application to Large Buildings." 7.15 *p.m.*

Paisley Association of Electrical Engineers.—39, High Street, Paisley. Lecture by Mr. W. M'Gregor on "Modern Electrical Equipment of Cinemas." 7.30 *p.m.*

Wednesday, February 19th.

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary meeting.

Electrical Development Association (North-West Area).—Demonstration Bureau, 1, Fountain Street, Manchester. Conference on "Personal Salesmanship in the Electrical Industry." 6.30 *p.m.*

Institution of Electrical Engineers (Sheffield Sub-Centre).—Royal Victoria Hotel, Sheffield. Address by the President, Col. Sir T. F. Purves. 7.30 *p.m.*

Institution of Electrical Engineers (Scottish Centre, Students' Section).—Royal Technical College, George Street, Glasgow. Lecture by Lt.-Col. H. E. O'Brien on "Electric Traction." 7.30 *p.m.*

Thursday, February 20th

Institution of Electrical Engineers (Hampshire Sub-Centre).—Portsmouth. Conversazione. 7.30 *p.m.*

Institution of Electrical Engineers (Irish Centre, Dublin).—Physical Laboratory, Trinity College. Paper by Messrs. B. A. G. Churcher and A. J. King on "The Analysis and Measurement of the Noise Emitted by Machinery." 7.45 *p.m.*

Friday, February 21st.

Institution of Electrical Engineers (London Students' Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. S. H. Hart on "Paper-Insulated Power Cables." 6.15 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, Strand, London. Conference on "The Electrical Industry and the Architect." Speaker, Mr. C. H. Flower. 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Mr. E. P. S. Gardner on "The Application of Electric Welding to the Erection and Strengthening of Steel Structures." 7.30 *p.m.*

Saturday, February 22nd.

Association of Supervising Electrical Engineers.—Hotel Cecil, Strand, London. Annual dinner.

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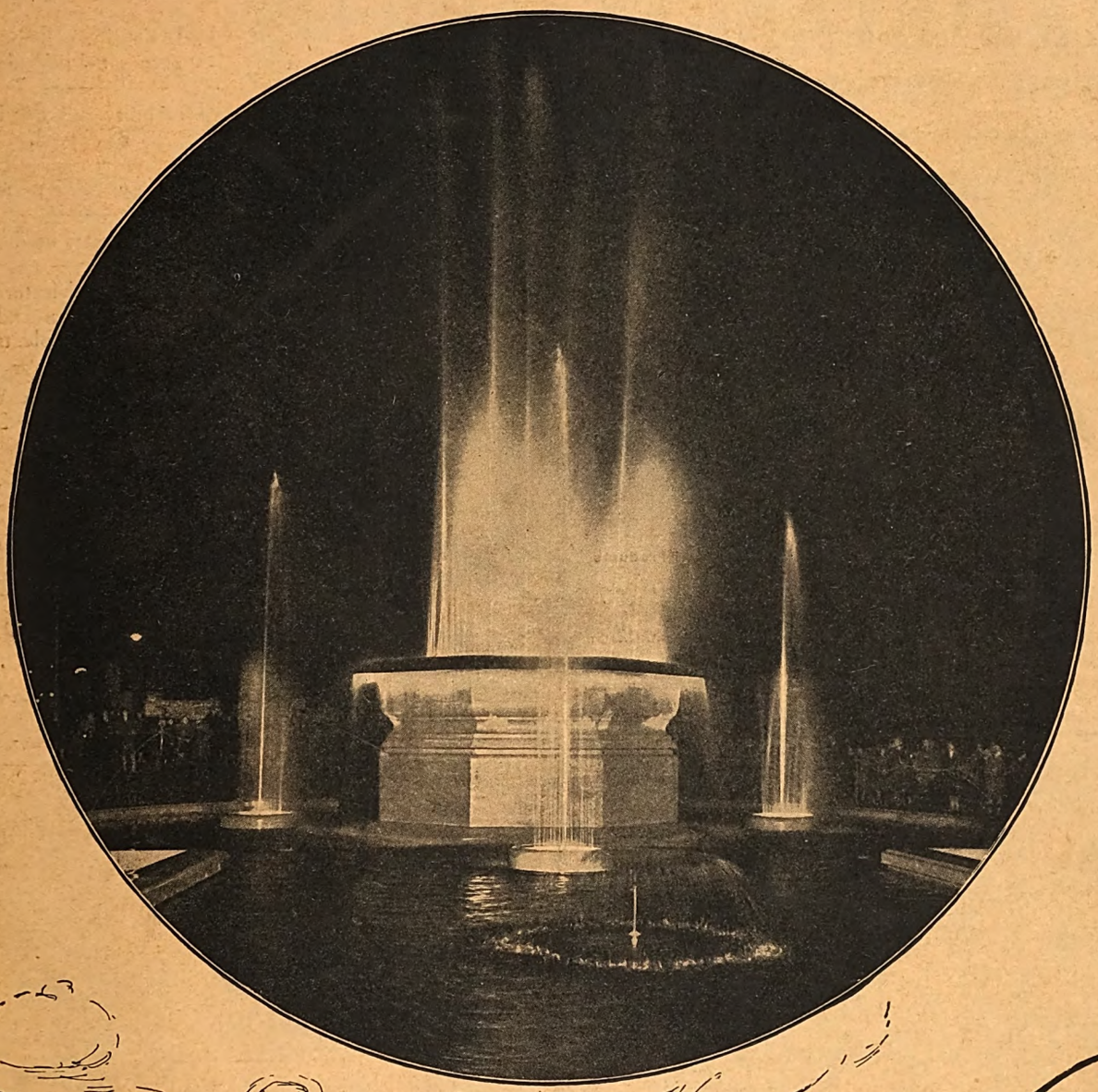
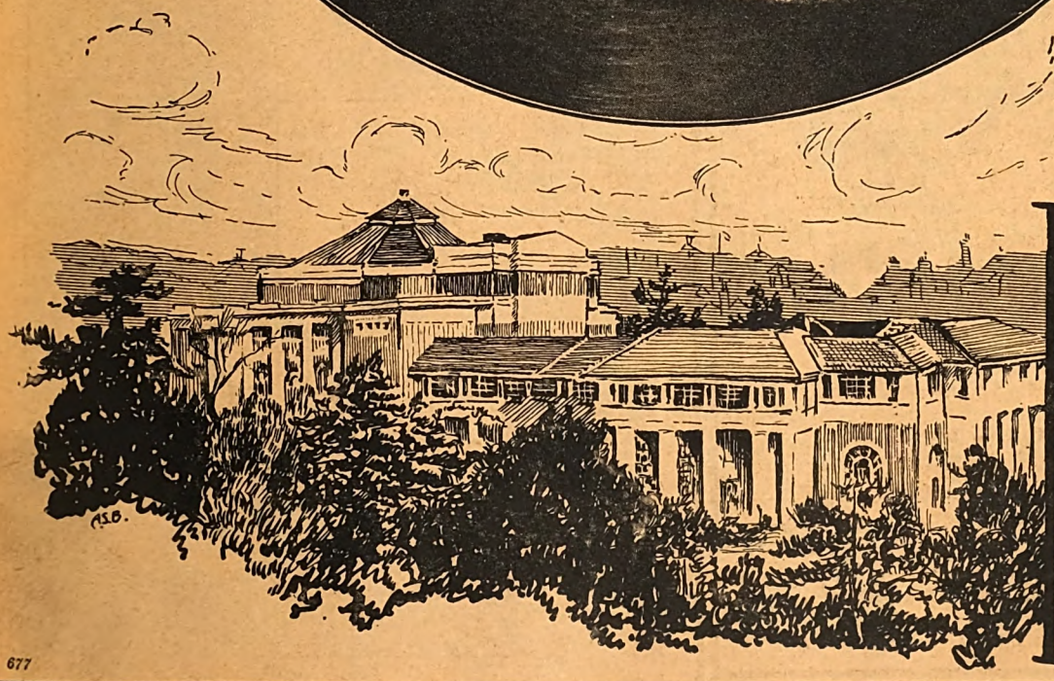
THE ELECTRICIAN

Vol. CIV.—No. 2699. Friday, February 21, 1930. [Registered at the General Post Office.] Sixpence





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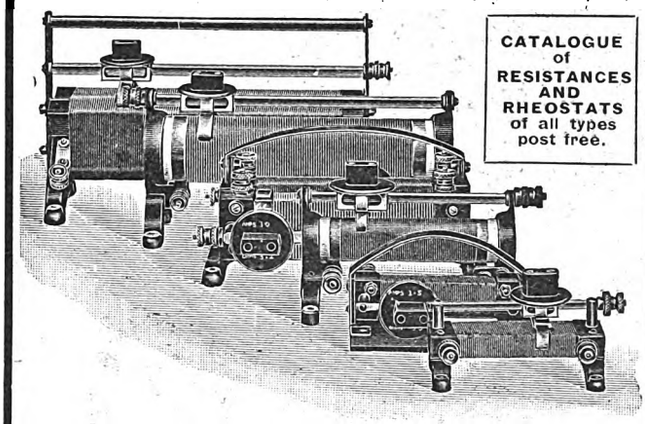

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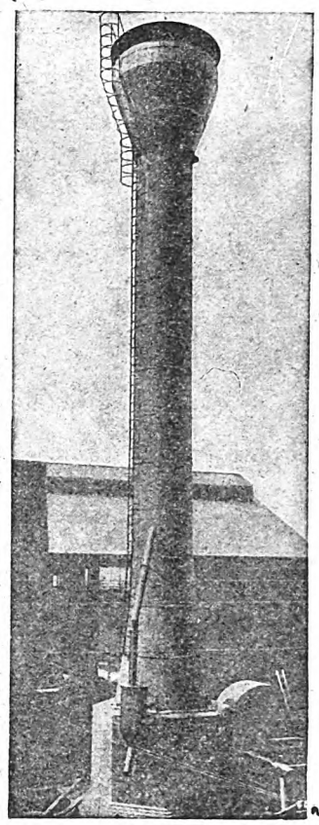

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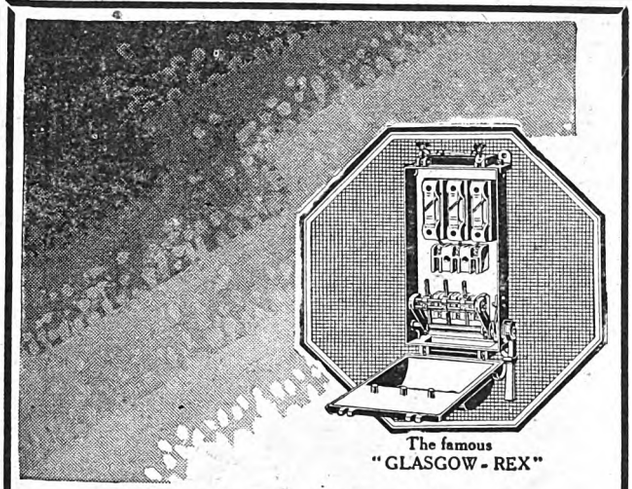

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Telephone Progress.

IF the telephone is even to-day less used in Great Britain than in North America and in some European countries, it is none the less true that great development has taken place in this country since the war. A statement on progress in the London area during 1929, prepared by the Controller of the London Telephone Service and the Superintending Engineer of the London Engineering District, primarily for the London Telephone Advisory Committee, points out that the number of direct exchange lines in the London area has grown from 181 606 in December, 1921, to 384 739 at the end of last year—an expansion of over 110% in eight years. The total number of telephones (exchange and private) at the end of 1929 was 661 977, an increase of 47 794, or 7·8% on the year. There are now 137 exchanges in the area, seven having been added during 1929. Of these exchanges 24 are automatic. The memorandum remarks that neither the use of long-distance trunks by trade representatives, nor the use of local lines for shopping and similar purposes, is nearly as great here as in America and elsewhere. This is no doubt partly due to the higher cost in this country, and partly to the need for more extensive propaganda. The two diagrams issued by the Swedish Post Office, which were reproduced in our issue of February 7th, certainly suggested that the cost factor is far from negligible. There are features of the system of charging for telephone connections in Great Britain which are not altogether calculated to enhance their popularity or use. Among such are the refusal to admit the possibility of error in the recording of calls and the demand for a larger deposit when the number of calls originated by a subscriber exceeds certain limits.

In this connection it is important to draw a distinction between the commercial and the technical departments of the Post Office. That institution commands the services of a remarkable body of very competent engineers, but on the commercial side it suffers from most of the vices inherent in Government departments engaged in trading operations. All comparisons between the use of the telephone and telegraph systems in this country and North America must therefore be subject to the qualification that in the one case we are dealing with a Government service and in the other with public companies. Even the work of the purely technical branches of the British Post Office cannot altogether escape the cramping effects which are inherent in State ownership of any public enterprise. The ability of individuals is not in question, but they are subject to limitations which do not apply to their "opposite numbers" on the other side of the Atlantic.

Undoubtedly the most remarkable development of telephony in recent years is the extension of long distance radio-telephonic facilities. Four channels are now working throughout the 24 hours between Europe and North Africa on the one hand and North America on the other, all traffic passing through London. As many as 140 calls have been passed over the Atlantic in a single day. There are also services by alternative routes between London and Buenos Aires. Last week we recorded a successful Marconi beam transmission between London and Japan, and it can now be said that radio-telephony between the most widely separated points on this planet is technically feasible, though not throughout the whole of each day. For the moment the establishment of regular radio-telephone services between London and the Dominions in the Southern Hemisphere and India appears to be awaiting a delimitation of the respective spheres of the Post Office and the I. and I.C. Company. Until the Cabinet Committee, which is looking into this matter, has made its report these valuable extensions of Imperial communications will remain in abeyance. But this state of affairs cannot long delay the establishment of direct vocal intercourse between all the more important units of the Empire—an immense step forward in the task of linking its peoples more closely together.

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Current Topics.

Coal Bill—Another Protest.

FURTHER consideration of the Coal Mines Bill, which had already been the subject of protests by the Federation of British Industries, has not removed that organisation's objections to the policy embodied in the Bill. Its opposition is now expressed to the proposals for compulsory amalgamation as well as to Part I of the Bill, dealing with marketing schemes. The F.B.I. points out that, although successful amalgamation depends upon exceptional ability, long experience and a careful selection of units to be amalgamated, the Government's proposal provides that where intimate knowledge and long experience have decided against amalgamation a Commission of three men can override such a decision without appeal. In the circumstances not only the F.B.I. but the country as a whole has reasons to fear that the Government's proposals " will saddle the country with a number of ill-assorted and unwieldy conglomerations whose inefficient operation and ultimate collapse will merely cause loss to the shareholder and unnecessary cost and inconvenience to the consumer of coal."

Taxation and the Budget.

IN a further communication the F.B.I. expresses serious concern at the increasing burden of taxation upon productive enterprise. The Federation describes the Budget outlook as " extremely grave " and points out that British industry has been struggling for nearly a decade to recover its position, handicapped by a load of taxation which not only far exceeds that of any important commercial country but now finds itself faced with the certain prospect of additional taxation. We have already expressed a similar view as to the disastrous consequences of an attempt to increase the burden of taxation in the forthcoming Budget in order to finance unproductive schemes or augment doles and pensions. The difficulties of the present period of readjustment will be greatly accentuated and recovery delayed unless the Government will set its face like flint against any policies involving further public expenditure involving fresh taxation.

Electrical Overseas Trade.

THOUGH the general export figures during January showed a decline, shipments of electrical goods, apparatus and machinery from the United Kingdom amounted to £2 245 057, as against £1 614 301 during January, 1929, an improvement of £630 750, and an increase on the December, 1929, figures of £533 179. The largest shipments of machinery were destined for countries in Europe, the total value exported being £141 626. India accepted £88 238, Australia £79 620, and South Africa £69 660. By comparison with last year, exports of submarine cables improved by £8 279, wires and cables other than rubber insulated by £55 509, and telegraph and telephone instruments by £83 183. Imports of electrical goods, apparatus and machinery during January last were valued at £912 228, or £314 133 more than during January, 1929, and an increase on the December total of £685. Imports of electrical machinery increased by comparison by £21 697 ; the largest increase, however, was recorded under electrical instruments, with an advance of £204 792. Wires and cables other than rubber insulated also increased during the month under review, the return by comparison with January, 1929, showing an advance of £24 151. Telephone and telegraph instruments, which usually show an increased amount, declined, however, by £11 893. It is interesting to note that this increase in electrical export trade is recorded during the month preceding the opening of the British Industries Fair, when manufacturers may reasonably expect a slowing up of business pending the examination by overseas buyers of all that is new and best in Britain's shop windows. Further, as mentioned in our last issue, the home demand is improving, thus bringing about a better balance between the home and export figures. The electrical industry has begun the new year well and with the B.I.F. to help, the February returns should be even more encouraging.

Parsimony in Lighting.

INSPECTION of a number of New England factories by a party of American editors caused them to report that " the lighting of New England factories appeared to us to be distressingly bad, despite a few examples of the most advanced industrial illumination." Great floors of machinery were common, " spotted only with dirty lamps in inefficient or improvised reflectors at the tool, supported by no adequate general illumination. With this dark halls and stairways came as a matter of course." There is no doubt that far too many factories and offices in this country are equally open to condemnation for similar faults, and in many post offices the lighting is atrocious. Bad lighting is false economy of the most shortsighted kind. As the American editors point out in their report, it " takes an inevitable toll in accidents, low speed, and spoiling of materials," not to mention the damage to eyesight and consequent impairment of the workers concerned. We are glad to see that a third edition of the Home Office Welfare Pamphlet No. 7, dealing with lighting in factories and workshops, has just been issued.

Life of Flashing Sign Lamps.

IT has been thought that the constant switching off and on of lamps used for flashing advertisement signs shortened the life of these lamps. Records kept for three years in an American city relating to 4 249 lamps fitted in a large sign of this type indicate that the reverse is true, according to the New Jersey Public Utility Information Committee. The sign which was kept under observation contains 2 992 lamps which burn continuously and 1 257 lamps which flash eight times a minute, the current passing for half the time. Fewer replacements were required in the case of the flashing lamps. It would seem that the short intervening periods of rest more than compensated for any damage done to the filament by the rapid switching on and off of current.

N.-E. Coast Engineering Museum.

ON behalf of the engineering industries of the area, the North-East Coast Institution of Engineers and Shipbuilders has forwarded a memorandum to the Lord Mayor of Newcastle-on-Tyne, urging that he appoint a representative committee with the object of establishing an engineering museum. Suggested exhibits of electrical interest are a collection of electric lamps illustrating development since the days of SWAN, which are in the possession of Mr. J. H. HOLMES. We hope that the plan will receive sufficient support to enable it to be carried out in a manner worthy of a district that is one of the cradles of engineering.

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EXTENSIONS TO LEICESTER CENTRAL GENERATING STATION.

New 25 000 kW Turbo-Generator and Pulverised Fuel Plant Opened—Growth of Demand for Current—Description of the New Installation.

SIR Andrew Duncan, chairman of the Central Electricity Board, opened the large extensions to the Leicester Central generating station on Wednesday.

Those present at the opening ceremony included the Lord Mayor, Coun. W. E. Hincks, the Bishop of Leicester, Coun. A. H. Swain, chairman of the Electricity Committee, Mr. V. Watlington, Sir A. Page, Mr. F. W. Purse, Capt. J. M. Donaldson, Sir W. Rolleston, Mr. T. P. Wilmhurst and Lt.-Col. W. A. Vignoles.

At a luncheon held at the Grand Hotel, Coun. Swain presiding, Sir Andrew Duncan proposed the toast of " The Leicester Electricity Undertaking " and said it was realised to-day that production of electricity must be on a rationalised basis. Industry had enough to do to find capital for its own business, and apart from exceptional cases, private plants should be discouraged.

Coun. Swain said when additional plant for which provision had been made in the new buildings was added, the total cost would be £10 6s. per kW of plant, against an average of £21 4s. for the United Kingdom.

Mr. John Mould, the chief engineer, said that the Leicester station burnt the worst coal in the country, but it stood in thermal efficiency at the head of all the large stations burning bad coal.

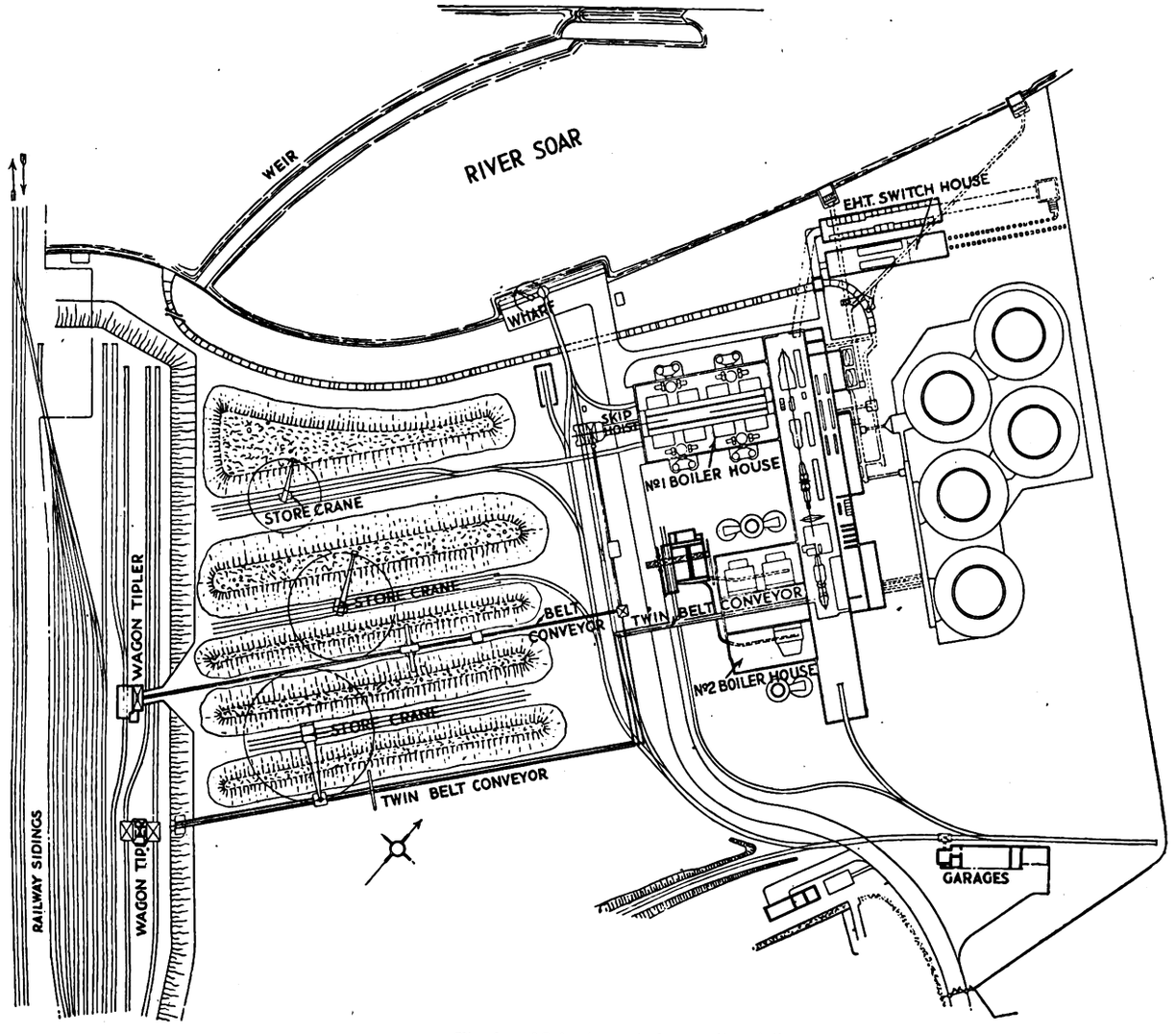
The Central generating station at Leicester, constructed on a site permitting extensions sufficient to cope with any increase in demand that can be reasonably anticipated for many years to come, was opened in 1922 and has since supplied practically all of the current consumed in the area administered by the City Electricity Committee. The present extension increases the capacity of the Central generating station to such an extent that it will in future be able to deal with the whole area of supply, and it is probable that the Lero and Aylestone plants will no longer be required as generating stations after March 31st, 1930. The following figures indicate the rapid growth of the Leicester electricity department since the war :—

Year.	Number of Consumers' Meters Working.	Units sold.
1920	7 720 ..	25¼ millions.
1925	19 871 ..	42 ,,
1928–9	36 999 ..	60 ,,

The total number of units generated during the nine months ended December 31st, 1929, amounted to 56½ millions.

The area of supply embraces 30 281 acres, and includes 21 parishes outside the city boundaries. To transmit electric current over this large area requires 500 miles of cables, while 6 primary and 254 secondary sub-stations have been erected.

When completed, the new section of the station will contain four water-tube boilers, two 25 000 kW generating sets, two house service turbo-generator sets of 1 500 kW each, with the necessary switchgear and other accessories. The buildings required to house all the ultimate equipment have now been constructed, but at present only one main and one house generating set are installed. Three boilers have also been constructed and are in operation. The contract was placed



Site plan of Leicester central generating station.

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in April, 1928, and was divided into sections. The supply of the main electrical generating equipment was entrusted to the English Electric Co., Ltd., of Rugby, the house service set to the Oerlikon Co., Ltd., of Zurich, and the switchgear to Ferguson, Pailin, Ltd., Manchester. The civil works, comprising the necessary buildings with the coal handling and ash disposal plants, were placed with the Mitchell Conveyor and Transporter Co., Ltd., of London, while International Combustion, Ltd., were responsible for the design and construction of the steam generating plant. To secure adequate co-ordination the International Combustion, Ltd., were appointed main contractors. All designs and progress of work have been carried out under the direct supervision of Mr. John Mould, Engineer and Manager of the Leicester City Electricity Department.

It is hoped that the advantages attaching to the combustion of coal in a pulverised form, and the extensive application of the principles of regenerative feed heating in connection with the turbo-generators, will be justified by a substantial reduction in generating costs.

The structural additions now completed include a new boiler house large enough to accommodate four boilers, an extension to the engine room, with provision for the installation of two 25 000 kW turbo-generator sets, and extensions to the switch-house buildings to house the additional switchgear

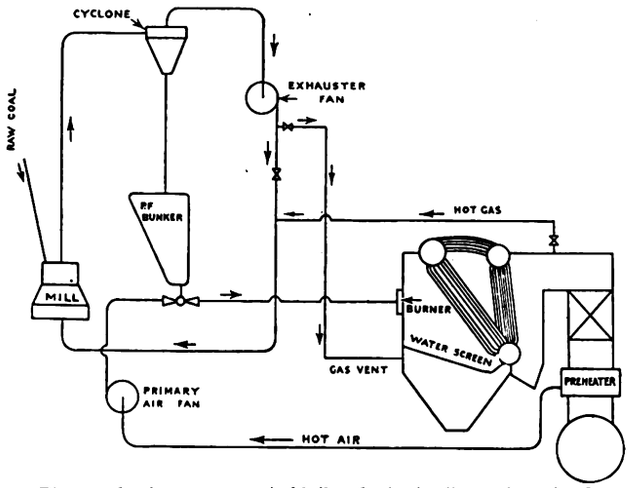

Diagram showing arrangement of boilers, heat extraction equipment and pulverising plant, No. 2 boiler house.

required. The buildings are steelwork structures with walls of brick panelling and roof coverings of slating and patent glazing. Particular attention has been directed to securing the largest measure of natural lighting.

The new boiler house is some 95 feet long, 130 feet wide, and 107 feet high from basement to apex of roof, arranged at right angles to the engine room. The engine room has been extended by 202 feet, making its present dimensions 430 feet long by 46 feet wide, and 69 feet high, so that it provides accommodation for a further turbo-generator set in addition to the machine at present installed.

New buildings, forming the control room, pump house and offices, have also been erected, parallel to the engine room, and a new structure in a remote part of the site houses the high tension switchgear.

The steam raising plant installed in the new extension comprises three watertube boilers, each capable of maintaining continuously an evaporation of 150 000 lb. of steam per hour, while an evaporation of 180 000 lb. per hour is obtainable under overload conditions. Provision has been made for the addition of a fourth boiler when the station is completed. The steam generating equipment is designed to operate normally with Leicestershire slack containing a high percentage of moisture and ash. The pulverised fuel system installed is the Lopulco Central System, in which powdered coal is delivered by the mills to a series of storage bins from which the boilers draw their supply. Conveyors are provided to distribute the product of each mill over all the bins and consequently the mills and boilers are completely interconnected. Four raw coal bunkers, having a total capacity of 1 820 tons, occupy the full width of the boiler house under the lantern roof and are supplied by two belt conveyors. The powdered product from the pulverising mills is stored in four pulverised fuel bins each of 45 tons capacity suspended from the firing floor. The amount of coal supplied to the boilers is measured by automatic coal weighers.

The coal handling plant has been extended to provide the additional capacity necessary to deal with the increased quantity of coal consumed, and to transport fuel to the new boiler house by the addition of two further "Mitchell" type weighing tipplers which are electrically controlled.

The pulverising equipment associated with each boiler comprises a mill, a cyclone separator and an exhauster fan, with a suitable system of piping connecting the component parts. The pulverisers are of the six-roller Raymond Super Mill Type, each being capable of dealing with approximately 15 tons of coal per hour and grinding it to a degree of fineness suitable for supplying the burners without further treatment.

Each boiler is fired by three Lopulco turbulent type "R" burners, which together are capable of delivering over 9 tons of coal to the furnace per hour. The burners are supplied by three sets of Duplex Feeders fitted at the bottom of the adjacent pulverised fuel bin. Of the three boilers comprising the present installation, two are of the vertical, bent-tube, three-drum type, erected above Lopulco water-cooled combustion chambers, and the third is of a special design developed by International Combustion, Ltd., for operation with pulverised fuel. The boilers are equipped with M.L.S. type superheaters and designed to give a pressure of 350 lb. per square inch and a total temperature of 750° F. at the turbine stop value. The air preheaters on the vertical tube boilers are of the Howden Ljungstrom regenerative type. On the Lopulco boiler an Usco plate type preheater is installed. A vacuum dust extraction plant has been provided for the purpose of removing grit deposited at those portions of the boilers and associated equipment where the accumulation of dust is likely to occur. The system provided for removing ashes from the boilers and ultimately from the site, is of the sluicing type. The system operates automatically and continuously, and very little manual labour is involved.

The main bulk of the feed water supplied to the boilers is provided by the condensate from the turbo-generator. To compensate for unavoidable losses a certain amount of additional water is required to make up the feed water supply. As this is obtained from a well sunk on the site, an evaporating plant has been installed to remove impurities. The evaporating plant is capable of supplying a total output of 1 000 gallons of pure water per hour at a temperature of 210° F. using 1 650 lb. of live boiler steam in the process, the latter being recovered as distillate.

All the auxiliary equipment including mills, fans, feeders, and so on, is electrically driven, the starters being located close to the motors, while control panels are grouped together on a platform raised above the operating floor in the centre of the building. The boilers are fully equipped with indicating and recording instruments, enabling the operation of the boilers to be adjusted to give maximum efficiency under all conditions of load. The plant is equipped with Bailey Automatic Control apparatus. The boilers may also be manually controlled by the aid of Bailey boiler meters. The amount of feed water supplied to each boiler is measured by a Kent Venturi Meter, while further meters of a similar design are installed in the two main feed ranges. Additional instruments provided on each boiler include a Multi-Pointer Draught Gauge, a CO_2 Recorder and a number of distance thermometers and pyrometers.

Electrical Equipment.

The main generating plant at present provided consists of a turbo-alternator having a maximum continuous rating of 25 000 kW at 0·8 power factor, generating three-phase alternating current at 6 600 V and 50 cycles per second when driven at a speed of 3 000 r.p.m. Its most economical load, however, is 20 000 kW. An exciter running at a speed of 1 500 r.p.m. is directly coupled to the alternator through reduction gear, and its field is provided with a specially graded shunt regulator for controlling the alternator voltage. The alternator is of the completely enclosed type. Cooling is provided by a closed air circuit in which circulation is maintained by a motor driven fan, and the temperature of the air is reduced in passing through a cooler supplied with water from the condenser circulating system. An alarm device is connected to the air cooler. Thermo-couples arranged in the stator indicate the temperature on a dial mounted in the control room.

The alternator is direct-coupled to a two cylinder impulse-reaction turbine embodying solid steel rotors. The high

(*Continued on page* 224.)

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pressure cylinder has built-up steel diaphragms, and is arranged for single flow. The low pressure cylinder is of the double flow type discharging into twin condensers. At normal load the turbine is designed to operate with steam at 350 lb. per sq. in and 750° F., while a vacuum of 28·45 inches of mercury is maintained at the exhaust flange. The maximum continuous rating of the set can be obtained when the temperature falls to 700 deg. F., the vacuum being then at least 28 inches. An automatic governor controls the speed of the turbine.

The condensers are of the two-pass, surface type, having brass tubes and tube-plates, and casings built up of welded steel plates, the total cooling surface being 23,000 square feet. The cooling water is drawn from a battery of cooling towers and is circulated through the condensers by means of two motor driven pumps each capable of supplying 26 800 gallons per minute. Duplicate Pervac extraction pumps remove the condensate from the condenser and deliver it to a closed feed heating system. Two surface type air ejectors, one designed to operate when the turbo-generator is on full normal load, and the other at maximum continuous rating, remove vapour from the condenser.

Three feed water heaters are installed in the basement of the engine room and each is supplied with steam bled from the main turbine at a stage where a suitable temperature and pressure are present. After leaving the extraction pumps the condensate passes through the first two heaters to two electrically driven boiler feed pumps which discharge it to the third bled steam heater of the high pressure type. A bye-pass is provided round each heater so that the system can operate while a unit is under examination or repair. The condensate main is connected to elevated surge tanks accommodated with the evaporated and town water tanks in a chamber above the switchgear control room. All the tanks are fitted with electrically operated level indicators installed in the engine room. An emergency steam turbine-driven pump is installed in the boiler house, taking its supply from the town water tank.

To provide current for the motors driving auxiliary plant an Oerlikon turbo-generator set having a maximum continuous rating of 1 500 kW has been installed in the engine room. The generator delivers alternating current normally at a pressure of 415 V and 50 cycles, but a voltage regulator enables the terminal pressure to be varied between 380 and 440 V. The machine is provided with a direct-coupled exciter, while the pressure is kept constant by means of a Tirrill voltage regulator. Air cooling arrangements similar to those of the main alternator are provided on the house set. Alarm and safety devices are fitted on the stator as on the main alternator. The alternator is coupled to a pure impulse type turbine designed for the same working conditions as the main alternator. The turbine is a single cylinder machine with a cast steel steam chest, and the governor, in addition to operating the main throttle valve, automatically controls auxiliary valves regulating the nozzle area of the first stage, according to the load. The turbine is provided with an air cooler arranged similar to that of the main machine, and arrangements are made for filtering the oil of both machines without intermixture through a common filter.

In addition to the temperature indicators on the main and house generator sets, and the level indicators on the tanks already mentioned, the most important instruments provided for indicating to the operators the performance of the equipment in the engine room include Venturi meters on the condensate pump discharges, and steam flow meters on the steam jet air ejectors, for both generator sets, the former embodying indicating, recording, and integrating mechanisms.

Three new cooling towers have now been provided to augment the two that previously served the original installation, so that the present battery comprises five towers all of similar design and capacity. The three new towers together are capable of cooling over 2 million gallons of water per hour through 12° F., and the outlet temperature will not exceed 74° F. under normal atmospheric conditions. The towers are of a special design developed by L. G. Mouchell and Partners, Ltd., and consist of external reinforced concrete shells about 125 feet high above pond level and 96 feet diameter at the base supported by diagonal columns of circular section. By a suitable system of sluice valves, it is possible to isolate any individual tower for inspection and repair.

The extra high tension busbars of the station are divided into four main sections, which are inter-connected by means of suitable re-actors with a tie bar, and with a reserve busbar. The contract for e.h.t. switchgear was placed with Messrs. Ferguson, Pailin, Ltd., and comprised one generator control equipment, and 15 equipments for the control of feeders, bus-couplers, re-actors, etc. The equipment is of their totally enclosed, metal clad, drop-down H.V.D. 75 type.

Each switch is designed with a rupturing capacity of 750 000 kVA, and is capable of handling any fault that can come on to the station. This gear is accommodated in an entirely new switch-house building remote from the station itself.

ILLUMINATING ENGINEERING SOCIETY.

Annual Dinner and Dance at Prince's Galleries—Coming Incorporation of the Society—Sustained Progress—Membership now Nearly 400.

THE annual dinner of the Illuminating Engineering Society was held at Prince's Galleries on February 12th. Dr. J. W. T. Walsh presided and those present included Col. Sir Thomas Purves, O.B.E. and Lady Purves, Mrs. H. Buckley, Sir Gerald Bellhouse and Lady Bellhouse, Mr. C. C. Paterson, O.B.E., and Mrs. Paterson, Capt. Donaldson, Dr. F. E. Smith, Lt.-Col. K. Edgcumbe, Miss H. M. Martindale, O.B.E., Mr. H. E. Copp, Mr. and Mrs. Thomas Wilkie, Lt.-Col. W. A. Vignoles, D.S.O., and Mrs. Vignoles. The dinner was followed by dancing.

Sir Thomas Purves, whose witty and genial speeches are always much appreciated, proposed the health of the Illuminating Engineering Society. He said that he had only the kindest feelings even for the gas engineers who now and again had their little games with him, injected quantities of their ethereal vapour into his telephone conduits and manholes, and in the friendliest manner blew them up. The Society in its 21 years of existence had, by the high quality of its purpose, placed itself in the front rank of technical societies. It had built up a real science of illumination which made them hope that even London would be a decently lighted place some day. He welcomed the presence of so many ladies.

Dr. Walsh (president of the Society), responding, paid a tribute to the work of the late Mr. Leon Gaster and his wonderful enthusiasm in the cause of illumination as secretary of the Society. The memorial fund had met with great success and had practically reached £250, the amount considered necessary for a memorial worthy of the Society and a fitting commemoration of Mr. Gaster's work.

The Society had now reached a total membership of nearly 400. Growth during the past few years had been such that the Society would be duly incorporated within the next few months. Two successful meetings had been held at Birmingham and the formation of local centres of the Society would follow in the very near future. As long as the Society remained confined to London it could not do the work that it might carry out if it had local centres in other parts of the country. The progress being made was in very large measure due to the indefatigable energy of their secretary, Mr. Dow.

In 1931 we hoped to welcome illuminating engineers from all parts of the globe when the meeting of the International Illumination Association and Illumination Congress would be held. They must all put their backs into the work of making the meeting worthy of the Illumination Movement in Great Britain.

Mr. C. C. Paterson, proposing the toast of "The Guests" said that both the Institution of Gas Engineers and the Institution of Electrical Engineers had always been as elder brothers to the Society if they had not to one another. There had always been a tradition of explosiveness about any combination of gas and electricity but their association in the Society was more in the nature of peaceful diffusion.

Dr. F. E. Smith, who replied, spoke of finding a house at Nyeri in Kenya, 17 miles south of the equator and 5 miles from any other white man's habitation, well lighted with gas-filled electric lamps supplied from accumulators which were recharged once a week.

Mr. H. E. Copp also replied and raised the pæan on behalf of the gas industry. As he was only separated by one place from Lt.-Col. Vignoles many of the company felt that the tradition of explosiveness referred to by a previous speaker might be enhanced, but Mrs. Wilkie, whose husband occupies the neutral position of vice-president of the Association of Public Lighting Engineers, proved to be an efficient insulator.

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ELECTRICAL WHOLESALERS' FEDERATION.

The Annual Dinner—Mr. Watlington on Rationalisation—President's Appeal for Co-operation in the Industry.

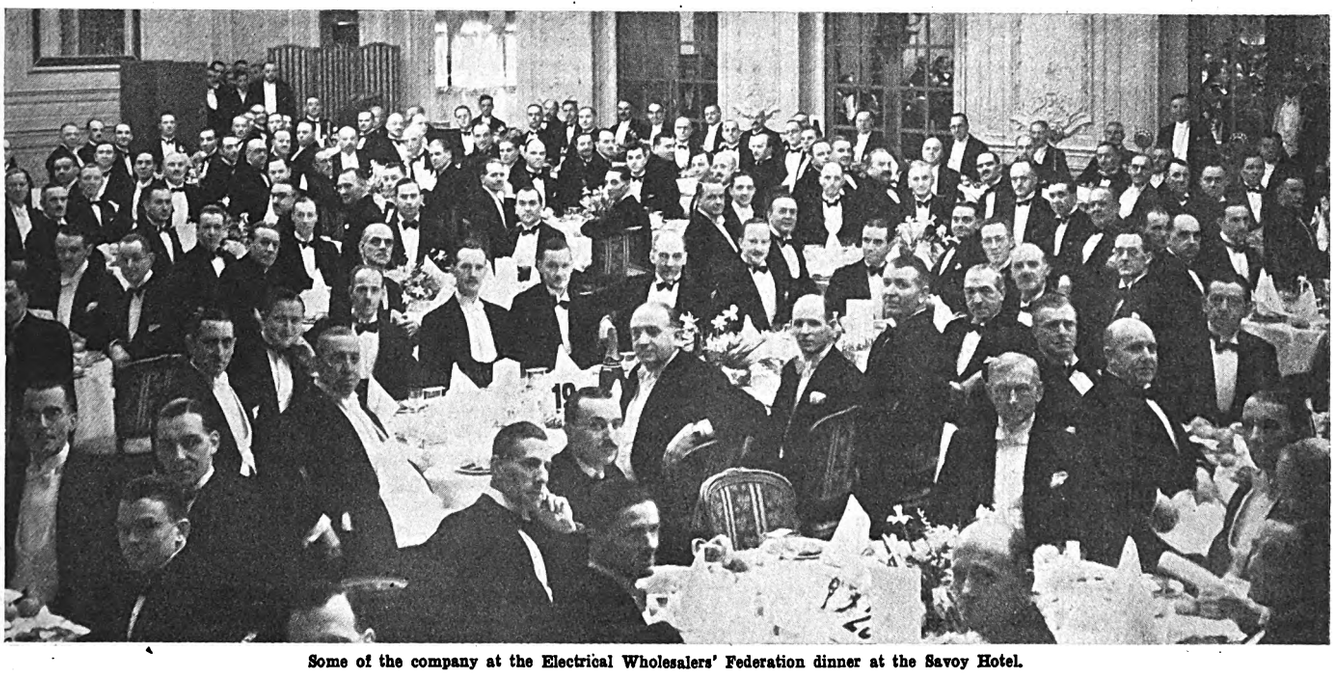
THE annual dinner of the Electrical Wholesalers' Federation was held at the Savoy Hotel on February 13th. Mr. James Wilson, president of the Federation, was in the chair, and the company included :—

Mr. V. Watlington, Sir Felix Pole, Mr. Percy Rosling, Mr. J. K. Brydges, Mr. J. Y. Fletcher, Mr. C. W. Sully, Mr. Willoughby Ellis, Mr. S. H. Callow, Mr. P. F. Crinks, Lt.-Col. W. A. Vignoles, D.S.O., Mr. D. N. Dunlop, Mr. L. B. Atkinson, Mr. P. V. Hunter, Mr. Howard Marryat, Capt. J. W. Barber, C.B.E., Mr. Theodore Stretton, Mr. A. G. Beaver, Mr. F. Winstanley, Mr. T. R. Martin, Mr. H. W. Jarvis and Mr. G. O. Donovan.

Mr. Watlington, proposing the toast of "Rationalisation," gave an outline of the evolution of the ideas embodied in the word in the Ruhr coalfield. He said that if demand was only sufficient to employ say 80 per cent. of the producing plant the final result of the intense competition that took place probably was that everyone ended by getting about 80 per cent. of their capacity but on a much reduced price level. Lowering of prices resulted in a lowering of quality and a vicious circle was established. It was quite a mistake to be constantly attacking wages. It was the load factor that should be attacked. Fixed charges and general overhead expenses were with us all the time and the key to prosperity in manufacturing was to try to give full time employment. Rationalisation meant putting certain units into full employment and putting others entirely out of action by providing a fund to pay off the capital in those units which were closed down. This meant a temporary reduction of employment, but the subsequent employment of more people. It was better to get the operation over quickly. It was the essence of successful rationalisation to reduce costs and prices in order that demand might be increased. Demand could be increased enormously if they were able to give the man in the street an article at a price that he could afford to pay. He was the base of the pyramid. Unfortunately in this country he had not a very high purchasing power. Taxes were high and wages were low. They must first be perfectly sure that the structure to be created would tend to reduce prices. The electrical industry spent too much money on selling its products. By the time an article reached the consumer the price was so high that he jibbed at it, with the result that demand was checked. It was better to cheapen the price to the user and cheapen the cost of getting the article to the user. They wanted people inside the industry to realise that their fate was in their own hands. If the industry would pull together it had a wonderful opportunity of making something of which they could all be proud and making it possible for everybody in the industry to get a proper reward for his work.

Sir Felix Pole, replying, said that it was common sense that people in an industry should conduct their business in such a way that they could make profits. The dividend declared by the Great Western Railway on the previous day would not have been declared if there had been no rationalisation scheme applied to the railways in 1921. Unregulated competition was very expensive.

Mr. P. V. Hunter proposed the toast of "The Electrical Wholesalers' Federation," to which the president, Mr. James Wilson, responded. Mr. Wilson said that we could not say that in our marketing we were operating in the best possible manner towards strengthening the position of this country. It was within our power to get to work with the pruning knife on those deadly growths—mistrust, suspicion, price-cutting, the "brass-plate merchant," the suppliers and installers of shoddy material. We should not free ourselves from them until we adopted the greatest co-operation between manufacturers, wholesale distributors, contractors and retailers.



Some of the company at the Electrical Wholesalers' Federation dinner at the Savoy Hotel.

Co-operation in marketing on the most economical lines was essential and must engage our immediate attention. He preferred to make his appeal for the bringing into being of a policy of co-operative effort, with this end in view between all sections, rather than that this co-operative effort should ultimately be created through economic circumstances. Economic circumstances sometimes meant a position following a period of operation which had impaired efficiency, sapped vitality, brought total impoverishment to some and partial impoverishment to all. It sometimes meant the result of government blundering, or too much government interference, or the placing of too heavy burdens upon industry, or was due to not availing ourselves of the resources within our Empire, to the neglect of our manufacturers and workpeople, from pandering and pauperising, instead of leading and teaching that only from work could reward be expected. Our manufacturers must be assured of the support of the supply authorities, wholesalers, contractors and retailers; likewise must the manufacturers extend to these sections an undertaking that they would support every effort made by those sections towards economical and efficient marketing, and see that their respective fields of activity were conserved to them.

Mr. G. O. Donovan, who proposed the toast of "Our Guests," strongly urged the elimination of "brass-plate merchants." Mr. P. F. Crinks and Mr. P. Rosling responded.

The toast of "Our Chairman" was proposed by Mr. Theodore Stretton and was given with musical honours.

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ROUND THE JOBS.

A Terrible Piece of Work—Responsibility of Surveyors and Architects—Consulting Engineers and Small Jobs—Wages and Their Basis—Misleading the Buyer of Fittings.

By "CONTRACTOR."

I HAVE just returned from a week-end at a friend's house where an incident occurred which is so full of morals that I cannot resist the temptation to relate it here.

Noticing the flicker of a standard lamp, I stamped on the floor, when the flicker occurred again. Now my host's house is some 350 years old and is a mass of timber. This, added to the fact that I have "bad installations" on the brain, to some extent, made me ask him if I might remove a trap in the middle of the floor. He acquiesced and I took off my coat and removed the trap. It revealed at first a mass of tightly packed cotton wool which was, in effect, nothing more or less than dampness. I removed some of this sticky white mess with my fingers and was rewarded with the sight of a jolly little arc going on at a break in some sodden cab tyre cable. The cable had been brought to the base of a moulded insulator junction box, and, at one time or other, connection had been made by means of connectors which formed part of this base. There was, however, no lid on the box and when I touched the base it broke in my fingers like a biscuit. The first thing to do, I thought, was to effect some sort of joint in the broken cables, but when I touched them they simply snapped off, rubber insulation, copper and all; for, needless to say, they were composed of only one strand of copper.

Next day I examined the remainder of the wiring and found that on the ground floor it was almost entirely laid beneath the floor boards. There were junction boxes, connections made by means of connectors and twisted joints; in some cases the twisted joints were covered with sticky tape, in others they were not. Inspection beneath the rafters, whence all the lights on the top floor were served, showed that this space under the roof was a mass of straw which had been placed there in order to protect water pipes against the effects of frost. After scrabbling and scraping a good deal I came across cab tyre cable. This was not clipped down but trailed loosely over joists with occasional connections made in a similar manner to those downstairs, except that I did not find a single junction box; the best connection of all was one in which two porcelain connectors had been used.

The individual responsible for carrying out this installation was neither a member of the National Register of Electrical Installation Contractors nor a member of the Electrical Contractors' Association. I can picture the scene six years ago or so when the installation was put in and a scornful householder—my host was not at that time the owner of the house—was telling some reputable contractor that his price was far in excess of another price which he had secured, and that it was evident that he was trying to make an exorbitant profit. So the householder went to his "lowest price." Even then the picture is not complete, for we can see the disreputable contractor putting a boy of sixteen on to the work, telling him to economise at every point he could, and, after a few days, perhaps, realising that further economies were possible by the omission of junction boxes; a little later by the omission of connectors.

When my host bought the house he took the precaution of paying a fee to a surveyor in order that this man might go down to the house and report upon its condition in every respect. My host got for his fee the assurance that the house was in every respect satisfactory, and there were no criticisms to offer. The surveyor could not possibly have tested the installation himself, but in this case he should either have included in his report some reference to his inability to comment on the state of the electric wiring or, alternatively, should have recommended my host to pay a consulting engineer to test this very important item.

Responsibility.

It is no light responsibility that these three persons—the original householder, the surveyor and the contractor who did the wiring—took upon their shoulders, for they might very easily have been responsible for the loss of a most beautiful house, and, further, for injury or death to its occupants.

The incident referred to above once again very seriously raises the question as to whether it is safe to trust an architect or a surveyor to give an adequate report upon an electrical installation. Architects and surveyors can hardly be blamed for not understanding the trade of the electrical contractor. But they can and should be blamed very much for assuming that there is no need to incorporate details of that subject in any report they may make. It is the duty of their client, in the first place, if he wishes to have a satisfactory report, to instruct a consulting engineer to examine the installation. There is a quaint idea, which is very prevalent these days, to the effect that the consulting engineer is a man who only builds power stations and designs the electrification of railways. People do not seem to think of him as a man who is also available for making just such reports as those I have mentioned.

The Wage Increases.

The new increase in the wages of electricians and assistants will come as a shock to very many people. This increase must not in any way be confused with the recent application on the part of the Electrical Trades Union for an increase to two shillings an hour. This recent advance is in accordance with the sliding scale which applies to the trade. The advance to two shillings was consistently and successfully rejected by the National Federated Electrical Association, who have reasonably held that the electrical contracting industry was not sufficiently prosperous to entertain the idea of such an increase. The electrical contracting industry is remarkably fortunate in its labour disputes committee, and one may very well accept their decisions in the matter of wages without question. Anyhow, no member of the Association can say that he was not afforded an opportunity to put forward his views. As in so many cases of this sort it is those who did not attend the meetings who are the first tocriticise.

I have always held that a really good electrician is worth far more than two shillings an hour. But—and it is a very large but—the average electrician is not worth that amount, and the majority of electricians—not to be confused with the average electrician—are not worth the wages which an assistant receives to-day. I should like to take half a dozen of the electricians whom I employ and pay them at least half-a-crown an hour. I should like to pay a very large number of the remainder about one shilling an hour. Unfortunately, the trade unions will not listen to payment by merit, therefore my good electrician continues to receive only one and tenpence three-farthings, because I have to pay his inefficient colleagues the same amount. It is argued of course that one shilling an hour would not be a living wage and that the sole aim of the trade unions is to see that all their members receive a living wage. But just see what the effect of paying a shilling an hour to the inefficient workman would be. These shilling-an-hour gentlemen would immediately resolve themselves into two classes. The first class would be those who were earning a shilling an hour because they were too lazy or, perhaps, too ignorant to qualify for a higher rate, these could very easily, and probably would, "pull up their socks," take text-books home with them at night, pay a little more attention to how the good craftsman did his work, and, in a very short space of time would be earning better pay. The second class would be those who are inherently incapable of becoming craftsmen, and these would, in a very short space of time, be weeded out of the industry to the great advantage of everyone concerned. It is an age-long problem, but one cannot help feeling sorry for my good electrician who is only earning one and tenpence three-farthings an hour and is never to be allowed to earn appreciably more.

I heard from a friend of mine the other day of an amusing incident. He was called in by a customer of his and asked to erect two fittings which had been sold to the customer over the counter by the salesman of the manufacturing company. My friend gave an estimate for the necessary wiring to two points to serve these fittings and an exasperated customer informed him that the estimate was exorbitant. When it was pointed out that it was necessary to run back for a very long distance in order to pick up the feed, the customer promptly replied that the salesman who had sold him the fittings had said that it would only be necessary to run one foot of tubing from where the fittings were to hang to an existing tube along the wall. It was then pointed out by my friend that the tube run in question was supplying high tension current to a Neon light sign!

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BOOKKEEPING FOR ELECTRICAL CONTRACTORS.—IV.

Entering Up the Cash Received—Recording Discounts Allowed to Customers—Balancing the Personal Accounts.

By S. HOWARD WITHEY, F.C.I.

ALTHOUGH the contractor's cash book will be nothing more than a cash account bound in book form for the sake of convenience, the precise rulings will depend to a large extent on the particular class of business and the method which has been set up for handling and dealing with the cash. If, for example, it is the custom to keep back certain amounts of cash received from customers and debtors in order to be able to defray pressing shop or office expenses or to meet the claims of local creditors, it will usually be found necessary to use a form of cash book which has been provided by the printers with three money columns on both the debit or receipts side and the credit or payments side. In the case of the contractor who pays all cash received into the bank intact, without exception, two money columns on the payments side of the cash book will suffice.

The three money columns on the debit side should be headed " Discount," " Cash," and " Bank," respectively. Upon the receipt of cash from a customer in whose name a ledger account has been opened in the contractor's books the amount should be entered up in the middle or " cash " column, with the date and the name of the sender. This applies whether the remittance is in the form of a cheque, postal order, or notes, or actual coin, and the amount should be posted from the cash book direct to the credit side of the particular person, firm, company, or corporation, etc., giving the date and the words " By Cheque," or " By Cash." The amount recorded on the debit side of the cash book and the amount posted to the credit side of the personal account will constitute the double entry, and in order to connect the two items and to show at a glance that the two sides of the transaction have been duly recorded, the page or folio on which the customer's account appears in the sales ledger should be inserted against the cash book entry, and the cash book folio against the entry made in the ledger. Upon no consideration should a ledger folio be inserted against an item in the cash book until the amount has been posted.

Percentage Deductions

Customers who are allowed a percentage deduction from the invoiced prices in respect of payment within a stipulated or a recognised period will usually make the deduction at the time of remittance, the net amount being recorded in the " cash " column of the contractor's cash book in each instance. When the accuracy of the deduction has been verified, the amount of the discount should be entered in the " Discount " column on the debit side of the cash book, and on the same line as the item of cash to which it relates. Both the cash and the discount will have to be posted to the credit side of the customer's ledger account, either separately or as one entry reading " By Cheque and Discount " or " By Cash and Discount." At the end of each month, the total of the " Discount " column of the cash book should be transferred to the debit side of a Discounts Account kept in the impersonal ledger, this ledger entry giving the date, viz., the last day of the particular month, the words " To Sundries per Cash Book," and the cash book folio, the folio of the ledger being then inserted underneath the total to show that the amount has been properly dealt with. Rebates allowed by manufacturers and suppliers should not be treated in the books as discounts, but should be recorded in the returns and allowances book, or at the end of the contractor's purchases book.

When all cash receipts are banked, the total of the cheques, notes, coin, etc., paid in should be extended into the outer or " Bank " column on the debit side of the cash book, and some care should be exercised to ensure that each sum deposited corresponds with the total of the items entered in the " Cash " column. If any money is kept back the actual sum paid to bank will have to be recorded in the " Cash " column on the credit side, showing the date and the words " By Bank," and also in the " Bank " column on the debit side, with the same date and the words " To Cash," these two cash book entries being connected by the insertion of the word " contra," or the abbreviation " c/-," in the ledger folio column against each. The amounts entered in the " Bank " column on the receipts side should agree with those shown on the deposits side of the contractor's pass book, and it is a good plan to compare them whenever the pass book is available, and at least once every month.

We come now to the method of keeping and balancing the personal accounts of customers and debtors. These accounts should be kept in a separate ledger, and should not be merged with the accounts of creditors and trade suppliers. For the most part the amounts appearing on the debit side of any sales ledger account will represent the invoiced prices of lamps, batteries, domestic appliances, wire, cable, switchgear, and accessories, etc., supplied by the contractor from time to time or the charges made for installations and other services, as detailed in the day book, the folio of which should be shown against each item. On the credit side of the account will appear the different amounts of cash paid by the customer, and the discounts allowed by the contractor for prompt payment, both these having been posted from the cash book, also the value of any returns or allowances made by the contractor in lieu thereof, as detailed in the sales returns and allowances book, or at the end of the day book.

To guarantee that too much money is not locked up in the form of book debts, and to ensure that debtors' accounts are not being allowed to remain outstanding month after month, it is advisable to balance the sales ledger at the end of each month, and to make out a list of debtors. When balancing an account the total of the debit items should be inserted in pencil, in the first instance, directly underneath the last entry on the debit side of the ledger account, and the total of the credit items inserted underneath the last entry on the credit side. If the debit total is the higher figure, the difference will represent the sum owing to the contractor, and this amount should be entered as the last item on the credit side, with the balancing date, and the words " By Balance carried down." When this has been done, the debit and credit totals will agree with each other, and may be ruled off directly opposite each other on the same line, the balance being at once brought down on the debit side of the account as the opening entry for the next month, with the date and the words " To Balance brought down."

In the event of a customer having overpaid his or her account, the credit total will exceed the debit total, and to rule off such an account the difference would have to be inserted as the last entry on the debit side, with the date and the words " To Balance carried down," enabling the two totals to be ruled off and the balance brought down on the credit side, with the opening date and the words " By Balance brought down." Usually the abbreviations " c/d " and " b/d " are used to denote " carried down," and " brought down," respectively. When the two totals of an account exactly correspond with each other, they should be ruled off at once to show no balance outstanding.

In the next instalment of this series the method of keeping contract accounts will be indicated.

(To be continued.)

INTERNATIONAL TELEVISION INSTITUTE.

We welcome the first issue of the Bulletin de l'Institut International de Télévision (for January). The Institute was founded as the result of a conference held last August and has its headquarters at 87 ch. de Tervueren (Anderghem), Brussels. intending members should communicate with the President of the Institute at the foregoing address. The annual subscription is 10 Belgas (50 Belgian francs). The first issue of the Bulletin contains papers by M. Ch. Gheude (Quelques considérations physiques sur les éléments photosensibles) and by M. Pierre Matvieff (Étude d'un procédé de Télévision).

The Dominion Water Power and Reclamation Service of the Department of the Interior of Canada has recently issued volume 59 of the water resources papers, containing the results of investigations made by the Dominion hydrometric survey during the climatic year October 1, 1926, to September 30, 1927, in British Columbia. Copies may be obtained free from the Director of the Dominion Water Power and Reclamation Service, Ottawa.

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ELECTRICITY SUPPLY IN PUBLIC BUILDINGS.

Difficulties Caused by Multiplicity of Regulations—Automatic Circuit Breakers or Fuses?—Water Heating—Danger from Earthing Wires—Insulation in Bathrooms.

A PAPER dealing with the regulations affecting the supply of electricity to large buildings, theatres, etc., was read by Mr. W. J. Jeffery, A.M.I.E.E., at a meeting of the London Local Technical Group of the Electrical Power Engineers' Association, on January 28th. Mr. J. H. C. Brooking presided.

Mr. Jeffery's principal object in reading the paper was to call attention to the difficulties encountered by supply authorities and engineers in connection with the supply of electricity to public buildings by reason of the fact that some half a dozen sets of regulations have to be complied with. The regulations governing such supplies fell into six groups :—

(1) Those of the Electricity Commissioners, under the Electric Lighting Acts.
(2) Home Office Regulations, under the Factory and Workshops Acts.
(3) Regulations of the various supply authorities, which are based primarily upon the first two groups, with the addition of special clauses dependent upon local conditions.
(4) Regulations of various licensing authorities for theatres and other places of public resort.
(5) Regulations for the electrical equipment of buildings, formerly known as the I.E.E. wiring rules.
(6) Regulations of fire insurance offices.

Generally speaking, said Mr. Jeffery, the Electricity Commissioners' regulations applied to supply undertakings, and contained few clauses relating to buildings, these clauses being framed with a view to ensuring the safety of the public. The Home Office regulations applied to factories and workshops.

Size and Cost.

Section 26A of the Commissioners' regulations provided that a suitable safety fuse or automatic circuit breaker should be inserted as closely as possible to the point of entry. In view of the size of services now frequently run in, he regarded the substitution of the circuit breaker for the fuse as a very desirable development, almost the only hindrance to which was the difference in the cost of the two pieces of apparatus. Several undertakings were adopting circuit breakers, and he asked what was the lowest limit of size adopted for this purpose. This led him to comment upon the urgent need for educating architects and property owners to the necessity for housing electrical apparatus decently.

A very frequent source of difficulty between supply authorities, contractors and owners of installations arose from the many slipshod methods of installing conduits in buildings. Sometimes such poor slip joints were used that there was no mechanical or electrical continuity in the conduit. It seemed necessary then for the authority to defend its action if it refused to connect, basing this refusal on Sub-Section 5 of Clause 27 of the Electric Lighting (Clauses) Act, 1899.

The regulations concerning installation were the logical development of the various regulations drawn up by the fire insurance companies, some of which were excellent, but could now be considered to have been superseded by the I.E.E. regulations. Speaking generally, none of the I.E.E. regulations had been more completely neglected than had Paragraph 94F, which provides that in installations where the normal working current in any circuit or circuits connected to the main distribution board exceeds 100 amps. there shall be provided, in addition to a fuse or circuit breaker with overload trip, an automatic device whereby the installation or faulty circuit, as the case may be, shall be disconnected in the event of a leakage to earth ; and that this device may be set to operate with any prescribed value of leakage current, provided that such value does not exceed 100 amps. Very few people seemed to be aware of its existence, and some had stated that it was impossible to carry it out with d.c. A few manufacturers had developed apparatus to do what was needed, but found that there was practically no demand for it. The G.P.O. engineers had put such apparatus into standard use, and deserved credit for that. Adoption of such apparatus involved the use of circuit breakers, and the only objection he could see was that of price.

Referring to Rule 126A (d), which provided that the H.P. conductors should conform in all respects to the appropriate British Standard Specification where a step-up transformer was used for raising the pressure of supply, he doubted whether this regulation was sufficient to deal with the high pressure mains involved in the supply to neon signs.

Again, although Rule 123H provided that in water heating apparatus the water should not be in direct contact with the live portion of the heating element, the development of thermal storage had introduced boilers heated by 3-phase current with pressures up to 11 000 V, and in which the heating was effected by immersing C.1 electrodes direct in the water, so that this development was directly in opposition to the rule. Various large installations had been equipped in this manner. It was likely that a carefully considered exemption clause would have to be drafted, leaving the existing rule to cover the smaller and lower pressure domestic apparatus.

Dealing with the London County Council regulations concerning electricity supply to places of public entertainment, he said they were in many respects comparable with those concerning electricity supply in mines, which were the most stringent regulations in operation. The L.C.C. regulations called for two entirely distinct systems of lighting for all parts of the buildings to which the public had access. Rule No. 80 (Section e) provided that the I.E.E. regulations should be complied with, except that only Class R (armoured cables), Class T.1 (conduits, screwed), or Class T.2 (metal conduits not screwed) should be used in the wiring systems. This debarred the use of lead-covered or C.T.S. cable unless run in conduit, and there was an apparent divergence of opinion between the authorities responsible for the two sets of regulations. In a recent letter to the Press, the Council of the I.E.E. had reaffirmed the opinion that lead-sheathed cables were both suitable and safe if installed and maintained in accordance with the I.E.E. wiring regulations.

Commenting on the L.C.C. rule that wiring must not be run in lift shafts or ventilating ducts, he said that the sooner definite and suitable conduit routes were provided in all buildings the better. Another rule was that electric radiators should be installed only in approved positions and must be provided with guards at least 6 in. from the elements. This was a direction in which most radiators might well be improved. He welcomed also the rule that gas and water pipes must be excluded from the electrical supply intake rooms, and that these chambers must be of adequate size, constructed of fire-resisting materials, and ventilated to the outer air. The L.C.C. regulations prohibited the use of twin-twisted flexcords without protection, except for pendant lights and portable table lamps, whereas the I.E.E. permitted their use for fixed wiring, fixed fittings, and so on. He had seen recently a shop window in which flex for lighting was securely fixed to the window frame with what appeared to be ordinary drawing pins inserted between the two flexes, so that there was much to be said for the L.C.C. restriction.

Discussion.

Mr. Arthur E. Drew, discussing the rule in the I.E.E. regulations concerning the provision of leakage protection on circuits exceeding 100 amps., and also the earthing of the neutral point on consumers' premises, said that experience had shown that circuit fuses were not of much use in some cases. The necessary apparatus did exist, but one could not provide leakage protection unless some part of the circuit was earthed, so that some decision must be come to with regard to earthing. The authorities in New Zealand were insisting on the protection of practically all circuits, and he believed they limited the rating of the circuit breakers to 5 amps. Circuit breakers were operating at as low a current as 5 amps. If the demand were sufficient such breakers could be supplied probably at something under £1.

Mr. A. F. Harmer emphasised the difficulty of obtaining adequate sites for transformers in buildings. One of the greatest bugbears was the curious attitude of the architects, who appeared to think that one could put a 300 kVA transformer into the space previously occupied by an ordinary five-light gas meter.

A speaker, after commenting upon the difficulty sometimes experienced in interpreting various regulations, owing to the curious wording adopted, said that he had had many interviews with L.C.C. authorities, and they had always stated

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quite clearly that every job would be considered on its merits. It was well that that should be known. The Middlesex County Council regulations relating to large buildings were just about as strict as those of the L.C.C.

Another speaker said that it was extremely difficult to get the authorities to make a pronouncement on any difficult matter until the work had been done, and then often it was condemned. Insulation work which was regarded in one district as sound was considered to be unsatisfactory in another. The introduction of an earthing wire into a building was a source of danger, because such a wire was always assumed to be in order and was never inspected after it had once been fixed.

Co-ordination of Rules.

Mr. W. F. Andrews (Hon. Secretary of the Group) said he would like to know why the L.C.C. did not always stick to their own rules with regard to the provision of proper spacing between the points of entry of gas, water and electricity mains into buildings. He agreed that it would be advantageous to have only one set of regulations relating to public buildings, which would be binding on the whole industry.

The Chairman, discussing the difference between the I.E.E. and other regulations, said that the I.E.E. rules were not so severe as the others because they had regard to the pockets of the individual consumers, whereas the other regulations affected everybody else's pockets. A house-owner would not have an installation at all unless the price was reasonable, and the other regulations were more severe than those of the I.E.E. because they legislated, not for the safety of the few inhabitants of each individual house, but for the safety of people in bulk. In regard to the desire for co-ordination of the existing rules, the meeting might care to express an opinion which might be referred to some competent body for consideration.

Dr. Allan urged that one set of rules only was needed. In regard to a.c. supplies to consumers having transformers on their own premises, he understood that the consumer could elect to have earthing or not. It seemed to be entirely wrong that that should be at the discretion of the consumer. He mentioned cases in which people had been electrocuted in bathrooms, and asked whether there were regulations as to the apparatus to be used, for instance, when switches were within reach of a person in a bath, and so on. He had seen plans of an American concrete building which included the provision of ducts below the level of each floor for the purpose of carrying cable and other services.

Mr. W. F. Andrews said his supply authority had ruled that the switches, lampholders, etc., installed in bathrooms on the Council's housing schemes must be of insulated materials.

Mr. Jeffery, replying to the discussion, and referring to the point that some authorities applied their public building supply regulations only to buildings with seating accommodation for over 500 people, said that, as the result of the Paisley disaster, those authorities would probably consider very seriously whether this limitation should be withdrawn. A manufacturer had told him a few weeks ago that he had received an inquiry for the supply of the largest number of circuit breakers he had ever been asked to quote for. The inquiry was from an undertaking abroad, who wanted to buy many thousands, the majority of them for currents under 50 amps. During the last few years he had noticed that architects were beginning to appreciate the position, and in certain directions things had become more satisfactory than they were hitherto. In this connection he called attention to the clever move made by the Electric Lamp Manufacturers' Association in attaching a fully qualified architect to the staff of their lighting bureau at Savoy Hill, London. He was able to put forward in architectural circles the views of the electrical industry. The various supply undertakings might with advantage group together and employ architects in a similar manner. As to co-ordination of rules, he gathered that it was not the intention to ask for the setting up of any new body, but that the Electricity Commissioners would be asked to consider the standardisation or grouping of the various rules. The I.E.E. rules did cover fittings in bathrooms to a limited extent by providing for the earthing of exposed metal parts, and also for placing them beyond the reach of the person in the bath.

After some discussion the meeting made a recommendation to the Transmission and Distribution Committee of the London Technical Group that the existence of too many sets of regulations concerning electrical supply to public buildings led to confusion, and that the matter should be considered and, if thought fit, representations as to the desirability of co-ordination should be made to a competent authority.

ELECTRIC WELDING.

Superiority to Riveting—Large Saving in Cost—Application to Shipbuilding.

At a meeting of the Institution of Structural Engineers, at Denison House, Vauxhall Bridge Road, London, on February 13th, Major James Caldwell read a paper bearing the title of "Welding."

After describing various processes of electric welding, Major Caldwell said that tests on ship plates welded with good quality covered electrodes had shown that, compared with riveted joints, the arc welded joint was consistently superior in ultimate strength, and water and air tight up to its breaking point. Stronger steels had recently been introduced for shipbuilding, and their use reduced deadweight without sacrificing strength.

In this country welding was not permitted for boilers by the official bodies who controlled boiler construction for some purposes, nor by the boiler insurance companies. For pressure vessels used in American oil refineries arc welding had been in satisfactory use for some years. Investigation by some good authorities showed that boiler failures occurred at riveted seams, and consequently, said these authorities, some form of welding must take the place of the riveting.

Pipe lines represented a very important branch of welded construction. In the case of pipes for water supply to the East Bay Municipal District, in California, electric welding was adopted. An offer received for riveted construction was £2 270 856, and the offer accepted for electric welded construction was £1 847 399, the difference in cost being £423 457, or 18·6%. For gas supply between Lamkin and Hodge, Louisiana, 45 miles of 7 in. dia. pipe was used, with 11 000 joints. An offer for oxy-acetylene welding was received of 11s. per joint, and the accepted offer for electric arc welding was 5s. per joint. The saving in cost was 6s., the actual cost 2s. 4d., and the profit 2s. 8d. per joint.

Probably one of the most extensive fields of application for electric arc welding was in the construction of oil storage tanks, although work on these had so far been limited to bottoms and roofs.

The manufacture of machine parts out of steel plates and rolled sections united by welding, as a substitute for castings, was now a standard production in some branches of engineering. In electrical machinery the magnetic properties required in certain parts were improved by welding. The largest electrical generator yet put into service was one of 160 000 kW, in the 14th Street station of the New York Edison Co. The stator frame and casing of this machine were entirely built up of steel plates and shapes, welded by electrical methods.

It was now for structural engineers to make use of this improved tool, and, by virtue of their knowledge of the particular requirements, to modify their designs and utilise special steels in order to secure the greatest possible advantages from an extensive use of electric arc welding, which had been shown to be the most wonderful means of saving materials and labour, besides providing efficient construction, that had been perfected in the twentieth century.

Discussion.

Prof. Haigh said he had been one of the first to argue that a welded joint was decidedly better than a riveted joint. He thought the saving of material that was possible with welding would make very great changes in the immediate future.

Dr. Oscar Faber said that at present they were prevented by the London County Council from taking whatever advantage there might be in the substitution of welding for riveting.

Dr. Stradling (director of the Department of Scientific and Industrial Research) referred to the desirability of finding a method of testing welded joints in the field. Four methods had been suggested, but none of them had been used to any extent.

Sir George Thurston expressed the opinion that before many years had passed arc welding would be applied not only to the hulls of ships, but also to those portions of a vessel on which its strength depended. There was no doubt that in Germany the application of arc welding had helped the German builders to obtain results which would have been impossible with the ordinary construction.

Mr. Ewart S. Andrews said it seemed to him that welding was rather more easily applicable to reinforced concrete than to structural steel work, as far as present knowledge went.

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THE BRITISH INDUSTRIES FAIR.

Some of the Domestic and Radio Exhibits at Birmingham and London Sections—Electric Water Heating well Catered for.

(*Continued from page 207.*)

MESSRS BULPITT AND SONS, LTD. (Swansea Works, Birmingham), Stand No. 20K-5. Here are to be seen examples of modern water heaters for domestic hot water supply. The type shown is the "Storage" heater calling for light loads spread over considerable periods and therefore adapted to take full advantage of any special tariffs which may apply to the scheme of charges operative in certain districts. The loading of the 10 gallon size heater is 0·75 kW, while the loading of the 15 gallon tank is 1 kW. Temperature is adjustable by the thermostat setting and can be varied between 120 deg. F. and 200 deg. F. An immersion heater of improved type is employed, working at a relatively low heat. It can be removed from its containing tube by turning a cap with a bayonet joint, which allows the porcelain former and heater to come away bodily without breaking any water joints. The thermostat is of a new type giving increased sensitivity, and operates the mercurial switch by means of a bi-metallic spiral strip. The temperature control is within two or three degrees of the figure for which the thermostat is set initially. A single coating at the base of the inner container carries the whole of the fittings, such as water inlet with a non-return valve, heater, thermostat, and porcelain terminal block. This plate is removable and allows access to the inside of the container for the purpose of cleaning out or scaling when necessary. When set up a covering cap encloses all the controls and preserves a clean outline to the tank with no pockets to trap the dust. In one type of tank adapted for pressure service the cold water feed is from the usual ball cistern at the top of the building, or from the mains, the hot water being led off from either top or bottom of the heater to the required site and controlled by stop cocks on the outlets.

BRITISH INDUSTRIES FAIR.
Feb. 17—Feb. 28.

Readers are cordially invited to visit the stands of THE ELECTRICIAN and allied publications at Castle Bromwich and Olympia, London, and to make full use of our Service.

CASTLE BROMWICH
Block 8G, Stand 1.

OLYMPIA
Stand D170.

THE EVER READY CO. (GREAT BRITAIN), LTD. (Hercules Place, Holloway, London, N.7), Stand No. 7G-3. A full range of electric lamps, batteries and accumulators is on view. The firm is also exhibiting in London, where their stand is in the wireless section, Nos. D22 and 32.

RANSOMES, SIMS AND JEFFERIES, LTD. (Orwell Works, Ipswich), Stand No. 9K-2. Electric lawn mowers of various types and sizes are being shown on this stand.

RESTLIGHT, LTD. (Aldwych House, Aldwych, London, W.C.2), Stand No. 21N-1. This company is displaying for the first time the improved "Restlight" filter screen. A new pattern glass is being used, giving much greater diffusion, and this, combined with an improved composition, results in a filter claimed to be far ahead of any other "artificial daylight" screen on the market for general illumination. As usual, all types of lighting fittings are being shown embodying Restlight glass, including the new P.R. model. This is a highly decorative model for bedside use, roll top desks, bureaux, piano tops, etc. The "Lamplough Daylamp," is also demonstrated.

The EDISON SWAN ELECTRIC CO., LTD. (123-5, Queen Victoria Street, London, E.C.4), Stand No. 19J-1. Ironclad switches and fuses and standard lighting accessories. In addition the new range of Ediswan "Fabrolite" house wiring accessories. Tungar rectifiers and chargers. Samples of all types of cable manufactured by Edison Swan Cables, Ltd., from the smaller flexibles to the heavy bitumen insulated cables for collieries, and paper insulated cables. Various examples of Ediswan stationary-type battery work, together with the many smaller types of accumulators and dry cells, including those used for radio purposes. Sangamo-Ediswan meters of various types and the Ediswan range of domestic, heating and cooking appliances. Ediswan radio products, including transmitting valves, the Mazda valve series, Ediswan all-electric receivers and the B.T.H. R.K. reproducers and loud speaker equipment. Royal Ediswan lamps of representative types including the "Pointolite" lamps. The Thor Juvenator—a type of health motor is also shown.

REVO ELECTRIC CO., LTD. (Britannia Works, Tividale, Tipton, Staffs), Stand No. 19H-4. The most interesting exhibit on this stand is the sample electric cooker in which all elements, boiling plates, grill and ovens are of the plug-in pattern. The makers believe that this is the first time an electric cooker has been so constructed. This has been made possible by the evolution of a suitable plug and socket which is not affected by local heat and therefore retains its resilience over an indefinitely long time. A smooth action is claimed and a maximum area of contact prevents arcing and resultant corrosion. This contact is obtained by the utilisation of a steel ring which encircles the brass socket. The socket is split into four segments, whilst the male portion is solid. This system is patented; it is also applied to the connecters of all Revo irons and kettles. Cookers are also exhibited in which top and bottom plug-in elements are employed and alternatively side and bottom. The cookers are finished in a special mottled vitreous enamel; and the firm's established policy of applying vitreous enamel to both sides of all sheet metal portions is followed. Deterioration due to rusting and corrosion is thereby avoided. Another cooker exhibited is completely enamelled in the new rainbow vitreous enamel finish. In connection with the cookers, a feature of interest is the adoption of a new switch. These switches are dustproof and situated behind the vitreous enamelled switch indication plate, the terminals being easily accessible for wiring and inspection. The well-known Revo superspeed boiling plate is also demonstrated. A range of irons is shown in chromium plated finish. There is also shown a new fire, which is elegant in design, and contains an efficient fire bar. This, whilst it follows the principle of the emitter bar, wherein the element is laid in parabolical troughs, takes a form more suited to the particular application required in the "Matchless" fire. The element, which is split into three sections, is so arranged that an even distribution is obtained over the reflector whichever portion of the element is in operation. Other devices of interest in the domestic field include a water heater, wash boilers, kettles (plain and automatic) and hot plates. An attractive display of street lighting fittings is exhibited. The refractor band is shown in several new fittings and a fitting of particular interest is the "Nigerian." This is made entirely of cast iron with an interesting "mirror finish" which is produced by a special vitreous enamel. Switches, fuses and ship fittings—from engine room pendants to cargo clusters—are also to be seen on the stand.

BERKELEY AND YOUNG, LTD. (Hay Mills, Birmingham), Stand No. 20K-4. The manufacturers of "Bandy" fans are showing a comprehensive range of exhaust and ventilating fans, in which they have been specialising for some twenty years. Included are marine (cabin and saloon) fans; slow speed ceiling fans for theatres and restaurants; boxblade exhaust fans for picture houses, workshops and laundries; oscillating and desk and wall fans for domestic and commercial use; and railway carriage fans and fans for refrigerator work, either direct or alternating current. Ceiling fans are fitted with various types of blades and supplied from 9 in. to 48 in. diameter; the whole is entirely of British material and made throughout at their works in Birmingham. Amongst the more recent productions exhibited is the "Ellipso" oscillating fan, which the makers claim to have the simplest control movement

(*Continued on page 232*).

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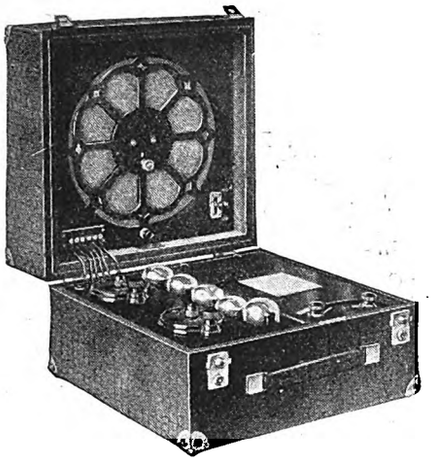
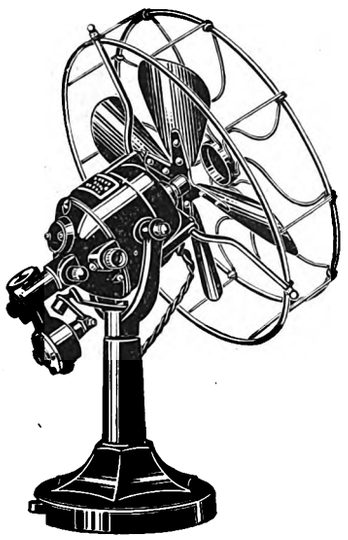
SOME DOMESTIC EXHIBITS AT THE FAIR.



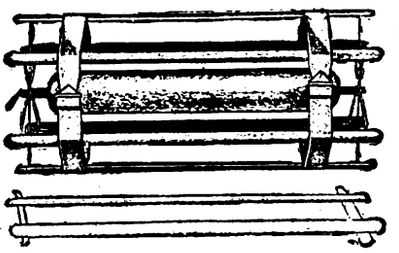
A five-valve portable receiver by Edison Bell, Ltd.

A "Portadyne" receiver by the Whittingham Smith Co.

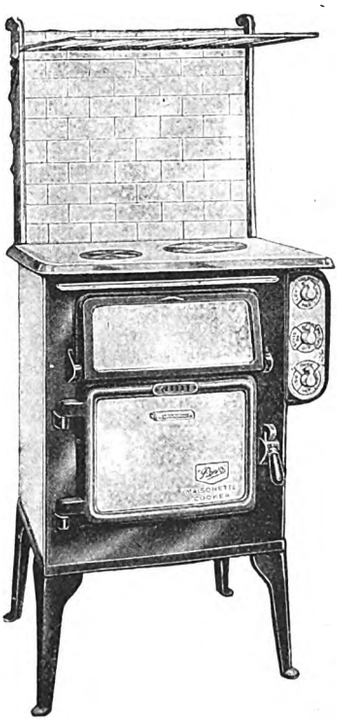
A sunlight lamp by I. Calvete, Ltd.



An oscillating fan shown by Berkeley and Young, Ltd.

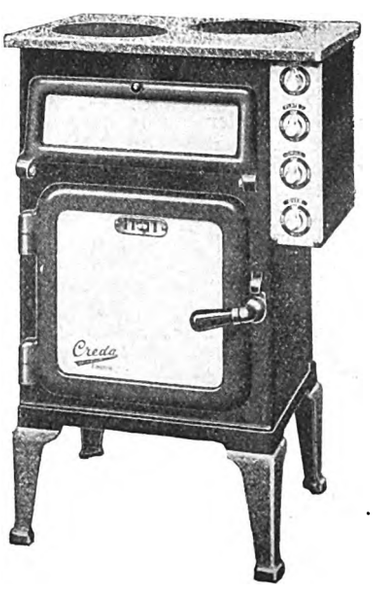


A bed warmer exhibited by Sturge and Baker, Ltd.



The "Maisonette" cooker of the Revo Electric Co., Ltd.

One of the cookers of the Credenda Conduits Co., Ltd.



Another "Creda" cooker to be seen at Castle Bromwich.

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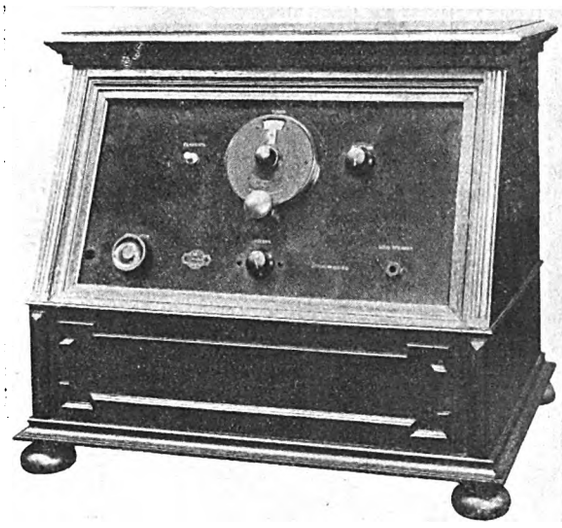
yet evolved. The elliptical traversing action of this fan is obtained by means of a single link which is connected to and rotates with a slow motion shaft. The link is anchored by a universal ball joint to a fulcrum fixed to the base. The reducing gear of 144 to 1 is contained in a simple gear box integral with the motor end cover and fitted with a friction clutch eliminating chance of damage by anything fouling the



The "Igranic Neutrosonic" short-wave receiver.

guard. The reducing gears are of hardened steel, worm wheels, having straight cut teeth, reduce friction to a minimum. Amongst the several models exhibited of slow speed ceiling fans, one of particular note is the model known as the "08," for direct current; it has been specially produced to comply with the exacting conditions of tropical service and Government requirements. The fan is automatically lubricated. Another interesting exhibit is the "Ace" a.c. ceiling fan; the motor in this case is of the enclosed induction type, fitted with ball bearings and so constructed as to be absolutely grease-tight; the watt consumption is 110, at 210 r.p.m. The air displacement is over 10 000 cubic feet. Speed regulators for use with the "Bandy" ceiling and exhaust fans, both d.c. and a.c., are also exhibited. These are fitted with five to seven speeds and are supplied with or without fans. Messrs. Berkeley and Young have for the past 25 years been manufacturing repulsion induction motors. They have recently perfected a new range of R.I. motors from $\frac{1}{6}$ up to 1 H.P. Samples of these motors are on their stand. They also manufacture the "Bandy" S.P.A.C. lift and crane motors, a model of which is displayed. Another exhibit shows two models of the "Giljay" battery charger.

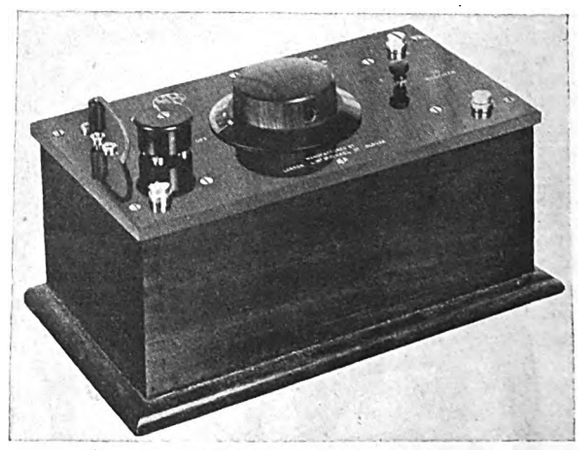
GEO. BRAY AND CO., LTD. (Leeds), Stand No. 21J-1. This firm show samples of the different articles they manufacture for the electrical trade. The "Chromalox" heating units are to be seen, both in the form of separate strips and rings and as the heating element in boiling plates, immersion heaters, radiators, car heaters, etc. Messrs. Bray include in their display several appliances, such as hot water boilers, radiators, fish frying ranges, etc., manufactured by firms fitting "Chromalox" units as the heating elements. The Bray electric lampholder is shown in a range of patterns and finishes. A comprehensive display of electrical porcelains and steatite insulators show the many forms in which the firm makes these insulators. The stand is decorated in the "Chromalox" catalogue colours—orange and black.

BELLING AND CO. (Bridge Works, Enfield, Middlesex), Stand No. 20K-3 and 4. This stand features a wide range of "Belling" electric heaters. Many different types of fires are displayed, both for domestic and industrial purposes. Amongst the domestic range are some portable designs in several finishes. Special attention is drawn to the "Empire" fire which is a new series introduced this season. Other models new this season are on view and there is also a range of imitation coal fires fitted with a realistic flickering flame effect. For industrial purposes, there are totally enclosed and fireproof air warmers, pipe heaters and electric hot water radiators. A series of electric cookers is also on show, ranging from the well-known "Baby Belling" cooker—suitable for small families—up to full size models. Included also are electric water heaters, suitable for fixing into any existing tanks or cylinders and for use in conjunction with the ordinary domestic hot water system. A new series of enclosed type boiling rings, makes another interesting exhibit. Practical demonstrations are given of the "Parmotor" relay. This is a new device for automatically controlling electrical circuits and is claimed to be more reliable, more flexible and cheaper than a time switch.

CREDENDA CONDUITS CO., LTD. (Oldbury, Birmingham), Stand No. 21L. This striking stand is built to simulate a large stone temple of modernist design. It displays a wide range of Creda electric cookers of latest type. These are shown in the two finishes which have been standardised, "Standard" and "De Luxe." An additional model is shown in the new Creda Cub, which has been designed to meet the need for a high-class and well finished cooker at a low price. This cooker has an oven with internal dimensions, 12 in. by 12 in. by 12 in., and the hob (which, like the oven, is finished in vitreous enamel) has an enclosed grill-boiling plate 8 in. by 6 in. (1 500 W.), and a Sadia boiling plate 8 in. by 6 in. (1 600 W). Some examples of the hotel and restaurant types of cooking apparatus now made by Credenda Conduits Co., Ltd., are also shown. These include a double compartment grill on a stand, a hot cupboard, double oven range, etc. Other exhibits include Creda electric fires, the Creda tubular heating system, various domestic appliances, "Credalux" industrial lighting reflectors and a range of street lighting fittings.

YOUNG, OSMOND AND YOUNG, LTD. (47, Victoria Street, London, S.W.1), Stand No. 18H-8. "Unity" tubular electric heaters for economical heating of schools, offices, factories, hospitals, private houses, etc. "Unity" electric towel airers for floor or wall mounting available in chromium or nickel plated finish. "Unity" tubular electric heaters for heating of tar, crude oil, etc. "Unity" tubular electric heater with gas-tight fittings as used in cellulose paint shops, powder factories, etc., and tubular electric heaters for traction work, available in two patterns—up to 600 V and up to 1 500 V. Tubular 4-bar radiators for use where wall space is limited, available with or without 3 heat control. Thermostats for use in conjunction with "Unity" tubular heaters to eliminate waste and to maintain a constant temperature. Tubular heaters bent for use in bow windows, curved rows of theatre seats, etc., and a tubular linen cupboard heater. "Unity" anti-condensation device for prevention of condensation on show windows, and a car bonnet heater for complete protection from frost are among the items shown.

BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC. (15, Savoy Street, London, W.C.2). Stand No. 20H-1. The E.D.A. has erected a handsome octagonal kiosk in the centre of the electrical section. Visitors are able to obtain full up-to-date information concerning the electrical facilities



The filter shown by L. McMichael, Ltd.

available in any part of the Kingdom. In co-operation with the Electrical Section Advisory Committee and the Fair management, the Association has introduced a uniform colour scheme which has been adopted by practically all the firms exhibiting in the Electrical Section.

The BRITISH HANOVIA QUARTZ LAMP CO., LTD. (Slough), Stand No. 20E-2. "Artificial sunlight," now so familiar, was little known when introduced by the first Hanovia quartz lamp 24 years ago. Since then the treatment has won world-wide recognition. In addition to sunlight lamps for medical use, the company have now smaller models for health sunbaths,

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and special lamps for industrial use. Of a large range of models, one of each class is to be seen on their exhibit. The "Alpine Sun" lamp is known throughout the world and is used by physicians for the treatment of disease. The "Homesun" is for home use. In appearance it is not unlike a neat reading lamp, is easily portable, and is made for any standard electric supply. The "analytic lamp" is for industrial use. Quartz lamps have many uses in industry, from manufacturing leather to testing sugar. One of the most interesting applications is for fluorescence tests, which give an immediate indication of the chemical composition and grade of test substances. The lamp has found extensive use in banks and government departments for the detection of forgeries. The analytic quartz lamp facilitates these tests by its powerful output of invisible ultra-violet rays, passed through a special dark filter. It can also be used for the unfiltered radiation used in rapid durability tests of varnishes, fabrics and materials.

BERRY'S ELECTRIC (1928), LTD. (85–86, Newman Street, London, W.1). Stand No. 19K-1. Magicoal fires form the main exhibit; in addition, however, this year the firm is showing for the first time their electric water heaters of the storage type. In these heaters high thermal efficiency is obtained by means of a special construction, enabling the inner container (made of heavy gauge tinned copper) to be completely suspended within a liberal thickness of insulating material.

A. P. LUNDBERG AND SONS, LTD. (477–489, Liverpool Road, Holloway). Stand No. 20E-6. Visitors to this stand will see a good range of quick make-and-break and special tumbler switches for lighting and small a.c. and d.c. motor control, also up-to-date types of switch plugs. The firm's "Edgewise" type of flush tumbler switch for narrow situations is being developed in most types, among those shown being single-way, two-way, double-pole, intermediate, "Twinob," two-way with "off," and also combined with two-pin plugs (ordinary and automatic). There are also up-to-date patterns of improved two, three and four-pin plugs and sockets, fitted with the "Minimax" type of plug, which is adjustable for gripping all diameters of flexible wires. Other types of switches comprise the triple-pole tumbler, also offered with interlocked three-pin earth plug; two-way, double-pole and change over switches for radio work; special radio plug connectors; magneto control switches for aeroplanes and numerous types of special adapters.

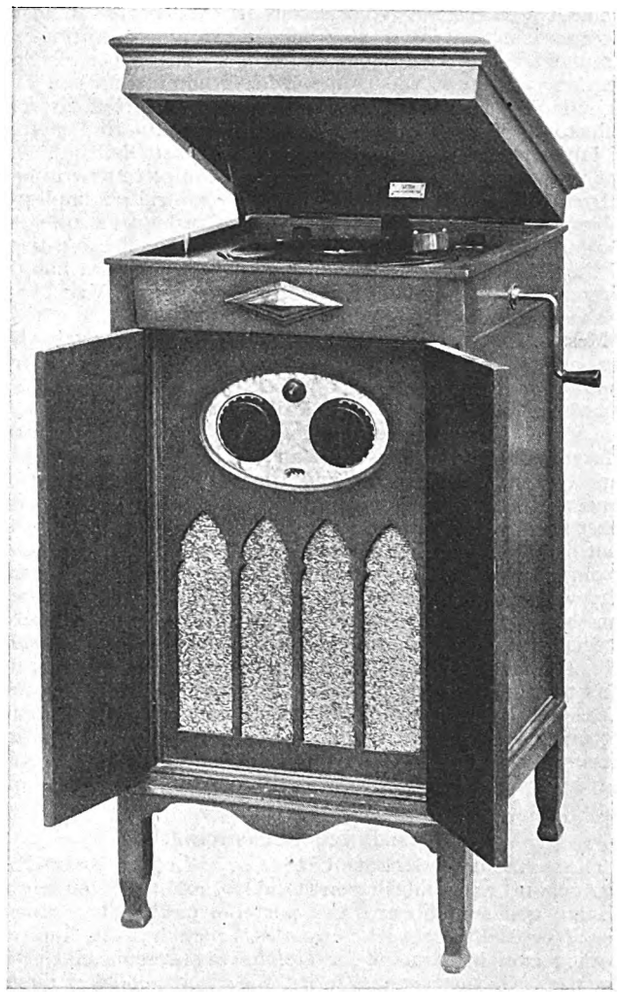
BRITISH BRASS FITTINGS, LTD. (100, Moorsom Street, Birmingham) Stand No. 21K-1. This firm is showing "Angelus" electric fires, and a large selection of electric cookers, which we understand have been considerably improved since last year. There are also electric water heaters of various types, from the "Instanter" geyser to the "Dual" water heater for use in connection with the normal household supply.

HAILWOOD AND ACKROYD, LTD. (Morley, near Leeds), Stand No. 3D-2. Lighting fittings in a variety of shapes, sizes, and designs are the chief thing to catch the eye here, though Messrs. Hailwood and Ackroyd—who are also exhibiting in London—have in addition put on view a selection of their ceiling plates, ring fittings, galleries, "Hailglass" globes for signs and advertising and "Hailware" wrought iron stands.

STURGE AND BAKER, LTD. (Premier Works, Sheepcote Street, Birmingham), Stand No. 21F-1. An interesting exhibit is the "garage winder," which is sold in various forms. Its function is to enable the driver to "help himself" to air for his tyres or water for his radiator while the car is taking in petrol. The "winder" consists of a rubber tube, which can be drawn out to the car, and through which the requisite supply can be obtained. The metal base—through the centre of which the tube passes—is marked "Air Service" or "Water Service" as the case may be. Another form of the same device is the "flex winder," which enables the motorist to draw out a hand lamp for inspection purposes. The firm also displays the "Red Rose" fire, an interesting type of electric heater with a very low current consumption. Other exhibits are the "Travellers Joy" portable heater, an electric bed warmer, and the "Stay-put cord absorber," which will support a shade up to 2 lb. in weight at any height desired.

The JACKSON ELECTRIC STOVE CO., LTD. (143, Sloane Street, London, S.W.1), Stand No. 20L-3. Electric cookers, including the No. 61 breakfast cooker, the No. 48 table cooking cabinet, the Overseas model, the Jackson Junior and others which have previously been described in THE ELECTRICIAN. The No. 48 cooking cabinet is capable of dealing with 14-18 persons, and is constructed on similar lines to the No. 46 cooking cabinet, except that the oven has a cooking space 19 in. high by 15 in. wide by 17 in. deep, the oven being loaded to 2·75 kW, and arranged for three-heat regulation.

CARRON COMPANY (Carron, Falkirk), on Stand No. 21M, at Birmingham, show a varied selection of cooking and heating appliances. The display includes the company's newest cookers representing two types. In the "M" series many unique features are incorporated in the design, the chief



One of the attractive radio equipments shown by Lissen, Ltd., at Olympia.

essentials being—all-vitreous enamel finish, inside and out, all interior fittings and parts also enamelled by this process. Side and bottom heated detachable oven interior, extra large warming chamber, bus bar wiring, cast-iron fuse box, cam lever door handle, carefully bedded and fitted joint between oven door and body, "Sadia" fast boiling plates fitted as standard. Fuses of the "Triumph" type are housed under enamelled plate, and side-hinged hob, allowing access to all connections even when cooker is situated in a confined space. The P.2 cooker on view in many ways resembles the No. 310 "Carron" cooker, but, while retaining certain important characteristics, the entire cooker has been re-designed and brought into line with modern standards and requirements. Top and bottom elements are used for oven heating, and a fixed interior is standardised. Special attention has been paid to the wiring assembly and general accessibility, but the outstanding feature is the relatively large sized oven in proportion to overall dimensions. A wide range of fires is displayed and is representative of the company's four popular series—"Carreflex," "Cathedral," "Stella," and "Carcole." An automatic kettle is shown for the first time.

CHESTERTON, JONES AND CO., LTD. (David Works, Tyseley), on Stand No. 21J-2, Birmingham Section, exhibit a range of electric cookers possessing many novel improvements, including a Davidson Junior model suitable for small families. In Davidson electric fires the display is extensive, ranging from designs in keeping with the most artistic and refined furnishings and surroundings, to models suited for use in less ambitious dwellings, also for office and industrial uses. The David electric iron is finished in shades of vitreous enamels and in nickel plate. Displayed also is a 1 lb. iron for gift purposes and for travelling. Another novel appliance is a combined lighting and heating fitting designed to give safe electrical heat in the bathroom.

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C. H. PARSONS, LTD. (Britannia Works, Wharfdale Road, Tyseley, Birmingham), Stand No. 21H-4. The firm's usual range of switchplugs, switches and lampholders, also their recently introduced range of Q.M. and B. in all types.

The exhibit of the WARDLE ENGINEERING CO., LTD., (Elsinore Road, Old Trafford, Manchester), Stand 20G-3, includes a representative selection of "Workslite" reflectors, incorporating patented easy wiring cap and vibration-proof lampholders. The designs conform to the B.E.S.A. Specification, and meet the Home Office recommendation. Gas-tight lanterns with cast iron reflectors and skirted dispersive reflectors are also displayed, together with a varied selection of lanterns and fittings for works and yard lighting. It is not possible to exhibit the company's complete new range of "Avenue" street lighting units, but several examples are shown, and the Wardle Street-lighting Catalogue, L.19, will be available for all interested in the subject. An effective display of the "Maxheat" tubular electric heating system has been arranged, and "Maxheat" radiators rated at 500 V and 750 W are available for inspection.

Messrs. HOLDEN AND HUNT (Old Hill, Staffs) are again showing on Stand No. 14L-1 a range of low voltage spot and butt-welding machines. Many of these are being run on light repetition work by the practically unskilled labour of boys and girls. Actual meter readings taken by the makers over a large number of welds, on clean iron and steel articles, show that current consumption and time are extremely low. In general, it is claimed that nearly all articles built up from sheet steel or iron, which would ordinarily be riveted, can be spot or butt welded at a lower cost, resulting in a neater and stronger product. Seven machines are shown, and visitors may weld for themselves articles provided—or, if they prefer, can bring their own articles and weld them themselves. Special attention should be paid to the high speed butt welder (No. 4), in which many unique improvements are incorporated. This machine is semi-automatic and pedal operated, and is capable of welding steels up to $\frac{1}{2}$ in. diameter. Besides manufacturing low voltage welders for the installation of plants, Messrs. Holden and Hunt have a large and up-to-date welding battery where they undertake the welding of articles on a repetition basis.

Resistance Measuring.

The RECORD ELECTRICAL CO., LTD. (Broadheath, Altrincham), are exhibiting on Stand No. 20K-6 moving iron and moving coil switchboard and portable pattern instruments, also a typical range of "Cirscales," including an improved moving iron instrument for a.c. having a reduced coil impedence. Of the portable series, the change coil test sets are worthy of note, particularly by those who require a compact set for use on a large variety of circuits. For those wishing to obtain current and voltage measurements in a.c. and d.c. circuits, is recommended the change coil combined double movement ammeter and voltmeter having six current ranges from 1 to 600 A and five voltage ranges from 1 to 750 V. For those wishing to obtain only current measurements there is exhibited a change coil multi-range ammeter having six current ranges only from 1 to 600 A, also useful for a.c. or d.c. As pioneers of the light weight model combined "Record" ohmmeter and generator, this company is showing a few of the standard models having 500 V generators and scale up to 100 MΩ. To meet the increasing demand for resistance measurement equipment, Mr. J. W. Record has patented a light-weight bridge ohmmeter which is particularly interesting for its compactness, wide range and speed of operation. The set comprises an ohmmeter and a Wheatstone bridge with a testing range on the ohmmeter from 10 000 Ω to .100 MΩ and on the bridge from 0·01 Ω to 999·900 Ω. Tests can be made consecutively by the ohmmeter and bridge method by moving one switch, while the resistance under test remains connected to the same pair of terminals. There has lately been an increasing demand for electrical tachometers because they have the advantage of being adaptable for use at any distance away from the actual machine or shaft, the speed of which is required to be measured. The Record Company is, therefore, manufacturing Cirscale r.p.m. indicators complete with the necessary generators. Two models are shown, a $2\frac{3}{4}$ in. dial with a light-weight generator for air ships, and a 16 in. dial and more rubust generator for engine rooms, etc.

RICHARD JOHNSON AND NEPHEW, LTD. (Bradford Iron Works, Manchester). The exhibit on Stand No. 17F-3 consists of products in the form of bars, strips, wire, in copper, bronze, cadmium copper, aluminium and iron and steel. The bars and strips are in the sizes and dimensions usually taken by manufacturers of electrical products and machinery, and amongst non-ferrous exhibits are "Caduro" cadmium copper. It is claimed that tramway engineers who were faced with excessive wear on their copper lines have made considerable economies by the use of "Caduro" cadmium copper trolley wire. "Caduro" cadmium copper has also been found of great value in power work in long spans and pole economy. The Fair provides an opportunity to introduce something new in coated wires. Samples will be found on the stand of Johnson's "Crapo" patent galvanised wire, which may be described as an improved coated wire, as the zinc coating is perfectly adhesive under all stresses or mechanical blows. It will, the makers state, wrap on itself without flaking or peeling, which, we understand, is not always the case with wires heavily galvanised to the standard specifications.

London Section.

L. MCMICHAEL, LTD. (265, Strand, London, W.C.2). The new problems introduced by the institution of the regional transmitters at Brookmans Park have led to numerous "wave traps" and selectivity devices being placed on the market with the avowed object of separating the twin transmissions from each other and permitting more distant stations to be received. The problem has been approached successfully by the "MH" radio filter, in which there is, in a sense, no attempt to eliminate "unwanted" stations, since the wanted station is given an easy but very narrow path into which any other station can only enter with the greatest difficulty, if at all. It is claimed that it will (1) on the most elementary set give independent reception of the twin wave transmissions and 5GB; (2) on more elaborate sets it will enable distant stations to be obtained in addition to eliminating the interference of one programme of Brookmans Park with the other; (3) on all but expensive and most up-to-date receivers it will improve the selectivity and widen the useful range obtainable.

THE M-L MAGNETO SYNDICATE., LTD. (Victoria Works, Coventry), Stand No. D7. Among anode converters, rotary transformers, and motor generator sets for supplying power for the operation of radio receiving and transmitting sets, there is being shown for the first time a new d.c. to a.c. rotary transformer, which has been specially designed for supplying current for an a.c. all-electric receiver, where d.c. mains are available. Such machines are stated to be especially suitable for use with receivers such as the Philips three and four-valve models, Marconiphone model No. 47, the Burndept seven-valve screen, and also for a number of the larger radio gramophones on the market.

LUMOS AND CO. (St. John's Works, Bookham Street, London, N.1.), Stand No. F52. Some interesting electrical novelties are on view at this exhibit. There are switch plates, produced in many different colours, and table lamps in "Galatix," which material is also utilised for door knobs.

Radio-Gramophones.

EDISON BELL, LTD. (Glengall Road, London, S.E.15), Stand No. D59. The whole range of this firm's products is displayed. Radio-gramophones (battery and all-mains models), the "Picnic" five-valve portable, the Regent and Console "Fours" and various three and two-valve sets form the chief exhibits. Speakers and numerous accessories are also present

WHITTINGHAM, SMITH AND CO. (Portadyne Works, Chase Estate, Park Royal, London, N.W.10), Stand No. D30. "Portadyne" portable radio receivers—the screened grid four, the table grand and the super five are the chief items shown.

I. CALVETE, LTD. (11, Little St. Andrew Street, London, W.C.2), Stand No. A236. This stand features "Solart" sun ray lamps, "Icalite" radiant heat lamps, "Everray" violet ray apparatus and various appliances. Included among the latter are hair-dryers of every description, hand-drying apparatus, health motors for stimulating and reducing, vibro-massage apparatus, diathermy apparatus, and permanent hair-waving machines.

READ RADIO, LTD. (32, Newman Street, Oxford Street, London, W.1), Stand No. D5. This firm is showing the revised model "Popular" portable, also three and four-valve screened grid models, and a three-valve all-mains screened grid receiver. The company is now designing and manufacturing special receivers for the trade and welcomes inquiries about this class of work.

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The DOWSING RADIANT HEAT CO., LTD. (Bollo Lane, Acton, London, W.3), is showing a representative display of special electrically heated appliances on Stand No. A227. Amongst the items exhibited are samples of many types of special electric irons, for all kinds of trades, including the cordless electric ironing system, and samples of special appliances, such as laundry rollers with electric heating elements applied to them. There are also milliners' hat steamers, sealing wax heaters, and the latest types of "Solarium" sun baths for home and institution use.

The ORMOND ENGINEERING CO., LTD. (Ormond House, Rosebery Avenue, London, E.C.1), Stand No. D42. The exhibit of the Ormond Engineering Co. includes a range of receiving sets and loud-speakers, in addition to a display of components. The receivers are the Ormond five-valve portables, five-valve leather portables, and four-valve screened grid portables. The Ormond four-pole adjustable loud speaker unit, cabinet loud speakers and a plaque loud-speaker are also shown. Ormond variable condensers include the logarithmic, straight line frequency, straight line wavelength and low-loss types, with and without friction control. Other exhibits comprise the following:—Slow-motion dual indicator dials, both large and small models, and the Ormond friction control dial, with ratio 55 to 1. Ormond 3 in. and 4 in. combined bakelite knobs and dials. L.F. transformers, and l.f. chokes, rheostats and potentiometers, radio frequency chokes, air-dielectric fixed condensers and moulded fixed condensers. Midget and neutralising condensers. Crystal detectors, resistance-capacity coupling units, fixed resistors, h.t. and grid bias batteries, push-pull switches and turntables are also exhibited in variety.

LISSEN, LTD. (Worple Road, Isleworth, Middlesex), Stand Nos. D41 and 46. Radio gramophones in pedestal or console models in walnut, oak or mahogany, comprised of three or four valve circuits, with frame or outside aerial, driven from a.c. or d.c. mains or batteries. Gramophones: a complete range of portable and console instruments, incorporating the Lissenola horn. Receivers: five-valve portable sets and two-valve transportable receivers operated from batteries or a.c. mains. A screened grid three home constructor's set operated from batteries or a.c. or d.c. mains. Loud speakers: units of all types. Horn and cone speakers at various prices. The new Lissen four-pole balance armature unit now obtainable mounted in a walnut bow-fronted cabinet. Batteries and accumulators: the usual Lissen range. Valves: two-V screened grid and pentode valves have been added recently. Eliminators: a.c. and d.c., also a rectifier to be used in conjunction with a d.c. eliminator for operation on a.c. mains. Components of all kinds for home assembly are also shown.

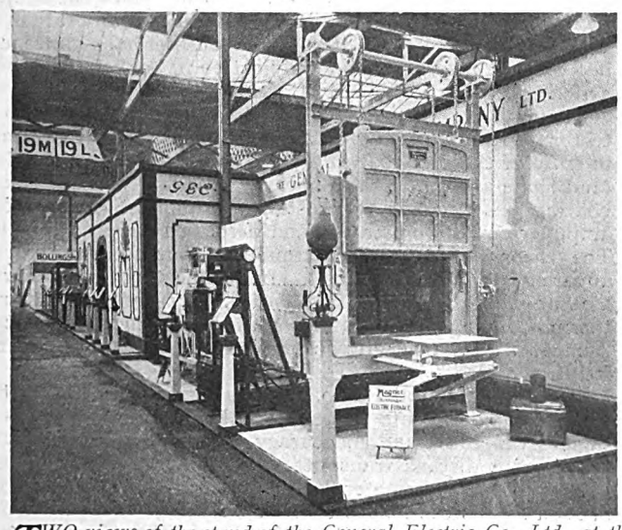
IGRANIC ELECTRIC CO., LTD. (149, Queen Victoria Street, London, E.C.4), Stand No. D26. Many newly developed radio components, as well as complete receiving sets for both broadcast and short-wave reception and radio-gramophones may be seen on this stand. The Igranic seven-valve Neutrosonic receiver, de luxe model, is shown in a neat mahogany cabinet. A set which will appeal to the short-wave enthusias is the Neutrosonic six-valve short-wave receiver, in teak table cabinet. The design of this set is based on the supersonic-heterodyne principle. Complicated tuning arrangements are avoided and only three controls are fitted on the panel. The advantages of the receiver are summarised as follows:—Good signal strength, high sensitivity, simplicity of operation and absence of undesirable noises. It is claimed to be possible to obtain world-wide reception at loud-speaker strength, on wave-bands from 12½ metres to 70 metres. Among the mains-operated receivers is the "A.C. 3" receiver. This set is fitted with a new type of self-contained frame aerial. The supply unit delivers the h.t. and l.t. current without requiring voltage adjustments. A loud-speaker is built into the cabinet. A switch is provided to change over from radio to gramophone reproduction, bringing into operation the "Phonovox" electrical pick-up. Another mains receiver is the A.C.3 table model. A dual range aerial coil is included for use in conjunction with an outside aerial. The latest mains receiver shown, however, is the A.C.2. It is designed as a "local" station set. The receiver embodies a mains unit, which is suitable for working off a.c. mains only. One knob tuning dial is provided. The apparatus is enclosed in a table cabinet, supplied in oak or mahogany. Among gramophone reproducers, the Igranicophone G.2 equipment is of interest. The equipment consists of a double gramophone turn-table, fitted with "Phonovox" pick-ups and Igranic "Phonomotors." A separate amplifier and power unit to work in conjunction with the double turn-table equipment is another of the attractive equipments exhibited.

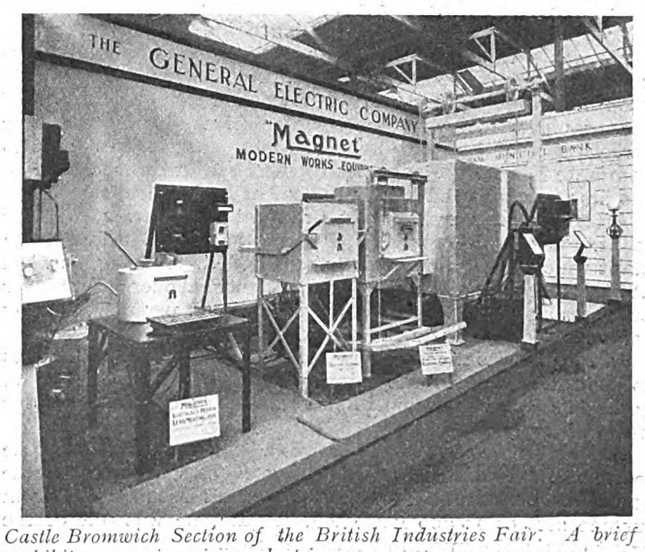
The NEOPHONE ENGINEERING CO. (8, Garrick Street, London, W.C.2), Stand No. D60. This company has put on the market a seamless vulcanite cone-diaphragm. It is made in three sizes—8 in., 10 in., and 12 in.—and can be obtained separately or mounted in a solid turned wood frame with a felt lining. The frame is attached to a baffle board of convenient size, and to the board are attached brackets, a strong aluminium brace being fixed to the turned frame for the purpose of mounting the unit.

J. J. EASTWICK AND SONS (Eelex House, 118, Bunhill Row, London, E.C.1), Stand No. D9. Here are being shown the "Eelex" standardised system of plugs and sockets, treble-duty terminals, safety switches, etc.

E. K. COLE, LTD. ("Ekco" Works, London Road, Leigh-on-Sea), Stand No. D28. A complete range of the firm's products is on show. H.T. units for both d.c. and a.c. mains with outputs ranging from 10-06 m/a., and all-power units, which enable users to obtain h.t., l.t. and grid bias from the mains without any alteration to their existing receivers or valves are also included. The "Ekco-Lectric" receiver is one that does not entail the use of batteries or any outside units. By plugging the adaptor into an electric lamp socket it is ready to switch on when desired.

(To be continued.)





TWO views of the stand of the General Electric Co., Ltd., at the Castle Bromwich Section of the British Industries Fair. A brief description of the stand, together with illustrations of some of the exhibits, were given in our last issue.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Meter Rents.

[To the Editor.]

Sir,—I am pleased to be able to inform you that the following revisions to our charges come into force as from the quarter beginning April 1st (next financial year, so far as collection):

Meter rent of 2s. 6d. per quarter abolished, no minimum charge to be substituted.

Alternative two-part tariff offered, fixed charge based on £13 per kW of adequate lighting plus running charge of 1½d. per unit (rental valuation system not possible here).

With reference to your Current Topic in your issue of January 24th *re* meter rents, my experience since coming here from Glasgow is that the meter rent causes more bad feeling towards the undertaking than our high flat rates of 10d. and 3d. Therefore even small undertakings should get rid of these pin pricks as soon as possible.—I am, etc.,

Edwin T. Pound,
Burgh Electrical Engineer,
North Berwick.

North Berwick,
February 4th.

The Late Mr. Sydney Baynes.

[To the Editor.]

Sir,—By the death of Sydney Baynes, for many years chief engineer of the Metropolitan Borough of St. Pancras, we lose another of the pioneer founders of the electrical industry.

When I began Crompton's electrical business, in 1878, my first assistant was Mr. A. P. Lundberg, and, on his advice, I took on as a boy assistant Sydney Baynes. Baynes, whose father owned a dairy in the Moscow Road, Bayswater, had watched us installing arc lamps for advertising purposes at Whiteley's, in Westbourne Grove, and had asked me whether I could take him on at my works.

From the very first he showed exceptional keenness in our new undertaking, which, during the first two or three years, was mainly in the lighting up of railway goods yards and similar open spaces by arc lamps; Baynes, although then a mere boy, was put in charge of the plant when first installed, and he had in most cases to teach the workmen the use of their plant.

After the Royal Agricultural Show, at Kilburn, where portable plant worked by Baynes attracted much attention, he was sent out by us in charge of portable plant and had many interesting experiences. In all parts of the kingdom, notably when the contracting firm of Easton Gibb and Co. were carrying out the works of the Barden reservoir for the Bradford waterworks, he showed such aptitude in using and placing our arc lamps so as to carry on work at night to the best advantage, that I was able to recommend him to take charge of similar plant at the Forth Bridge works.

He was actually in charge for us when Swan's lamps were used in public for the first time at the Glasgow Exhibition in 1880, and then showed that he had such exceptional grip of the problems which presented themselves during the very early years of house-to-house supply, that I was able to nominate him as the engineer to the Bradford Corporation—the first municipal authority to deal with electrical supply.

After several years work at Bradford Corporation, he went to St. Pancras in 1895. St. Pancras had already laid down plant which Baynes completely remodelled. During his work at St. Pancras he was able to supply electrical energy for power purposes at the then very low figure of 2d. per unit, and by the year 1905 he again reduced the price to 1d.

In 1903 he was the first engineer of the Municipal authorities to lead the way to the adoption of three-phase, 5 000 V, 50 cycle a.c. transmission to sub-stations to the more distant parts of the borough.

In 1905 he was one of the first to adopt the Parsons turbine to replace the existing reciprocating engines, and in 1912 he persuaded his committee to adopt the first Brush Ljungstrom turbine sets of 10 000 kW each. Again, he was one of the first to interest himself in pulverised fuel.

Owing to ill-health he retired in December, 1927, and the Borough Council then placed on record their recognition of the great and distinguished services he had rendered to them during his long period of service.

Baynes, like Ferranti, was a man who did things, he did not talk about them; but he was a man for whose judgment I personally had the greatest respect, and I am one of those who most sincerely deplore his loss.—I am, etc.,

R. E. Crompton.

February 13th.

[To the Editor.]

Sir,—It was with deep regret that we heard of the recent death of Mr. Sydney W. Baynes, late electrical engineer to the St. Pancras Borough Council, whom we have had the pleasure of knowing intimately for nearly 60 years.

It may be of some interest to your readers to hear that Mr. Baynes received his original mechanical training when apprenticed to the late Mr. A. P. Lundberg, the founder of this firm, who was then in business in Bayswater.

He followed Mr. Lundberg when that gentleman accepted service under Col. R. E. Crompton, in Chelmsford, in 1878.—We are, etc.,

for A. P. Lundberg and Sons, Ltd.,
Gus C. Lundberg,
Director.

London,
February 13th.

BOOK REVIEWS.

Pioneers of Electrical Communication. By Rollo Appleyard. Macmillan and Co. Pp. 347. 21s.

Most of the memoirs included in this readable and well-illustrated volume were originally published in "Electrical Communication." Mr. Appleyard has been to the sources, both in England and on the Continent, for his material and his book will be a welcome addition to the libraries of all who are in any way interested in the early history of electricity and its practical application. Naturally, we were particularly interested by the facsimile reproduction of a letter addressed by Oliver Heaviside to Mr. Trotter, then Editor of The Electrician, dated December 5th, 1894, in which the rumblings of the great controversy between science and religion which raged in the second half of the nineteenth century are to be found.

"Fundamentals of Radio." Pp. xii+372. $3.50.
"Experimental Radio." Third Edition. Pp. xii+255. $2.75. By R. R. Ramsey. (Bloomington, Indiana: Ramsey Publishing Co.).

In the publisher's circular accompanying the former book it is called "an Elementary Text-Book for College Students"; and in the same circular "Experimental Radio" is described as "the standard radio manual in domestic and foreign laboratories." The reviewer fears that the one statement is as far from strict accuracy as the other.

The books are puzzling. From internal evidence here and there it is clear that the author does really know the subject; but yet neither of the books is at all useful—at any rate in this country. They convey the impression (perhaps quite erroneous) that they are the republication in book form of some articles on radio in the daily Press.

For example, in "Fundamentals of Radio" the radio detector is repeatedly referred to as a "square-law" instrument, in spite of the fact that all detectors for telephony should be (and some are) practically linear. It is stated that "motor-boating" is peculiar to resistance amplifiers. Many of the amplifier circuits illustrated and described have no grid bias. The theory of getting maximum output from a valve is apparently not understood. In connection with current measurement at radio frequencies, a current transformer thermo-couple instrument is mentioned, and it is stated "since this has a turn of wire, it cannot be used at very high frequency."

In "Experimental Radio," which purports to give instructions for experiments in academic laboratories, there is the same scrappiness and inaccuracy. In measuring the wave-length of a distant transmitter, we are told to "connect a buzzer to the wavemeter." What about the change of calibration? Instructions are given on bridge measurement of the inter-electrode capacities of valves without a word as to stray capacity difficulties. Amplifiers are shown again and again without grid bias.

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NEWS IN BRIEF.

The Annual Dinner of the Batti-Wallahs—Electric Cookers in Manchester—Electrical Wages—Birmingham Corporation and the B.I.F.—Stoke-on-Trent and Local Exhibitions.

WINSLOW Board of Guardians proposes wiring the institution for electric light.

The Batti Wallahs' Society will hold a luncheon at the Hotel Cecil, London, on Thursday, March 6th, at 12.30 for 1 p.m. Sir Felix Pole will deliver an address. The annual dinner and dance of the society will be held at the Hotel Cecil on Friday, March 21st, 7 for 7.30 p.m. till 1 a.m.

Mr. A. A. Milne's clever detective play, "The Fourth Wall," was performed by the Metropolitan-Vickers Dramatic Society at the M.V. Club on four nights, beginning on February 5th. It was a very successful production, there being appreciative audiences at each of the four performances. It was well within the capacity of the efficient stage lighting equipment to deal with the simple interior in which this play is staged.

Eston Electricity Committee is acquiring premises at South Bank for electricity showrooms.

Hired cookers connected to Manchester Corporation's mains in December last numbered 119, making a total of 5 893 connected.

It has been reported to Portsmouth Corporation that the total number of electricity meters tested was 822, all of which were correct. These were all new meters.

Wimbledon electricity department is to carry out electrical work at the baths department's proposed new cycle store and dressing room in Latimer Road, at a cost of £84 10s.

Gellygaer U.D.C. on February 14th held an electric cooking demonstration at the Moose Hall, at Ystrad Mynach. Demonstrations in the use of other labour saving apparatus were also given.

Over fifty members of the Electrical Association for Women attended a recent lecture by Mr. G. S. Francis on "Plastic Lighting and Modern Architecture—Changing Styles in Cities and Homes," at the E.L.M.A. Lighting Service Bureau, London, with Mrs. Wilfrid Ashley in the chair. By means of slides Mr. Francis illustrated the development of architecture and the part lighting has played in this connection.

The Council of the Institute of Fuel invites competition for a medal, together with a prize of books or instruments to the value of £5, to be awarded annually for a paper submitted by a student member of the Institute. The paper must deal with some subject relating to the preparation or utilisation of fuel or allied subjects, which come within the purview of the activities of the Institute. Further particulars can be obtained from the Secretary, 53, Victoria Street, London, S.W.1.

Mr. I. S. Coggleshall, of the Western Union Telegraph Co., recently informed the American Institute of Electrical Engineers that coded telegraph messages can now be sent across the Atlantic at a speed of 2 500 letters per minute. and that further speed would soon be attainable through improvement of cable insulation, and that an immediate result of this would be the possibility of transmitting voice impulses as well as telegraph signals over the submarine cables.

Sir William Ray, speaking on "A Municipal Industrial Policy" at St. Stephen's Club, London, recently, said the policy of the Municipal Reform majority on the London County Council was to purchase in every possible case home productions, and, failing this, to give a preference to the productions of the British Empire. During the last three years, over 438 000 electric lamps had been purchased, and the Council limited its purchases to lamps which were made in this country from parts produced in this country.

About 150 members of the Institute of Municipal Engineers paid a visit to the works at Dagenham Dock, Essex, of Messrs. Pritchett and Gold and E.P.S. Co., Ltd. The visitors were taken through the whole process of battery manufacture from the refining of lead to the packing of the finished article.

Mr. C. H. Yeaman, city electrical engineer, Stoke-on-Trent, is to arrange for a series of exhibitions to be held in the town halls throughout the city during next autumn and to invite the co-operation of manufacturers of electrical apparatus and local electrical contractors. With regard to the question of holding an electrical exhibition at the Hanley Park Fetes, in July, 1930, inquiries are to be made as to what co-operation would be afforded by the electrical trade generally.

LOOKING BACKWARD.

FIFTY years ago it was recorded in THE ELECTRICIAN *of February 21st, 1880, that the Trustees of the British Museum were so satisfied with the electric light in the Reading Room that they had decided to order another dynamo from Siemens Bros., and permanently to adopt this new form of lighting.*

Oliver Heaviside was to read a paper on the Resistance of Galvanometers at the Society of Telegraph Engineers on February 25th.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of February 17th, 1905, published details of the scheme for electrification of the L.B. & S.C. Railway Company's suburban lines.*

The electric railway round the base of Mount Vesuvius had just been completed and the electric tramway from Castellamare to Sorrento was to be ready for opening in the spring.

At the eighth ordinary general meeting of the Marconi Wireless Telegraph Co., Ltd. (on February 16th, 1905), the chairman, Col. Sir Charles Euan-Smith, said that in England, H.M. Post Office was in close alliance with the company.

The Metropolitan Asylums Board is to renew the X-ray apparatus at High Wood Hospital, at an estimated cost of £350.

Eston Electricity Committee has asked the electrical engineer to report on the question of letting out domestic appliances on the hire-purchase system.

Colchester electricity department opened new showrooms in High Street on February 12th. There were demonstrations of cooking, washing, water heating, pumping, etc.

Copies of regulations for the supply and use of electricity in Johannesburg can be obtained from the Department of Overseas Trade, London. (Reference B. 6 134.)

"The Continuity of Wireless Waves" was the subject of a lecture given at the University College of the South West, Exeter, on February 3rd, by Prof. V. H. L. Searle, lecturer in physics at the college.

Mr. J. T. Wade, president of Fleetwood Chamber of Trade, recently urged traders to utilise the electricity bureau, opened by the Council, when requiring electrical equipment. Coun. C. A. Copeland said he did not approve of municipal trading at the expense of the private trader.

When the Property and Estates Committee of Oxford City Council recommended the appointment of an expert to report on the electric lighting system of the municipal buildings, Ald. J. Carter stated that it was time they put a stop to this expensive plague of experts. In two or three years they had spent the proceeds of a shilling rate in employing super-experts, and then they had to have their own experts to see that those experts did not make mistakes. The report was referred back.

In his report to the members of the Electrical Trades Union, the general secretary, Mr. James Rowan, refers to what he considers the inexplicable attitude taken up by employers in regard to the agreement recently signed between the employers' and workers' sides of the N.J.I.C. for certain rates of wages covering switchboard and sub-station attendants and their assistants. Employers, he says, have added on to the agreement certain qualifications which were not even mentioned at any of the meetings of the negotiating committee who drafted the report.

Birmingham Corporation has published, in connection with the British Industries Fair and for the general information of visitors to the city, "The City of Birmingham Handbook, 1929–30." It contains fine views of the Council House and other municipal buildings, educational establishments, baths, sanatoria, places of recreation, etc., and a mass of interesting matter describing these places, besides the University, the public health, education, gas, water, electricity supply and transport services, the city estates, markets and municipal bank, and a statement of the origin, objects and organisation of the British Industries Fair.

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PERSONAL.

MR. S. Billington has been appointed manager of the city transport undertaking at Gloucester.

Mr. C. A. Pike, resident electrical engineer to the Penmaenmawr U.D.C., has been appointed manager of Carnarvon electricity works.

Right and left respectively, Mr. T. R. Martin and Mr. H. H. Berry, chairman and deputy-chairman of the Advisory Committee, Electrical Section, British Industries Fair. (See note on this page.)

Mr. J. Jones, of the Melksham branch of the West Wilts Electric Supply Co., has been presented with a Westminster chiming clock on the occasion of his marriage.

Rotherham Electricity Committee recommends an increase of the salary of the deputy electrical engineer, Mr. W. H. Duffett, from £900 to £1 000 per annum.

Plymouth Tramways and Transport Committee, having accepted the resignation of Mr. J. W. Eunson, has resolved to advertise for a rolling stock superintendent at a commencing salary of £400 per annum.

At the ordinary meeting of the Institution of Electrical Engineers to be held at 6 p.m. on February 27th, the Hon. Sir Charles A. Parsons, F.R.S., will present to the Institution an oil painting of Sir Joseph Wilson Swan.

Mr. F. F. Sharles has relinquished his appointment as secretary of Aeonic Radio. The Board of the company now consists of Sir William Kay (chairman), Sir Robert J. Lynn (deputy-chairman), Mr. J. L. Gottlieb and Mr. E. V. Kayley.

In connection with the illustration in the top left hand corner of page 213 in the February 14th issue a reproduction of a photograph of Mr. H. H. Berry appeared in error over the name of Mr. T. R. Martin. Mr. Berry is, of course, deputy chairman of the Advisory Committee, Electrical Section, British Industries Fair, and Mr. Martin, chairman.

Ilford Electricity Committee recommends that the salary of the deputy borough electrical engineer, Mr. G. F. Gregory, at present £700 per annum, be increased by £50 per annum, and the salary of Mr. H. King, assistant commercial manager, at present £500 per annum, by £25, rising subsequently by annual increments of £25 to £600 per annum.

Lieut.-Colonel Sir James Lithgow has been nominated as president-elect of the Federation of British Industries, in succession to Mr. Lennox B. Lee. Sir Arthur Duckham and Sir Hugo Hirst have been nominated as new vice-presidents. These nominations will come up for confirmation by the general meeting of members towards the end of March.

At the annual meeting of the Manchester and Salford District Branch of the Electrical Association for Women, last week, Lady Emmott was elected president; Mrs. S. Z. de Ferranti, Mrs. A. P. M. Fleming, Lady Longbottom, Mrs. E. D. Simon and Miss Ellen Wilkinson, M.P., vice presidents; Mrs. J. Harcourt Williams and Miss D. Foster Jeffery, hon. secretaries and Miss O. M. Forbes, hon. treasurer.

Obituary.

MR. ALAN ARCHIBALD CAMPBELL SWINTON, F.R.S., on Wednesday, in his 67th year. Memorial service at St. Michael's Church, Chester Square, London, S.W., to-morrow, Saturday, at 2.30 p.m.

MR. MICHAEL BIRT FIELD, on February 15th. He was appointed chief electrical engineer to Glasgow Tramways Department in 1900 and later became chief engineer. From 1912 to the time of his death Mr. Field was managing director of Kelvin, Bottomley and Baird, Ltd.

BUSINESS ITEMS.

THE GENERAL ELECTRIC CO. (INDIA), LTD., announces the opening of new branches at 7, Brigade Road, Bangalore, Mysore State, and Main Road, Trivandrum, Travancore State.

OERLIKON, LTD., have removed to Victoria House, Southampton Row, London, W.C.1.

The telephone area at Dudley is now converted to full automatic working, and the new exchanges comprised in the area are Dudley (1 300 lines), Brierley Hill (500 lines), Cradley Heath (600 lines), and Stourbridge (1 100). These new exchanges supersede the old rotary system at Dudley and manual switchboards at each of the other exchanges, and now provide a full automatic service for the area. The new equipments were made and installed by SIEMENS BROTHERS AND CO., LTD., and are of their No. 50 non-director type.

Automatic and toll exchange in Pisa was inaugurated on February 9th, and successfully cut over. This exchange equipped for 1 200 sub-lines and 32 toll lines is of the 7 D rotary automatic district system and the first of its kind to be installed in Italy. It is equipped for automatic toll switching and provided with 50 cycle long distance dialling system for local and transit toll connections. Pisa Exchange is centre exchange of Pisa district which includes 10 district rural exchanges to be put into service this year. Pisa is in fourth zone; the concessionary company being Societa Telefonica Tirrena from whom the order was received by Standard Elettrica Italiana.

In connection with the £100 Radio Week Window Display Competition, organised by the MARCONIPHONE CO., LTD., the prizes were allotted as follows:—1st Prize, H. Sayner, 28-30, Saltaire Road, Shipley; 2nd Prize, R. Barker and Co., Ltd., 4, New Station Street, Leeds; 3rd Prize, Neal and Bacon, 64, St. Benedicts, Norwich; 4th Prize, Tamplin and Makovski, Bell Street, Reigate; Robert Hazelton, Woodhouse Street, Portadown; Radio House, 17, Union Street, Plymouth; Guy V. Laycock, 12, Cloth Hall Street, Huddersfield. Highly commended: Fred. G. Fuzzey, Ltd., High Street, Guernsey, C.I.; A. H. Dykes, 8, Bury Street, Stowmarket; Jack Hubble, 2, Market Buildings, Maidstone; Paul Taylor, 1, Silver Street, Kettering; Clarkes Cash Chemist, 65, High Street, Newport; Paterson Sons and Co., Ltd., 152, Buchanan Street, Glasgow; Parker and Smith, 3, Bedford Street, Plymouth; Trojan Electrical Co., 12, Alexander Road, Manchester; Western Radio and Supplies, Ltd., 10, Working Street, Cardiff; F. W. Wood, Ltd., 24A, Bull Ring, Grimsby; Duck Son and Pinker, Ltd., Pulteney Bridge, Bath; The Signal Shop, 7, York Buildings, Bridgwater; Kenneth Levell, King's Head Arcade, Cloth Hall Street, Huddersfield; City Radio and Cycle Stores, 17, Queen Street Arcade, Cardiff; Atkinsons, 103, Falsgrave Road, Scarborough; Barnes and Avis, Ltd., 5, Duke Street, Reading; Calvert and Heald, Market Street, Lancaster; Lawtons, 10, Mill Street, Crewe; E. Upton and Sons, 175, Linthorpe Road, Middlesbrough; Hunt and Co., 26, Stodman Street, Newark.

The appearance of a new accumulator manufacturer will be of general interest to the electrical industry. We have received a catalogue of stationary lead batteries from BRITANNIA BATTERIES, LTD., who have recently established at Redditch, near Birmingham, a factory where they are undertaking the production, on an extensive scale, of accumulators and batteries of a large variety of types. Besides lead accumulators of all types and sizes, Britannia batteries are manufacturing nickel-iron-alkaline accumulators for Edison Accumulators, Ltd. The Pertrix dry battery is also made at Britannia works. The Britannia lead accumulators are based on the designs of the A.F.A., whose practical and technical experience extending over forty years, are utilised and every process of the manufacture is controlled with such care that the makers state that a product of uniform and reliable quality can be depended upon. The stationary batteries described in the catalogue before us, besides being built in accordance with modern practice, include a number of improvements. The wood separators are supported by ebonite rods, and an improved process of casting the positive plates, claims to eliminate buckling to a large extent. The depth of the boxes is increased, allowing more mud space below the plates and more acid space above. The larger cells in glass boxes are mounted in double boxes, which reduces the risk of breakage of boxes. This catalogue will shortly be followed by others dealing with motor-car startor batteries, vehicle batteries, wireless batteries, and other types which are being developed by the company.

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F.B.I. AND EMPIRE TRADE

Views on British Economic Policy with Regard to the Dominions.

THE Federation of British Industries has issued a lengthy memorandum this week on British Economic Policy with regard to the Dominions. It takes the view that the most urgent necessity exists for this country to take all possible steps to increase trade with the Dominions, taking into account the economic desires of the Dominions and the importance of Empire migration. The memorandum expresses the opinion that the present Imperial machinery for consultation upon economic questions is unsatisfactory, and inferior to that which the Economic Section of the League of Nations affords for discussing economic problems with foreign countries.

The holding of an Imperial Trade Conference composed of government officials, representatives of industry (employers and employed), and of commerce, finance, shipping and agriculture, to review every question affecting inter-Imperial trade is suggested. This conference should not be an isolated effort but a permanent part of Imperial economic machinery. The establishment of an Imperial economic secretariat is also advocated. Meanwhile it is suggested that steps be taken to "rationalise" Empire industrial production, that there should be a closer liaison between the United Kingdom and Dominion industries and that existing preferences granted by Great Britain to the Dominions should not be disturbed. Other recommendations relate to the elaboration of a system of information in regard to Empire sources of supply, the establishment of an Empire College for Overseas students in London and the provision of further financial facilities for the furtherance of air transport within the Empire.

ELECTROPLATERS' EXHIBITION.

Interesting Examples Illustrating the Progress of Chromium Plating.

A CONVENTION was held recently by the Electroplaters' and Depositors' Technical Society at the Northampton Polytechnic Institute, Clerkenwell. An interesting feature was an exhibition representing modern scientific and practical advances in electro deposition. The exhibition was illustrative of the great developments which have occurred in the technique of metal deposition in the past few years. The evening meeting was addressed by Dr. W. Rosenhain, F.R.S., of the National Physical Laboratory, Teddington, the subject of his talk being "Research and Practice." The evening session was devoted to a discussion on the "Present Position of Chromium Plating," there being a large attendance. Dr. R. S. Hutton, director of the British Non-Ferrous Metals Research Association, and president of the Electroplaters' and Depositors' Technical Society, was in the chair. The exhibition represented practically every phase of electro-deposition art and science. The modern note in decorative plating was struck by the many beautiful exhibits of chromium plating. The exhibits of Messrs. Canning and Co., Ltd., Messrs. Crauer and Weil, Messrs. J. Nixon and Co., the Matchless Motorcycle Co., and the Kings Cross and Attwood Plating Co., illustrated how far the chromium plater has gone in solving the problem of the poor "throwing power" of the chromium plating solution. The Royal Aircraft Establishment (Farnborough) exhibited examples of zinc and cadmium plate upon aluminium. In this repsect the exhibit of Mr. U. R. Evans was very interesting. This consisted of deposited and other coatings upon iron after they had been submitted to corrosion tests. The Royal Aircraft Establishment also exhibited samples of aluminium to which the anodic process had been applied, together with specimens of the film of aluminium oxide which had been separated, the thickness of which was as little as one eighty-thousandth of an inch. A special exhibit was sent by Dr. Mueller from the Physikalish-Technisches Reichsanstallt, Charlottenburg, Berlin, and consisted of gold and nickel foil in films less than a millionth of an inch in thickness. Messrs. Thomas Try, Ltd., showed some examples of built up engineering parts in electro deposited nickel and iron deposits as thick as ¼ inch, these being perfectly adherent to the base metal and sound in structure. The Standard Plating and Kupron Works and the British Metallising Co. showed deposits of porcelain, plaster, glass, vulcanite, and cellulose acetate. Deposits of platinum and palladium illustrative of precious metal deposition were shown by Messrs. Johnson, Matthey and Co., Ltd. The Research Department, Woolwich, supplied an exhibit illustrating the X-ray spectra of deposited nickel.

LEGAL INTELLIGENCE.

Well-known Plug and Socket Patent Subject of Action.

IN the Chancery Division on February 11th Mr. Justice Clauson began the trial of an action by Messrs. Albert Edward Chapman and Charles Reginald Cook and Lectro Linx, Ltd., London, S.W., against the Deltavis Co., of Voleure, Switzerland, for an injunction restraining the alleged infringement of the plaintiffs' Patent No. 231280 for improvements in electric coupling terminals and the like. The plaintiffs also asked for delivery up for destruction of the alleged infringing articles and damages.

Infringement was denied and the defendants pleaded that the patent was invalid on the grounds of prior publication and prior common general knowledge.

Mr. Rudolph Moritz, K.C., for the plaintiffs, said at the date of the issue of the writ the registered owners of the patent were the first two plaintiffs, but it was afterwards assigned to the third plaintiffs. On the plea of invalidity the issues raised were want of novelty, want of subject matter, and inutility.

The patent dealt with small electrical connections. Since the introduction of wireless broadcasting all sorts of devices had been used for the purpose of making connections and one of the developments was the use of cylindrical and conical slotted pins. It was thought that a split pin would make a tight joint, but practice proved otherwise. In the particulars of objection filed by the defendants there was shown a variety of ways of reaching the same result but it was the plaintiffs' method that solved the problem and was now a commercial success. The contention of the defendants was that the plaintiffs were claiming a patent for a coupling which consisted of a plug and socket and not for a pin alone which they alleged invalidated the patents. But he submitted that the pith and marrow of the invention was the two-ended suspension of the hollow centre of the pin or plug and that there was infringement even if the plug was omitted. In support of their plea of lack of novelty and subject matter the defendants, said Mr. Moritz, had cited prior specifications of Shiels, Stott, a Dutch company, Pellant, Arnold and Bosch.

Mr. James Swinburne, consulting engineer, and other expert witnesses, gave evidence in support of the plaintiffs' case.

The Defence.

Mr. J. Whitehead, K.C., opening the case for the defence, said what the patentee claimed was a spigot made on a new and fundamental principle. But it had been clearly laid down by the House of Lords that if a patentee was seeking to make use of a so-called new principle to catch infringement, it must be made plain in the specification that it was the principle that was being claimed. Yet nowhere in the plaintiffs' specification was the principle pointed out. There were claims to a plug and socket and to variants of a socket, but there was no statement or illustration in the specification describing or showing the use of a plug as a valve pin. Mr. Whitehead said that the pith and marrow of the invention claimed was the provision of a plug and socket contact formed as a single unit and provided with leading-in means.

Mr. Hubert Alexander Gill, consulting engineer and a chartered patent agent, then gave expert evidence.

Mr. Trevor Watson, junior counsel for the defendants, in summing up their case said, on the question whether the Deltavis pin infringed the plaintiffs' patent, an attempt had been made by the plaintiffs to show that although the Deltavis pin was not an infringing article when made, it might, by being pressed into a parallel-sided socket, become an infringing article by compression. But there was no evidence that the defendants had ever put one of their plugs into a socket. If such plea was of any avail it would be against the user and, against the user only.

Mr. Moritz replied on behalf of the plaintiffs.

Giving judgment his lordship said that in his view of the construction of the plaintiffs' specification he could not hold that the claim was one for a coupling formed of a plug and socket as a unit and also as a claim to a monopoly for a particular form of plug. If the invention related to a plug and socket as a single unit with modifications he could understand it, but the patentee had told them of no invention except that which was comprised in a combination of a socket and pin. Therefore there was no grant of a monopoly for a particular form of pin and on that view, said his lordship, there was no infringement, and the action must be dismissed with costs.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BARRHEAD CORPORATION.—Electric lighting work in connection with erection of 70 houses under No. 2, Arthurlee Site housing scheme. Schedules, etc., from the Town Clerk, Municipal Buildings, Barrhead.

CENTRAL ELECTRICITY BOARD, February 22nd.—Transformer oil-treating plant for 18 transformer stations in the area of the Central England Scheme. Specification (No. B.E.—P.S. 2), etc., from Mr. R. E. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Prepayment Meters.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, February 24th.—Supply of prepayment meters. Specification from Mr. D. J. Keep, town clerk, Town Hall, Cambridge Road, London, E.2; deposit £2 2s.

BRENTFORD GUARDIANS, February 26th.—Provision of central switchboard and laying of electric mains, at West Middlesex Hospital, Isleworth. Specification, etc., from Messrs. Dodge and Reid, 120, High Street, Brentford; deposit £1 1s.

BRISTOL CORPORATION, February 26th.—Six months' supply of electrical fittings. Particulars from Mr. T. S. Lamb, clerk, St. Peter's Hospital, Bristol.

CROYDON CORPORATION, February 26th.—Six months' supply of electrical fittings and appliances, etc. Specification, etc., from the Union Offices, Mayday Road, Thornton Heath. Stamped, addressed envelope to be sent.

HAMMERSMITH (LONDON) BOROUGH COUNCIL, February 26th.—Twelve months' supply of electric lighting sundries, insulated wires, ordinary and prepayment meters, insulating compound; h.t. and l.t. concentric, paper insulated cables, etc. Forms of tender, etc., from the Borough Electrical Engineer, 85, Fulham Palace Road, London, W.6.

ASHFORD (KENT) URBAN DISTRICT COUNCIL, February 28th.—Vertical, solid injection, heavy oil engine, with alternator (about 900 kW), suitable for 6 600 V, three-phase, 50 periods. Tenders to Mr. J. Sudlow, clerk to the Council, High Street, Ashford.

GLASGOW EDUCATION AUTHORITY, February 28th.—Electric light installations in Globerhill Temporary, Rotherwood Avenue, and Knightswood Schools and in Govan Secondary School extension, Langlands Road, Govan. Specifications, etc., from Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s. per specification.

WEST RIDING EDUCATION COMMITTEE, February 28th.—Electric light installation in Southowram Withinfields Council School. Specification, etc., from Mr. G. Dodgson, Education Office, Huddersfield Road, Elland.

LITTLEHAMPTON URBAN DISTRICT COUNCIL, March 1st.—Supply and installation of automatic operating, electrically driven air compressor. Specification, etc., from the Engineer, Town Offices, Littlehampton.

OXFORD CORPORATION, March 1st.—Manufacture and erection of engines and pumps, including two oil-driven auxiliary engines each driving an electric generator; electric light installation, etc. Specification, until noon on March 1st, from Sir A. Binnie, Son and Deacon, Artillery House, Artillery Row, Westminster, S.W.1; deposit £10.

CENTRAL ELECTRICITY BOARD, March 3rd.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme. Specification (No. S.E.E.—P.F. 5) from the secretary and solicitor, Mr. R. H. Fox. Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

DOVER HARBOUR BOARD, March 3rd.—Twelve months' supply of electric cables, electrical sundries, etc. Schedules, etc. (2s. 6d.), from the office of the Register, Castle Street, Dover.

HALIFAX CORPORATION, March 3rd.—Electrician's work at public conveniences. Specification, etc., from the Borough Engineer, Crossley Street, Halifax; deposit £1 1s.

HOVE CORPORATION, March 3rd.—Supply of electric lamps, etc., for one year. Forms of tender from the Town Clerk.

SOUTHEND CORPORATION, March 3rd.—Twelve months' supply of stores, including meters and instruments, electrical fittings, cables and steel conduits, joint boxes, earthenware conduits, etc. Specification, etc., from the Borough Electrical Engineer and Manager, Electricity Works, London Road, Southend-on-Sea.

WESTHOUGHTON URBAN DISTRICT COUNCIL, March 3rd.—One year's supply of stores, including metallic filament lamps. Forms of tender, etc., from the Surveyor, Town Hall, Westhoughton. Stamped, addressed envelope to be sent.

CAMBRIDGE CORPORATION, March 4th.—Twelve months' supply of stores, including electric lamps (schedule 16). Forms of tender, etc., from the Borough Engineer, Guildhall, Cambridge.

ALLOA CORPORATION, March 6th.—Electrical installation in connection with erection of 63 houses at Broad Street, Alloa. Schedules from Messrs. J. Melvin and Son, architects, Mar Street, Alloa.

LEICESTER CORPORATION, March 7th.—Installation of electric light wiring and fittings at Belgrave pumping station. Specifications, etc., from the City Surveyor, Town Hall, Leicester; deposit £1.

EDINBURGH CORPORATION, March 8th.—Supply and maintenance of telephones, in Edinburgh, Leith and Portobello districts. Forms of tender, etc., from the City Architect, City Chambers, Edinburgh.

BEDFORD CORPORATION, March 10th.—Supply during one year of e.h.t., h.t. and l.t. underground cables; and incandescent lamps. Specifications from the Borough Electrical Engineer, Prebend Street, Bedford. Tenders from British manufacturers in the United Kingdom only are invited.

BLACKBURN CORPORATION, March 10th.—Manufacture and supply of electrical requirements for 12 months, including paper insulated, lead sheathed cable, rubber insulated wire, consumers' meters and gasfilled and vacuum incandescent lamps. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall, Blackburn; deposit 10s.

CHEDDLESTON (LEEK) MENTAL HOSPITAL, March 10th.—Supply of electric lamps for six months. Tender forms from the clerk and steward, Mr. F. G. Eve.

PRESTWICH URBAN DISTRICT COUNCIL, March 10th.—Twelve months' supply of lamp standards, electric lamps, etc. Forms and tender, etc., from Mr. H. T. Ainsworth, surveyor, Town Hall, Prestwich, Lancs.

TORQUAY CORPORATION, March 10th.—Supply and erection of 7 500 kW m.c.r. turbo-alternator and condensing plant Specifications, etc., from Mr. G. J. Hollyer, Electricity Offices, Torquay; deposit £3 3s.

LIVERPOOL CORPORATION, March 12th.—Supply of 5 000 kVA, 12 500 kVA and 33 000 V step-down transformers and 6 000 V and 3 3000 V metal-clad switchgear for sub-stations. Specification, etc., from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, March 19th.—Coal-handling plant at Ironbridge generating station. Specification (No. 8), etc., from Mr. E. F. Hetherington, Phœnix Buildings, Dudley Road, Wolverhampton.

EDINBURGH CORPORATION, March 24th.—Twelve months' supply of materials, including underground insulated cables, conduits, house service fuse boxes and fuse boards, electrical material for interior wiring, electricity meters, etc. Specifications, etc., from the Engineer and Manager, Electricity Department, Dewar Place, Edinburgh.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk denotes that local representation is, in practice, essential.

MEATH COUNTY COUNCIL, February 15th.—Electric lighting and heating installation in Trim Courthouse building. Specification, etc., can be seen at the County Surveyor's Office, County Hall, Navan.

SOUTH INDIAN RAILWAY CO., LTD., February 21st.—Supply of wood sheet separators for train lighting cells. Specification etc. (5s.), from the company's offices, 91, Petty France, Westminster, S.W.1.

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POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of primary battery material. (Reference B.X. 6 139.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of telephone switches. (Reference B.X. 6 018.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Reference B.X. 5 941.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of switchboard plugs (schedule C. 548). (Reference B.X. 5 998.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Supply of magneto and common battery telephones and automatic dials (schedule C. 544). (Reference B.X. 5 999.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

INDIAN STORES DEPARTMENT, February 27th.—Inert cells (to Indian Telegraph specification No. 2A, revised March, 1928), and Carsac elements (spec. No. 3, approved July 2nd, 1929). (Reference B.X. 6 165.)

GOTHENBURG HARBOUR AUTHORITY, March 3rd.—Supply of ten electrically operated 2½-ton portal cranes. (Reference A.X. 9 089.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 4th.—Supply of automatic exchange power boards (schedule C. 562). (Reference B.X. 6 072.)

INDIAN STORES DEPARTMENT, March 5th.—Supply of battery charging motor generator set, for Wireless Section (schedule No. 880 R/1). (Reference B.X. 6 146).

NEW ZEALAND POSTS AND TELEGRAPHS, March 5th.—Supply of v.i.r. wire (specification No. P. and T. 151/2 096). (Reference B.X. 6 089.)

VICTORIAN ELECTRICITY COMMISSION, March 10th (extension of time).—Two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

MOROCCO POSTS AND TELEPHONES (FRENCH ZONE), March 11th.—Supply of glass insulators, bronze and copper wire and galvanised ironwork. (Reference B.X. 6 410.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, April 3rd.—Supply of eleven 4-ton electric cranes for Durban Harbour. (Reference A.X. 9 119.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, April 30th.—Supply and erection of h.t. overhead transmission lines in isolated basins of Upper Egypt. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1; £10 5s., not returnable.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

Tenders Accepted.

GLASGOW CORPORATION.—Metro-Vick Supplies, supply of 2 000 Cosmos traction lamps to the tramways department.

LONDON, MIDLAND AND SCOTTISH RAILWAY CO.—Metro-Vick Supplies, supply of Cosmos electric lamps for 12 months (part contract).

SUTTON COLDFIELD CORPORATION.—General Electric Co., Ltd., supply of paper insulated, lead sheathed, double steel tape armoured cables, £12 543.

GREEK GOVERNMENT.—Siemens and Halske Akt.-Ges., installation and exploitation of automatic telephones in Athens, Piræus and the suburbs.

LONDON, MIDLAND AND SCOTTISH RAILWAY CO.—Siemens Electric Lamps and Supplies, Ltd., supply of Siemens vacuum and gasfilled electric lamps for 12 months.

BRADFORD CORPORATION.—English Electric Co., Ltd., rewinding 100 tramcar motors for 50 express cars and supply of spare motor for railless trolley vehicles, £205.

LIVERPOOL CORPORATION.—Thomas Bolton and Sons, Ltd., supply of 5 000 35 in. copper bonds, 2s. 6½d. each; British Insulated Cables, Ltd., supply of 300 65 in. copper bonds, 4s. each.

MANCHESTER CORPORATION.—Waygood-Otis, Ltd., inspection and maintenance of electric lift at High School of Commerce; Maitland and Co., Ltd., electrical installation at Princess Road motor bus garage.

Lamp Supplies.

ADMIRALTY.—Edison Swan Electric Co., Ltd., supply of 100 V 40 W, 100 V 100 W, and 230 V 25 W pearl, and 220 V 150 W clear lamps; Metro-Vick Supplies, supply of Cosmos vacuum and gasfilled metal filament lamps (part contract).

BRISTOL CORPORATION.—Johnson and Phillips, Ltd., supply of eleven outdoor weatherproof sheet steel transformer pillars, each to control a 150 kVA transformer and to be supplied complete with e.h.t. switchgear and distribution gear for five l.t. circuits.

CENTRAL ELECTRICITY BOARD.—Ferranti, Ltd., Fuller Electrical and Manufacturing Co., Ltd. and General Electric Co., Ltd., supply of 132 kV transformers in the area of the Mid-East England electricity scheme. The contracts amount to a total of approximately £150 000.

GENERAL POST OFFICE.—Electric lift, Wigan Telephone Exchange, W. Wadsworth and Sons, Ltd.; motor generator, Central (London) Telephone Exchange, Haslam and Newton, Ltd.; power plant, Valentia Radio Station (County Kerry, I.F.S.), Davey, Paxman and Co., Ltd.; Telephone exchange equipment, Maida Vale, Siemens Bros., and Co., Ltd.; Acorn (Acton), Standard Telephones and Cables, Ltd.

CAPE TOWN CORPORATION.—Roger Jenkins and Co., Ltd., supply of 200 cast iron pole bases, £213 2s. 8d.; Steel Trading Co., S. A., Ltd., 1 500 weldless steel tubular poles, £6 375; S. A. General Electric Co., Ltd., supply of switchgear for Dock Road power station, £330; British Insulated Cables (S.A.), Ltd. (£1 094 5s.), Hubert Davies and Co., Ltd. (£591), and Davis and Soper, Ltd. (£844 5s.), overhead materials. (All recommended.)

PORTSMOUTH CORPORATION.—Supply of switchgear:—English Electric Co., Ltd., £41 760 (recommended). Alternative tender submitted £40 191. Other tenders: Switchgear and Cowans, Ltd., £45 537 5s.; Ferguson, Pailin, Ltd., £40 191 and £41 766; British Thomson-Houston Co., Ltd., £44 961 11s.; Metropolitan-Vickers Electrical Co., Ltd., £44 945; Johnson and Phillips, Ltd., £48 012 5s.; General Electric Co., Ltd., £41 913; A. Reyrolle and Co., Ltd., £44 113 2s. and £42 460 2s.; Park Royal Engineering Co., Ltd., £41 472; New Switchgear Construction Co., Ltd., £48 844.

GLASGOW CORPORATION.—Malcolm and Allan, Ltd., electrical work of observation ward, Belvidere Hospital, £889; Barr and Co., two motors (new), including reconditioning vacuum plant, £192; Edison Swan Electric Co., Ltd., 140, Sangamo type current meters (new), £288; J. L. Saunders and Co., Ltd., three motors (new), including reconditioning oil burning plant, £198; Corporation Electricity Department, about 240 yards of 0·25 four-core l.t. a.c. cable, laid complete, £560; Metropolitan-Vickers Electrical Co., Ltd., new turbo-alternator and spares, £41 867, subject to a deduction from offer in respect of spares for condensing plant; G. and J. Weir, Ltd., condenser and spares, £9 448.

LIVERPOOL CORPORATION.—Equipment, etc., for Clarence Dock power station: Tudor Accumulator Co., Ltd., two control batteries, £2 928; British Thomson-Houston Co., Ltd., 3 300 V and 400 V armour-clad switchgear, and low-voltage lighting and power distribution boards, £11 100; Lancashire Dynamo and Motor Co., Ltd., two battery-charging motor generators, £477; E.P.I., Ltd., cable work in connection with auxiliary switchgear and lighting, telephones, call signals, heating etc.; Metropolitan-Vickers Electrical Co., Ltd., supply and erection of 50 000 kW m.c.r. turbo-alternator, with accessories, £187 870; British Thomson-Houston Co., Ltd., supply and erection of auxiliary switchgear at power station, to form part of the main switchgear (sections 1 and 3 of Corporation specification), at *pro rata* price to value of contract for main switchgear, estimated cost, £9 800. (All recommended.)

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RURAL ELECTRIFICATION.

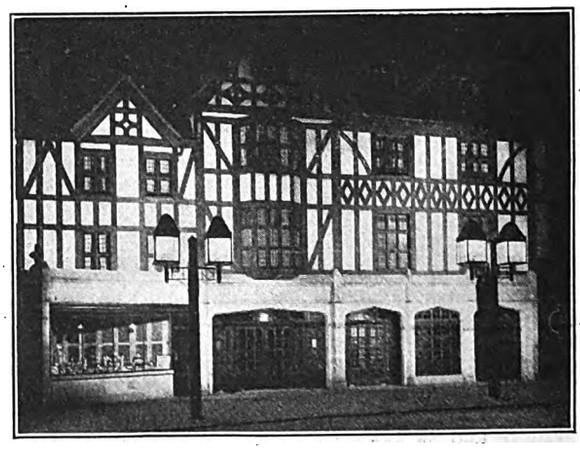
Description of Bedford Demonstration Scheme Issued by Commissioners.

THE Electricity Commission has issued a description of what is known as the Bedford Demonstration Scheme, prepared as the outcome of a request by the Minister of Transport in 1927, that the Commissioners should make investigations to see whether it was possible to proceed with the electrification of rural areas more rapidly than had hitherto been considered as possible. It was stated in the ninth annual report of the Electricity Commissioners that a demonstration scheme for a selected area forming part of the authorised area of supply of the Corporation of Bedford was prepared with the approval of the Minister and in collaboration with the corporation, and the present memorandum has been published in view of inquiries received from authorised undertakers and others interested in the development of the supply of electricity in rural areas.

The object of this scheme is to provide for the comprehensive and rapid electrification of a typical rural area where mixed farming is the main industry and electricity has not been previously available, so that within a period of about two years supplies for all purposes will be within the reach of practically all the inhabitants. The scheme will thus serve as a local demonstration of the advantages of rural electrification and of the possibility of more rapid development than has hitherto been regarded as economically possible. The main demonstration area is 101 square miles in extent with a population (based on the 1921 Census) of 15 860, and 4 038 occupied dwellings. The average density of the population is thus 157 per square mile, or practically the same as the general average of 151 per square mile for all rural areas in England and Wales. About three-quarters of the land is cultivated, a large proportion being devoted to corn raising, while the remainder is largely pasture. The area contains two brickworks which are already connected to the supply system of the corporation and account for a substantial consumption of electricity; and other small industries may become consumers in due course. Public supplies of gas are available in only three of the villages.

The technical scheme for the development of the demonstration area is based upon a supply of electricity in bulk obtained from Bedford, which occupies a fairly central position in relation to the area and is a "grid" point under the South East England Electricity Scheme. It involves the construction, in the main area, of network of about 56 miles of three-phase overhead transmission lines at 11 000 V. In completing the circuit, use will be made of about seven miles of existing underground cable which runs from Bedford to Sandy, and also of one or two other existing lines. Smaller villages, isolated residences and farms are to be supplied from single-phase extensions, these extensions representing a further 87 miles of 11 000 V overhead lines. The voltage of transmission at Bedford has hitherto been 6 600 V, but provision has been made in the scheme for stepping up from 6 600 V to 11 000 V at four transforming points, namely, Wootton Pillinge, Harrowden, Bromham and Milton Ernest. At these points either brick-built sub-stations or kiosks of simple and inexpensive design are contemplated, the transformer equipment having a capacity of 500 kVA in three cases and of 200 kVA in the other. Supplies to villages and isolated consumers will be given by means of pole transformers of the following proposed standard sizes, namely, 50, 20 and 10 kVA for three-phase, and 20, 10 and 5 kVA for single-phase supplies. With regard to low tension distribution in villages, involving about 45 miles of lines, it is anticipated that in most cases a neat overhead system which does not interfere with the amenities will prove possible; but a margin has been allowed in the estimates in case a certain amount of underground distribution should prove necessary in some instances. The voltage adopted for distribution is 400/230 V.

It is contemplated that the whole of the transmission system will be constructed within two years, the first of which has been designated "constructional year." Thereafter the only additional capital expenditure will be that incurred in connecting new consumers. The total capital cost for the main area, including all service connections and meters on consumers' premises, is estimated to be £116 250. It is estimated that by the end of six years from the commencement of supply about 75 per cent. of all the dwellings in the demonstration area will be connected to the supply system, and that the sales of electricity will have grown by that year to an average of about 130 units per head of population in the area. Estimates of revenue are based on the assumed adoption of an attractive two-part tariff for domestic supplies, and of suitable alternative flat rates for consumers taking supplies for lighting and/or power only. These charges are estimated to yield an average revenue from all classes of supply taken collectively of 2·4d. per unit sold. After providing for interest on bank overdraft, the estimates show deficits on net revenue account in the constructional year and the first two years of operation, but surpluses in each of the years thereafter sufficient to place the scheme on a remunerative basis in the course of a few years of working. Preliminary plans for the lay-out of the transmission system have been approved and supplies are already being given in ten parishes. It is anticipated that a supply will be available by the early part of 1931 in the whole of the area.



TWO views of the Plough Inn, Clapham, London, S.W., showing a close-up of the specially designed G.E.C. floodlighting units and the effect they produce.

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WORK IN PROSPECT.

BARNSLEY.—New hotel at Kendray Estate. Particulars, H. Raper, Oakwell Brewery, Barnsley (architect).

CHESTERFIELD.—School to cost £18 666. Particulars, the Director of Education.

COSELEY.—School. Particulars, Messrs. Scott and Clark.

CROYDON.—Houses (20). Particulars, Truett and Steel, Ltd., Thornton Heath.—Additional 364 houses. Particulars the Borough Engineer.—Baths, public washhouses, laundry, etc. Particulars, the Borough Engineer.

DEWSBURY.—Laying new cables, for T.C. Particulars, H. Dearden, Town Hall, Dewsbury. (Estimated cost, £45 000.)

DONCASTER.—Proposed new electric mains (£3 680). Particulars, F. O. Kirby, Priory Place, Doncaster.

DONCASTER.—Various school extensions. Particulars, R. E. Ford, Priory Place, Doncaster.

HALIFAX.—Electric light installation to school, Withinfields, Southowram. Particulars from G. Dodgson, Huddersfield Road, Elland.

HATFIELD.—50 new houses, for Mr. Dunn. Particulars, E. C. Dunn, builder, Hatfield, near Doncaster.

KNOTTINGLEY.—Additions to the Grange. Particulars from R. A. Easdale and Son, County Chambers, Castleford.

LLANGEITHO.—Police station. Particulars, Mr. T. Owen, Aberystwyth, county surveyor.

MIDDLESBROUGH.—Houses (100). Particulars, Gilbert Long Ltd.

MIDDLESBROUGH.—Houses (104). Particulars, the Borough Surveyor.—Church, Whinney Banks Estate. Particulars, the Vicar of Acklam.

OLD FLETTON.—School. Particulars, the County Surveyor, Huntingdon.

PETERBOROUGH.—Housing scheme (20). Particulars, the Surveyor.

PONTEFRACT.—Electrical installation to 24 houses. Particulars from J. E. White, Tanshelf House, Pontefract.

PONTEFRACT.—Erection of 16 houses, for U.D.C. Particulars from Tennant and Smith, Ropergate, Pontefract.

RICCALL.—New school, for C.C. Particulars, J. H. Carr and Sons, builders, Selby.

ROTHERHAM.—Housing scheme (440). Particulars, the Borough Engineer.

ROTHERHAM.—New public library for B.C. Particulars, V. Turner, borough surveyor, Town Hall, Rotherham.

SCARBOROUGH.—Extensions to town hall. Particulars, H. W. Smith, borough engineer, Town Hall, Scarborough.

SKELMANTHORPE.—Eight new houses, for U.D.C. Particulars from H. Lodge, Huddersfield Road, Skelmanthorpe.

STANFORD-LE-HOPE.—School (250 places). Particulars, Mr. W. O. Lester Smith, Chemlsford.

STIRLING.—Housing scheme (52 to 64). Particulars, the Burgh Surveyor.

STOCKPORT.—Houses (118). Particulars, Thomas Davies and Son.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.

Among the guests who have accepted invitations to be present at the annual dinner of the Association of Supervising Electrical Engineers, to be held at the Hotel Cecil to-morrow evening, are :—

Col. Sir T. P. Purves, Sir Archibald Page, Mr. W. W. Lackie, Mr. V. Watlington, Mr. P. Rosling, Col. R. E. Crompton, Sir Wm. Noble, Mr. P. V. Hunter, Mr. G. Scott Ram, Mr. J. M. Kennedy, Mr. A. P. Thurston, Mr. G. Lathan, M.P., and Mr. E. J. Evershed.

Mr. S. B. Donkin, president of the Association, will be in the chair, and he will be supported by two past presidents, Mr. J. S. Highfield and Mr. A. M. Sillar.

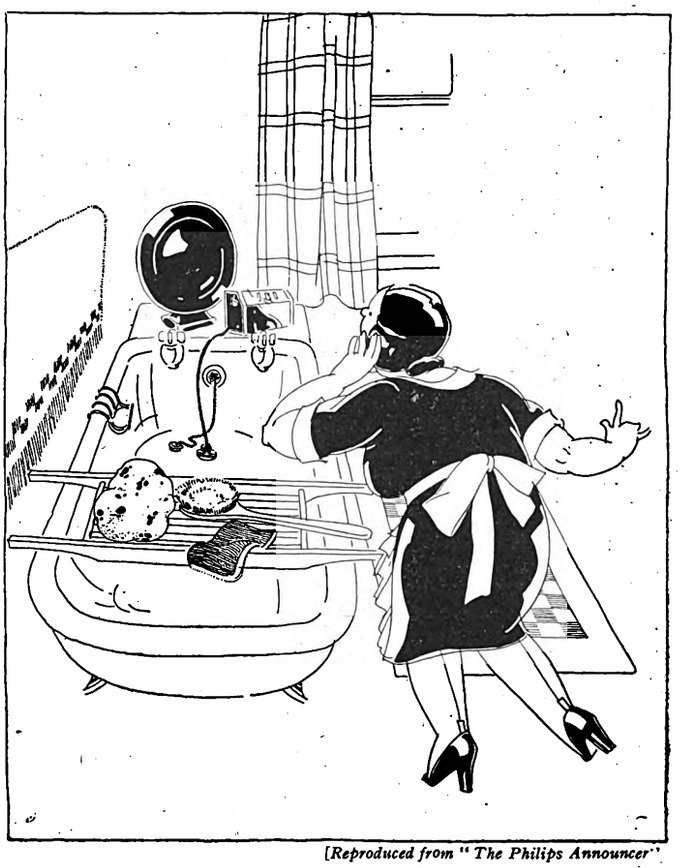
EX-BRITISH WESTINGHOUSE ASSOCIATION.

The 12th re-union dinner of the Ex-British Westinghouse Association will take place on Friday, March 14th, at the Hotel Cecil, London, with Mr. J. S. Peck in the chair. Dinner tickets (12s. 6d.) can be obtained from the hon. treasurer, Mr. L. S. Hawes, 51, Fontenoy Road, Balham, London, S.W.12, to whom subscriptions (2s. 6d. to December 31st, 1930) may be paid. Any further particulars from the hon. secretary, Mr. L. S. Richardson, 70, Preston Road, Wembley Park, Middlesex.

TRADE PUBLICATIONS.

THE WHOLESALE FITTINGS CO., LTD., 23-37, Commercial Street, London, E.1, has published list No. 238 dealing with electrical glassware.

DANIEL DONCASTER AND SONS, LTD., associated with the United Steel Companies, Ltd., have sent us booklet No. DD106 relative to forgings.



[Reproduced from "The Philips Announcer"

Just plug it in . . . (P)

A new mailing card relative to "Tungstone" batteries has been received from the TUNGSTONE ACCUMULATOR CO., LTD., Salisbury Square, London, E.C.4.

The wholesale firm of R. CADISH AND SONS, 5-6, Red Lion Square, London, W.1, have issued a special leaflet describing the "Dunham'" portable wireless receiver.

We have received from the UNITED STEEL COMPANIES, LTD., 17, Westbourne Road, Sheffield, a special brochure, No. U.S.C. 101, dealing with their products.

J. H. TUCKER AND CO., LTD., Kings Road, Tyseley, Birmingham, have published folder F1 by way of introducing a new range of teak-case fuseboards, 15A 250 V—10 A 500 V.

The DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton, Middlesex, has issued list No. 129 relative to "A.M. Junior" temperature recorders; and list No. 96 dealing with boiler water level controllers.

The ORMOND ENGINEERING CO., LTD., Ormond House, Rosebery Avenue, London, E.C.1, has published a new catalogue of the company's range of radio products. The issue is well illustrated and contains very complete descriptions.

Two new publications of the MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, London, W.C.2, are leaflet No. 1110 dealing with a new type S.P.2 10w portable short-wave set and leaflet No. 1104 describing type R.G. 24 short-wave receiver.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4, has issued leaflet No. 1 015 dealing with three-phase self-acting reversible motor startors, for squirrel cage motors, and leaflet No. 110 describing multiple finger self-acting starting rheostats for small d.c. motors.

We have received from ECK AND BROOK, LTD., 4/12, Palmer Street, London, S.W.1, a copy of publication H.B. 406/a. This is a newly issued brochure dealing with the company's grip current tester and besides giving a comprehensive description of the instrument contains a number of appreciations from well-known engineers.

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ELECTRICITY SUPPLY.

New Generator for Ashford—Lincolnshire Supply Scheme—Barnsley's Halfpenny Off-Peak Supply—First Portion of Bristol Station Nearing Completion—Abolition of Torquay's Service Charge—New Plant and Mains at Wimbledon.

PORTLAND Electricity Committee has decided to lay cables at a cost of £1 492.

Sanction to a loan of £3 308 for mains extensions has been received by East Ham T.C.

Sheffield Electricity Committee has authorised mains extensions at a cost of £9 075.

Ashford (Kent) U.D.C. has received sanction to instal at the electricity works another 800 kW set.

Hastings electricity department is to extend mains, at a cost of £1 100, for the supply of electricity to Sedlescombe.

The Borough Surveyor of Paignton is to submit an estimate of the cost of providing decorative coloured lighting on the sea front.

Coventry Electricity Committee seeks sanction to borrow £110 519 for the outstanding balance of the cost of the Longford generating station.

Hackney (London) Electricity Committee has arranged to lease a site adjoining the power station to the Central Electricity Board for a grid sub-station.

An estimate from the Irish Free State Electricity Supply Board for the lighting of Carrick-on-Suir town with 50 lamps at £171 a year, has been referred by the U.D.C. to a committee.

With regard to the proposal to extend the area of supply, Kendal T.C. has decided to restrict the application to the Commissioners to an area covered by a circle of three miles radius from the town hall.

Colchester Electricity Committee has authorised extensions of mains at Stanway and Chitts Hill, at a cost of £820.—The Committee has decided to seek consent to the erection of the line to West Mersea above ground.

Liverpool Electric Power and Lighting Committee has had under consideration a proposal to construct a cable tunnel between Clarence Dock power station and Pumpfields sub-station. Estimates are being prepared.

Spilsby R.D.C. has decided to support the application of Mr. Borlase Matthews for an electricity scheme for the district. Mr. Matthews has undertaken to have electricity available for Spilsby and Humbleby within two years.

Darwen Corporation is making application to the Electricity Commissioners for permission to change the system of supply from d.c. to a.c. and for sanction to borrow £22 000 for that purpose and the extension and renewal of mains.

An application is to be made by Birkenhead T.C. to the Electricity Commissioners for sanction to borrow £10 000, the cost of substituting an a.c. for the present d.c. supply in Grange Road, Cavendish Drive and Bebington Road.

Barnsley Electricity Committee recommends that a flat rate tariff of ½d. per kWh be offered to consumers employing electricity for certain purposes, including commercial baking ovens and central heating during off-peak load periods.

Hertfordshire County Council is about to approach the North Metropolitan Electric Power Supply Co. and the Chesham Electric Light and Power Co. in regard to a supply of electricity by either of them in the parish of Markyate.

Newport (Isle of Wight) Lighting Committee has received from the Isle of Wight Electric Light and Power Co. an application for consent to the change of system from d.c. to a.c. The Committee recommends that consent be given.

Chichester Corporation has instructed the Electrical Engineer to place before the Commissioners a scheme for extending and developing the electricity undertaking at a cost not to exceed £70 000. An unemployment grant is to be applied for.

Bristol Electricity Committee reports that the first instalment of Portishead generating station is nearing completion, and it is now expedient to borrow £210 000 to cover the outstanding portion of the total expenditure in connection therewith.

Balrothery R.D.C. has received a tender from the Irish Free State Electricity Supply Board for the lighting of the town of Rush with 35 200 W lamps from April 1st, 1930, to March 31st, 1931, at a cost of £105. Consideration of the offer has been postponed.

Manchester Lighting Committee recommended, at last week's City Council meeting, that improved gas lighting be installed in Queen's Road, from Cheetham Hill Road to Oldham Road. The Council, however, decided to adopt electric lighting in the thoroughfare referred to.

Torquay Electricity Committee seeks sanction to borrow £2 010 for the erection of an overhead line from Buckfastleigh to Ashburton.—In future no charge is to be made for services to connect new consumers' premises to the Corporation's mains unless the length of such services exceeds 30 ft.

It is estimated that the cost of the main switchboard and switchgear required at the Burton-on-Trent electricity works in connection with the Central England electricity scheme will be £30 346, including £5 821 for rearrangement of existing board; £19 625 for new switchgear and house, and £4 900 for transformers. The Electricity Committee has authorised the carrying out of the work.

Marking the opening of the 1930 Mardi Gras celebration in New Orleans next month will be the formal inauguration of the South's greatest "White Way" with the light from the city's new ornamental lighting system. More than 100 standards, of Louis XVI design, and each equipped with three 1 000 W lighting units, will be erected at 100-ft. intervals down the parkway of Canal Street. Compared as to brilliance, the New Orleans system will rank third among cities of the country.

Col. Gordon Tucker held a Ministry of Transport inquiry on February 6th, at Rugby, relative to the application of the Leicestershire and Warwickshire Electric Power Co. for compulsory wayleaves to erect poles to carry an overhead line at Lower Hillmorton on land belonging to Lieut.-Col. J. T. Bucknill, who wrote saying that the poles would ruin his land agriculturally. Mr. Wallace, for the company, said the cost of the proposed line would be £1 935, while the revenue from the scheme for many years would not exceed £250 a year.

Marylebone (London) B.C. is advised by the Electricity Committee to enter into an agreement with the Regent Estate Co., Ltd., for the installation of rising mains for the 53 flats comprising the property known as Manor House, Marylebone Road, at a total estimated cost of £1 166.—The Committee also recommends that the Council agree to provide the necessary rising mains and sub-mains in connection with the first two blocks of tenements on the London County Council's Carlisle Street housing estate at a cost of £290 per block.

Weymouth General Purposes Committee reports that it has been negotiating with a view to obtaining a firm price for the supply of electricity for the pumping stations. The Committee has suggested to the electricity department that the price might be reduced, and fixed for a definite period, subject to the fluctuations usually provided for in agreements for the supply of electrical energy. The Electricity Committee is unable to agree to the suggestions. It has been decided that the pumping stations be reorganised on an electrical basis.

Wimbledon Electricity Committee recommends the provision of five new sub-stations and two new transformer kiosks, the enlargement of 18 existing sub-stations, and the equipment of several sub-stations on consumers' premises, at an estimated total cost of £19 000. The Committee also recommends the laying of supplemental cables and the replacement of one of the existing h.t. mains between Raynes Park and Malden sub-stations, and a similar main from the electricity works to Raynes Park sub-station, by cables of a larger section, at a cost of £22 196. Sanction is sought to purchase an additional 7 500 kW two-phase turbo-alternator, with switchgear and auxiliaries, and to the raising of a loan of £33 000 for the purpose.

SOUTH-EAST ENGLAND MAP.

The Electricity Commissioners have forwarded, for our information, a copy of a map which they have had prepared, and are publishing, showing the areasof supply of authorised undertakers in South-East England as at January 31st, 1930. If there is a sufficient demand for maps of this character, the Commissioners will undertake the preparation and issue of similar maps for other sections of the country. Copies are obtainable from Edward Stanford, Ltd., 12-14, Long Acre, London, W.C.2, price 10s. each, package and postage 9d. extra.

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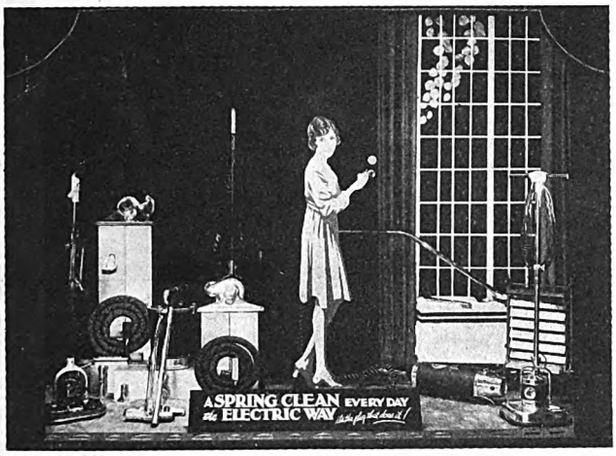
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

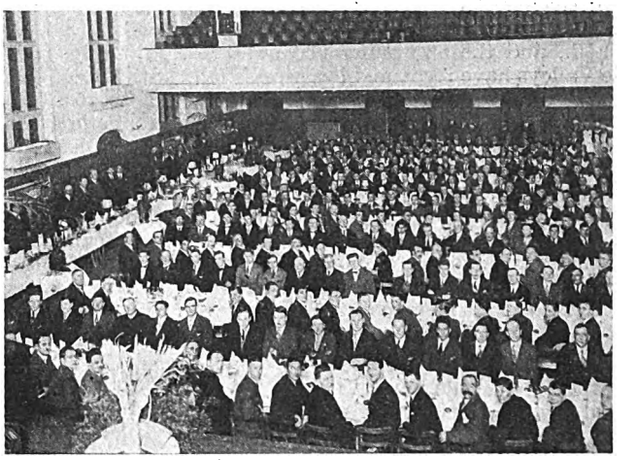
The Earl of Clarendon, chairman of the British Broadcasting Corporation, who has resigned in order to accept the appointment of Governor-General of South Africa.

A general view of the control room at the Leicester generating station, the extensions of which were brought into service on Wednesday. A description of the new plant, together with further pictures of the station appear on pages 221–223.

Sir Andrew Duncan, chairman of the Central Electricity Board, who has been appointed to the Economic Council inquiring into general economic conditions.



The March window display in connection with the E.D.A. selling campaign is devoted to the subject of spring cleaning. The interior is first covered with pale green crêpe paper and the home window effect is obtained by setting aside a portion of the background to be used as an imitation window. This is then covered with pale blue crêpe paper, and the window panes are obtained by making use of strips or tubes of white crêpe paper.



A company of over 400 employees of the Shropshire, Worcestershire and Staffordshire Electric Power Co. were entertained at their fifth annual dinner by the company at Dudley Town Hall on February 8th. Representatives were present from all parts of the company's area, which now embraces about 2 500 square miles. Mr. T. E. Boothby presided, supported by Mr. J. T. H. Legge, the Mayor of Dudley and the Chief Constable.

During the latter half of last week, from February 12th to the 15th, a remarkable effort was made to promote the better electrical education of women engaged in supply authority and contractors' showrooms in this country. The "course" was provided by the E.D.A., E.L.M.A. and the Electrical Association for Women, working in close alliance, and no fewer than 130 women from all parts of the country signed on for three days' intensive instruction. The lectures were staged in E.L.M.A.'s Lighting Bureau in Savoy Street, London, and attention was devoted during the morning and afternoon sessions on Wednesday, Thursday and Friday to the whole range of electrical activities—lighting, installation work, heating, cooking, and salesmanship. On Friday evening more than one hundred of the students assembled for an informal dinner at the Coventry Restaurant, with Lt.-Col. Vignoles in the chair. On the following morning (Saturday) visits were arranged to the new Polytechnic building and to the showrooms of the Westminster Electric Supply Corporation and the Battersea electricity department.

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COMPANY NEWS.

Cables and Wireless Stocks Steady—Enfield Cables Shares Improve—Underground Companies' Dividends—Yorkshire Electric Power Co.'s Meeting—New Companies.

CABLES and Wireless "A" ordinary stock has steadied a little after its recent fluctuation, and this week's quotation of 64½ compares with 63 a week ago. The "B" and preference stocks of the company are unchanged at 30½ and 96 respectively. Radio Corporation of America shares have continued to be in demand, and the price has risen from 43¼ to 46; while American Telephone and Telegraph capital stock has not only maintained the higher price level reacted on the announcement recently regarding the proposed agreement between the two companies, but has during the past week advanced a further five points to 240. Hydro-Electric Securities have recovered from 42¼ to 43⅝, and International Telephone and Telegraph stock from 70 to 72½ dollars. International Holdings are rather easier at 5.

In the manufacturing section the feature has been the further strength of Enfield Cable Works ordinary shares, which show an advance on the week from 93s. 9d. to 96s. 3d., after being higher. General Electrics have put on 1s. 3d. to 47s. 6d., and British Thomson-Houston debentures are a point better at 104½. Consolidated Signal ordinary shares have dropped five shillings, from 42s. 6d. to 37s. 6d. Ever-Ready ordinary shares have eased 3d. to 17s. 3d.

Quite a number of changes are recorded among electricity supply shares. The ordinary shares of the Fife Tramway, Light and Power Company have jumped up from 12s. 6d. to 14s. 4½d., and the 6% preference from 16s. 3d. to 17s. 6d. Clyde Valleys have recovered last week's fall. St. James' and Pall Mall shares are up a shilling, from 25s. 6d. to 26s. 6d., and Electrical Distribution of Yorkshire shares have been advanced to 35s. Midland Corporation for Power Distribution shares have fallen 1s. 3d. to 32s. 6d., and Scottish Power shares from 30s. to 29s. Tokyo bonds are half a point higher; Victoria Falls shares are slightly down at 58s. 9d.

In the transportation section, London United Tramways debentures are a couple of points higher at 52½, and Rio de Janeiro 1 at 86⅜. Central London ordinary stock has risen 2 points, but Metropolitan ordinary is a point down.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6¼	" " "C" Cum. Pref. ..	21/-	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	61/3	61/3	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/6	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	80	80	81	77½
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	36/3	35/7½	44/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	45/-	45/7½	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	33/9	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	14/4½	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	16/3	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	87*	89	92	80½
—	Hydro Electric Securities.. ..	43⅛	42½	87	20
—	International Holdings	5	5⅛	35½	6
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	26/6	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	99	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
1/9⅜	Metro. Elec. Sup. Ord.	38/9	38/9	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	28/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2⅜	N'castle-upon-Tyne Elec. Sup. Ord..	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	11½	9⅜
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
c)	St. James' & P.M. Ord. (£1) ..	26/6	25/6	28/6	23/6
8	Scottish Power Ord.	29/-	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94½	94	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	58/9	59/4½	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	90½	90½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	" " " " 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
4	Cent. Lon. Ry. Ord. Stk. (asstd.)..	73	71	74½	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. .	69	69	65½	52
4	" 4% Perp. Deb. ..	76½	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	79	42½
4	" " " " 4% Pf. Stk.	72	72	77	68
4	" " " 4% Deb. ..	76½	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	50½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " 5% Deb. ..	70½	70½	72½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	63½	64½	81	54½
3½	" " " 3½% Pf. Stk. ..	62	62	76	60½
3½	" " " 3½% Deb. ..	67½	67½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	74½	74½	81½	52½
4½	" " " 4½% 1st Pref. ..	80½	80½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	86½	85½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	23/-	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	26/6	26/6	58/6	26/3
8	" " " 8% C.P.	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	99/4½	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	104½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	75/-	75/	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	37/6	42/6	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	20/-
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	96/3	93/9	112/6	60/-
7½	" " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb... ..	65½	65½	107⅜	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/3	17/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/6	28/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	47/6	46/3	81/3	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	121/3	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	27	27	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	240	235	314½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk.	102½	102½	105½	91
1½	" " Deferred Stk.	24⅜	24	27	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	64½	63	90½	73½
—	"B" Ord. Stk.	30½	30½	104	33
—	5½% Cum. Pref. Stk. ..	96	96	99	90
3½	Eastern 3½% Pref. Stk.	63½	63½	70½	58½
4	" 4% Deb.	77	76	81½	73
4	Eastern Extension 4% Deb. Stk.	76*	76	80½	73
22	Great Northern Telegraph (£10)	30½	31	43½	26
—	International Teleph. & Teleg. ..	$72½	$70	161½	48½
15	Marconi Int. Mar.	43/9	43/9	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	97⅛	97⅛	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	46	43⅜	115⅜	18⅛
4½	United R. Plate Teleph. 4½% Deb.	87½	87½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(a) 19⅜d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7.181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅜d. per share.
*Ex dividend.

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Directors' Reports, etc.

CONSOLIDATED SIGNAL CO., LTD.—Fin. div. 12%, less tax, is announced.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—Fin. div. 10·477d. p. sh., less tax, is announced, makg. standard div. for year of 8·532%.

WESTERN ELECTRIC CO. (U.S.A.).—The company has offered shhldrs. the right to subscribe for 700 000 shs. of common stk., at 40, in the ratio of one new sh. for every seven held.

CHARING CROSS ELECTRICITY SUPPLY CO., LTD.—Fin. div. of 10 1/16d. p. sh., less tax, makg. 19 3/16d. (same as last year), being standard div. on West End undertakgs. of the company, is announced.

METROPOLITAN RAILWAY CO.—The British Shareholders' Trust, Ltd., has, during the present week, offered for sale £2 000 000 of 3½ % A deb. stk. at £65½, to yield, after 1st int. paymt, £5 6s. 10d. %.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Fin. div. of 3% (3s. p. sh.) on 6% £5 pref. shs., makg. 6% for year 1929, less tax, and fin. div. of 5% (1s. p. sh.) on £1 ord. shs., makg. 9% for year 1929, less tax, will be payable on March 12.

INTERNATIONAL MARINE RADIO CO.—The British directors of the International Marine Radio Co., which was recently formed by the International Telephone and Telegraph Co., are Messrs. G. H. Nash, F. J. E. Brake, Alex. Davidson and R. L. Nicholson,

ALUMINIUM CORPORATION, LTD.—At a mtg last Friday, the 1st deb. hldrs' assented to the release of rights of the deb. hldrs. agst the company, conditionally on a scheme of reorganisation of cap. becoming operative. The deb. hldrs. are to receive 60% in cash, and for the blce. they will receive a new 1st deb. carrying a higher rate of int. Whereas the present debs. are redeemable at a premium of 5%, the premium of 5% on the new debs. applies to only 40% of the principal.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Net rev. for 1929, £400 225, agst £374 621 ; plus blce. brt. in £28 202. Int., £33 983 ; to res. for 5% mtges. £2 000; redemptn. fund for 5½% deb. stk.; £8 750 ; to res. £126 548. Div. on 6% cum. pref. shs. for year, £69 000 ; div. on ord. shs., 10% for year, of wh. 4% has already been paid. Fwd. £28 146. Electricity sold was 199 700 000 kWh, agst. 164 300 000. A specl. mtg. will be held on Feb. 25, following the ord. gen. mtg., to consider resolutions to create and issue 250 000 6% cum. pref. shs. of £1 each and £750 000 further 5½% deb. stk.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—Income for 1929, £650 192, blce. to net rev. acct., £206 739 ; net rev. £161 292 ; fin. ord. div., 13·12d. p. sh., makg. standard div. of 1s. 9·12d. p. sh. To special res. (ord. shhldrs.' proportn. of consumers' benefit), £29 166. Fwd., £25 574, agst. £29 022. Consumers' benefit for year amtd. to £174 996. Directors have inaugurated an employees' co-partnership scheme, and amt. to be distributed for 1929 is £9 803. Total number of meters connected at Dec. 31, 1929, amtd. to 33 423, agst. 31 294. Electy. sold during year was 71 436 473 kWh, increase 11 582 064.

SOUTHERN RAILWAY CO.—Gross receipts for 1929, £26 507 018, decrease £9 877 ; pft. £6 547 965, increase £153 553. Div. on pfd. 5%, and on defd. 2½%, agst. 2%. Surplus for year £26 168, agst. £30 052 ; fwd. £161 886, agst. £135 718. Orders have been given for electrificatn. of lines from Hounslow and Twickenham to Windsor, Dartford to Gravesend, and West Croydon to Wimbledon, and it is anticipated that these lines will be operated electrically during the current year. In accord with the remissn. of railway passenger duty, company will expend £2 042 560, and this will be applied in electrifying line to Reigate, Brighton and Worthing.

FIFE TRAMWAY, LIGHT AND POWER CO., LTD.—Net rev. for 1929, £99 771, agst. £80 198. Int. charges £28 117, agst. £26 635 ; to debenture sinkg. fund £4 449, agst. £4 968 ; to res. £7 767, agst. £8 000. Ord. div., 4% (same) ; fwd. £25 286, agst. £5 848. Pfts. of undertakgs. owned and operated by company, £122 218, agst. £127 004. Power and lightg. business was sold as at July 1, 1929. Accts. include rev. of power and lightg. properties for half year to June 30, 1929. Outstandg. 5% deb. stk. was repaid on Nov. 11, and repaymt. of 5½% regd. notes will be made on March 31. Arrangemts. have been made for further protectg. tramway undertakgs.

ELECTRICAL AND INDUSTRIAL INVESTMENT CO., LTD.—Pft. for 1929, £23 797, agst. £22 148 ; pref. div. (6%) absorbed £6 000 (same), div. on pfd. (7%), £7 000, agst. 6%, or £5 400. Fwd. £3 797, agst. £3 748, makg. undivided pfts. acct., £21 737. The unissued 10 000 dfd. shs. of £1 each were subscribed at par ; dfd. ord. shs. were converted into dfd. ord. stk. Credit blce. resultg. from changes of investmts. has been placed to res., making that acct. £71 363. Investmts. are stated in blce. sheet at or under cost (£628 786). They consist of debs., deb. stks., etc., 19·92% (agst. 22·15%) ; pref. shs. and stks., etc., 16·72% (agst. 17·84%) ; ord. shs. and stks., etc., 52·92% (agst. 53·46%) ; Governmt. and municipal loans, 7·57% (agst. 6·55%) ; syndicates and loans, 2·87% (agst. nil). Of total investmts., electric power and tractn. (combined undertakings) acct. for 2·82%, tramways and omnibuses 15·97%, electric lighting and power 1·69%, commercial and industrial 24·54%, railways 14·24%, financial trusts 9·62%, and Government 7·21%.

UNDERGROUND GROUP.—The following are abstracts of the accounts of the Underground Electric Railways Co. of London, and companies controlled by the Underground Group. —*Underground Electric Railways Co. of London, Ltd.*—Full half year's int. to Dec. 31, 1929, on 6% 1st cum. income deb. stk. and on 6 % income bonds of 1948, makg. in each case a full rate for year, and fin. div. of 5% on ord. shs., makg. 8% for year, agst. 7% (payable on March 7) ; Fwd. £265 950, agst. £262 504. *Metropolitan District Railway Co.*—Fin. div. on ord. stk. of 2½%, makg. 5% for year (same as last year) ; to res., £117 000, increase £6 575 ; fwd. £48 108, agst. £44 768. *London Electric Railway Co.*—Fin. div. on consol. ord. stk., 2½%, makg. 5% (same) ; to res. £186 332, increase £16 383 ; fwd. £186 784, agst. £177 152. *City and South London Railway Co.*—Fin. div. on consol. ord. stk., 2½%, makg. 5% (same) ; to res., £30 000, agst. £25 000 ; fwd. £37 708, agst. £36 179. *Central London Railway Co.*—Fin. div. on undivided ord. stk., 2½%, makg. 5% (same) ; fin. div. on pfd. ord., 2%, makg. 4% (same) and div. for year on dfd. ord. stk. 6% (same) ; to res., £33 000, decrease £7 134 ; fwd. £108 151, agst. £105 053. *Associated Equipment Co., Ltd.*—Fin. div. on ord., 4%, tax free, makg. 8% (same) ; fwd. £207 843, agst. £201 261. In all cases except the ord. div. of the Underground Co., the int. and divs. will be paid on March 1.

Company Meetings.

GLARE-VISOR PARENT, LTD.—At a recent special meeting resolutions for the amalgamation of the company with the Sphinx Electric Co. were adopted. The proposals were that Glare-Visor be wound up voluntarily, that Sphinx Electric take over the undertaking, assets and liabilities of the company, and that shareholders be entitled for every share now held to subscribe for two ordinary shares in the amalgamated company of 1s., credited as 6d. paid up, leaving a liability of 6d. per share. Sphinx Electric will increase its present capital by the creation of the necessary number of ordinary shares of 1s. each.

WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD.—Lord Southborough, presiding at meeting on Monday said the net profit for the year ended September, 1929, was £102 292. The average for the four preceding years was £101 144. Their rectifier business continued to increase in volume. This year their output had been about three times the amount of last year. He hoped that the apparatus was familiar to all who used wireless sets, and, if it were not, they hoped shareholders would examine the invention and give their support to the company rather than to the manufacturers of rectifying valves. For the first four months of the present financial year both orders and sales had been high, and he was advised that these four months would show highly satisfactory trading profit figures. Prospects for the remainder of the current financial year were good in the sense that a very large volume of signalling work was to be let by the British railways during the next eight months, and they hoped to obtain their proportion of it. The report was adopted and the dividend of 8%, less tax, approved.

POWER SECURITIES CORPORATION, LTD.—Mr. George Balfour, M.P., presiding at the meeting last Friday, said he did not think that any responsible person could view the future of the country with anything but grave misgivings. They could only hope that the serious situation with which the country was faced would stimulate interest in public affairs, resulting in a diminution of Government interference, which, in his view, was the chief cause of unemployment and other troubles. The large works at Lochaber had been successfully carried out, involving the removal of a million tons of rock in the 15-mile tunnel, the construction of many shafts, dams, and intakes, finished with the blasting out of the end of the tunnel into Loch Treig 100 ft. under water. The profits shown in the corporation's account would have been substan-

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tially greater during the last few years if they had not been under the necessity of making provision in the accounts of Balfour, Beatty, and Co. against any possible loss on these works instead of bringing into their account substantial profits from this source. The work on the Grampian scheme had gone on without a hitch, and was well up to time. They had every reason to believe that the hydro-electric power works, equipped with 32 000 kW plant, would be in operation in the autumn and the supply available over a very wide area. They solidly established the Spanish enterprise to which he referred last year and pulled it out of its difficulties and arranged a sale, for their friends for whom they were acting, to the most important Spanish interests, the transaction giving satisfaction to all parties. At present they had on hand works involving finance and engineering on a thoroughly satisfactory basis amounting to upwards of £2 000 000 at home and abroad, including South America, East Africa, India, Palestine, Italy, etc. Only a few days ago they signed the contract with the Madras Government for the handling of a large hydro-electric plant and the construction of over 100 miles of extra high tension transmission lines. Investments at or under cost amounted to £550 082, an increase of about £50 000 over last year, this amount being largely represented by additional shares which they had taken up in electric supply companies. Investments in shares of subsidiary companies stood at £377 529, being the cost of their investments in Balfour, Beatty, and Co., Ltd., and the Hydro-Electric Development Co., Ltd. The reserve account had been increased to £150 000. The income for the year was £112 393, a decrease of £11 000. The balance, after provision for expenses, taxation and directors' fees, was £79 424, a reduction in the net profit of £6 000. The report was adopted, and the dividend of 7%, less tax, on the ordinary shares was approved.

YORKSHIRE ELECTRIC POWER CO.

Increased Revenue—Further Growth of Bulk Supplies—The Ferrybridge Selected Station.

THE shareholders' meeting of the Yorkshire Electric Power Co. was held in Leeds on Tuesday, February 18th.

The Chairman said: The revenue has grown from £605 858 to £675 309, an increase of over £70 000.

The company is supplying a number of local authorities and Water Boards with electricity for water pumping purposes, and a supply of electricity is available throughout the whole of the company's area for these purposes. In the revenue account £20 000 has been reserved for contingencies; this will be added to the £100 000 set aside in past years. The company's works have been fully maintained out of revenue, and so far it has not been necessary to make calls upon this fund.

Bulk supplies again show an increase; the company is now giving a supply in bulk to 8 boroughs, 93 urban districts and 20 rural districts. During the year the company has been authorised to supply electricity in an area of 66 square miles in the county of Derby, and the company is already meeting substantial demands in the new district. The company is proceeding with the application for powers to supply in the county of Lincoln and in the East Riding of Yorkshire.

The Commissioners have now intimated their intention to grant powers to the company to supply for all purposes, and the details are under discussion. It was reported at the last meeting that the Central Electricity Board had issued their Mid-East England Electricity Scheme. The area to which the scheme relates contains 40 public generating stations, of which 18 have been determined to be selected stations. The company's Ferrybridge power station is the most efficient of those 18 stations in the area under the Mid-East England Scheme which the Board have determined to be "selected" stations and is one of the four most efficient stations in the country. It is satisfactory to note that all the stations of the company have been selected, and that two of them are included in the five which are intended to deal with the base load output over an area of above 7 500 square miles.

It is proposed to make an early extension of the generating plant at Thornhill by the installation of a 27 500 kW turbo-alternator to meet the growing demands.

The proposals of the board include the addition of £100 000 to the general reserve fund, increasing that fund to £575 000. This amount, with the sum carried forward after payment of dividend and the balances standing to the credit of the share premium account and plant renewals fund, amount to a total of £804 155, which is available for renewals and other purposes.

The report and accounts were adopted.

NEW COMPANIES.

HUPP, LTD.—Cap., £1 000. Wireless, electrical and general engineers, etc. Reg. Office: 112, Fenchurch Street, London, E.C.

EDWARDS AND MARSHALL, LTD.—Cap., £1 500. Electrical and general engineers, etc. Reg. Office: 30½, Winchcombe Street, Cheltenham.

IRISH A. E. G. ELECTRIC CO., LTD.—Cap., £100. Manufacturing and consulting electrical engineers, etc. A subscriber: J. McBreen, 88, Grosvenor Square, Rathmines, Dublin.

E. L. MAIDEN, LTD.—Cap., £1 000. Heating and ventilating engineers, electrical engineers, etc. Reg. Office: 36, Bolsover Street, Great Portland Street, London, W.1.

HOME UTILITIES (MIDLANDS) CO., LTD.—Cap., £500. Dealers in electrical or non-electrical cookers, refrigerators, vacuum cleaners, etc. Reg. Office: 19, Gordon House, Carrington Street, Nottingham.

MACBRIDES, LTD.—Cap., £500. Manufacturers of, agents for, and dealers in machinery and plant, including electrical generators, engines and plant, etc. Reg. Office: Southern Railway Sidings, Hampton, Middlesex.

R. C. SEAL AND CO., LTD.—Cap., £2 000. To acquire business carried on by T. A. R. Terrell as "R. C. Seal," at 18, Dartmouth Street, Westminster, S.W.1, to carry on business of manufacturers of electrical appliances, etc.

INDUSTRIAL SCIENTISTS, CONSULTANTS AND FINANCE CORPORATION, LTD.—Industrial scientists, scientific advisers, electrical and general engineers, etc. A director: G. Martin, Woodleigh, Barrington Road, Wembley, London, N. (both permanent, subject to each holding 50 shares).

FREDERICK SQUIRE, LTD.—Cap., £1 000. Manufacturers of and dealers in wireless apparatus, apparatus for the transmission and reception of pictures by wireless, amplifiers, generators, accumulators and batteries, electrical engineers, etc. Reg. Office: King's Works, Leswin Place, Stoke Newington, London, N.16.

BROADCAST RELAY SERVICE (CLACTON), LTD.—Cap., £7 000. To acquire business established by Broadcast Relay Service, Ltd., at Clacton-on-Sea, and Braintree, to construct and maintain wireless signal stations for the reception or distribution of wireless or radio signals, etc. Reg. Office: 93, Hayes Road, Clacton-on-Sea.

METAL AND CHEMICAL PRICES.

TUESDAY, February 18th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£77 0 0	—	£1 10 0
Electro Wirebars	,,	£84 5 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	,,	11⅛d.	—	⅛d.
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 0 0	—	—
Foreign or Colonial	,,	£21 12 6	2s. 6d.	—
Tin—				
Ingot	per ton	£174 7 6	-	£1 0 0
Wire, basis	per lb.	2s. 4½d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 7 6	—	7s. 6d.
Mercury	per bottle	£23 5 0	—	—

Sulphur—Flowers, Ton £12 0 0 Roll, ,, £10 10 0

Sulphuric Acid (168° Tw.) Ton £6 15 0

Copper Sulphate .. Ton £25 to £25 10s.

Boric Acid (Crystals) ,, £32 0 0

Sodium Chlorate—Per lb., 2⅝d

Sodium Bichromate—Per lb., 3⅛d.

Rubber—Para fine, 8½d.; plantation, 1st latex, 8½d.

.·. The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

According to James Forster and Co. the closing prices on February 14th were £21 13s. 9d. for February, £21 11s. 3d. for March, April and May; 3s. 9d. to 1s. 3d. higher on the week.

GOVERNMENT PUBLICATIONS.

The following publications have been issued by H.M. Stationery Office, London, etc.:—

Great Yarmouth Electricity Supply Draft Special Order. 6d.

Electric Lighting Orders Confirmation Act (No. 3). (Reprint.) 14s. 3d.

North-East England Electricity Scheme, 1929. 1s. 6d.

Report of Department of Scientific and Industrial Research for 1928–29. 3s. 6d.

Ministry of Transport: Tramways and Light Railways (Street and Road) and Trackless Trolley Undertakings, 1928–29. 10s. 6d.

Department of Scientific and Industrial Research: Building Research Technical Paper No. 8.—The Corrosion of Lead in Buildings. 1s.

Mines and Quarries Forms, II. Coal Mines Act, 1911. General regulations as to the installation and use of electricity, with explanatory notes. (Revised edition, January, 1930.) 6d.

General Post Office, Engineering Department. Technical instructions, XXV. Automatic Telephone Exchange Systems: Part 8. P.B.X. Final Selectors. 6d.

War Office, Government Department Electrical Specifications, No. 129, 1929. Electric Cables, K.P. and L.P. Classes. (Paper, insulated, for Electric Power and Light.) 6d.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ANDIA, LTD., 13, Old Burlington Street, W., electrical engineers. £17 19s. 8d. December 2nd.

APPLEYARD BROTHERS, 21, Reliance Place, Sheffield, electrical dealers. £19 17s. 5d. December 31st.

COATES, Dennis, Anson Street, Rugeley (late trading as POWIS AND PYLE), electrical engineer. £18 15s. 2d. December 19th.

COWNE, Cecil A., 13, Cobbold Road, Willesden, electrical contractor. £28 8s. January 8th.

DEVEREUX, LTD., Yukon Road, Balham, electrical engineers. £13 10s. 2d. January 13th.

FORSTER, George, Carlton House, Lower Regent Street, W., radio dealer. £14 10s. 9d. January 1st.

JACKSON, C. H., Chantry Wireless Stores, Cartergate, Grimsby, electrical dealer. £18 4s. 1d. January 10th.

MAYFAIR ELECTRIC GRAMOPHONE, LTD., 39/41, New Bond Street, E.C., manufacturers. £16 12s. 10d. December 19th.

MCKERCHAR (W. A.) AND SONS, 23, Skelton Terrace, York Road, Leeds, electrical engineers. £55 7s. 10d. January 10th.

NEWMAN, A., 4, Cranbrook Road, Ilford, radio dealer. £37 10s. 8d. January 8th.

PENN, Arthur James, 43, Gladstone Terrace, Northampton, wireless equipment dealer. £12 15s. 2d. January 8th.

ROBINSON (R. J.) AND CO., 1, Brackenborough Road, Louth, electrical engineers. £17 1s. 10d. January 17th.

Receiverships.

ACME ELECTRIC WIRE AND CABLE CO., LTD.—S. I. Wallis, of King John's Chambers, Bridlesmith Gate, Nottingham, was appointed receiver on February 3rd, 1930, under powers contained in debenture dated August 18th, 1925.

TANGENT TOOL ENGINEERING CO., LTD. F. W. Eacott, of 68, Filton Road, Horfield, Bristol, was appointed receiver on February 5th, 1930, under powers contained in debenture dated October 2nd, 1925.

T.V.E. (TRIPLEX-BLADE VENTILATING ENGINEERING) CO., LTD. —E. L. Lee, of 25, Victoria Street, Westminster, was appointed receiver on February 1st, 1930, under powers contained in instrument dated September 24th, 1928, and on January 25th, 1930, under powers contained in instruments dated December 3rd, 1928, and January 29th, 1929.

Mortgages.

[NOTE.—***The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.***]

BOWERS AND BARR, LTD., Great Yarmouth, electricians.—Registered February 5th, £350 mortgage, to Mrs. S. A. R. Barr, 11, Trafalgar Road, Great Yarmouth; charged on 9, Baker Street, Gorleston-on-Sea. *£1 138 bank overdraft, £300 mortgage. December 31st, 1929.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD., London, S.W. —Registered February 1st, £850 000 charge, to Secretary of the Government of F.M.S. Kuala Lumpur; charged on a concession etc. lands and property in the F.M.S. or elsewhere present and future, etc. (subject to 1st Trust Deed and in priority to 2nd Trust Deed). *£2 850 000. January 14th, 1930.

RIDOUT AND RATCLIFF, LTD., London, W., electrical contractors. —Registered February 4th, £1 000 debenture, to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on land in London, also general charge. *Nil. October 31st, 1929.

London Gazette, etc.

Winding-up Petition.

HALCYON WIRELESS CO., LTD. A creditor's petition for winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, on Monday, March 3rd.

Companies Winding-up Voluntarily.

CLEETHORPES RADIO SUPPLY, LTD. By reason of its liabilities, February 10th. A. J. Weaver, corporate accountant, 77, Victoria Street, Grimsby, appointed as liquidator.

STANDARD ELECTRIC CO., LTD. Meeting of creditors, 190, West George Street, Glasgow, Tuesday, March 11th, at 11.15 a.m.

Bankruptcy Information.

CANE, John Alwyn, CANE, Thomas Phillips, CANE, Douglas Raymond, consulting and electrical engineers, trading as CANE BROTHERS, Sturry, Kent. Receiving order, January 28th. Creditor's petition.

EDGHILL, Harry George, 13, Wembley Hill Road, Wembley, Middlesex, electrical and wireless engineer. Receiving order, February 10th. Debtor's petition. First meeting, February 26th, 12 noon, 29, Russell Square, London, W.C.1. Public examination, March 12th, 10.30 a.m., Court House, St. Albans.

Bankruptcy Proceedings.

COHEN, George, electrical engineer, 49, Newman Street, London, W. The affairs of this debtor came before Mr. Registrar Warmington in the London Bankruptcy Court on Wednesday on the hearing of his application for an order of discharge. The Official Receiver reported that the adjudication in bankruptcy took place on November 20th, 1928. According to the report of the trustee in bankruptcy the proofs of debt and probable claims together amounted to £4 075 and the assets which were valued by the debtor at £550 had realised £344. The debtor originally began business as an electrical engineer in 1901, but in 1910 was compelled to compound with his creditors, having incurred losses through bad debts. Afterwards he carried on business in Golders Green Road. On his demobilisation from the Army in April, 1919, he resumed business in the City, and he had since traded either alone or in partnership. The Official Receiver opposed the application on several statutory grounds and alleged that the debtor had failed to account satisfactorily for a deficiency of his assets; and that he had been guilty of misconduct under the Bankruptcy Act in transferring his assets in April, 1928, to an alleged partnership with his son, aged 17 years, and in appealing against the receiving order and thereby delaying the proceedings for nearly three months, whereby he was enabled to dispose of a large quantity of stock purporting to be partnership property after the receiving order, thereby defeating and delaying his creditors and causing them substantial losses estimated by himself at £901; and further that in making payments of £150 and £50 to two persons after the date of the receiving order for alleged loans he had also been guilty of misconduct. His Honour suspended the discharge for five years.

LANCELOT, E., Old Trinity House, 5, Water Lane, London, E.C. The debtor, who formerly carried on business as a dealer in electrical batteries, attended before Mr. Registrar Mellor in the London Bankruptcy Court last week for his public examination. It appeared that in January, 1926, he began business, with a capital of about £65, as a dealer in electrical batteries. Shortly afterwards, with a view to developing the business, he entered into a verbal arrangement with a certain firm, to whom, in consideration of financial assistance, he agreed to pay half of his profits. In or about June, 1926, the debtor took an office at 145, Fenchurch Street, City, and early in the following year the firm just mentioned was unable to provide further money, and, as a result, he was forced to cease trading. In August last judgment was obtained against him by default in respect of a disputed claim for moneys advanced under the arrangement, and the proceedings in bankruptcy ensued. The debtor attributed his insolvency to his liability under the judgment. The examination was concluded.

WYLIE, Ewart James Hutchings, 1 367, London Road, Norbury, Surrey, lately wireless set manufacturer. The receiving order herein was made on January 13th on the debtor's own petition. According to the statement of affairs there are liabilities amounting to £742, against assets of £14, a deficiency of £728. Debtor attributed his failure to lack of capital and bad trade. The debtor states that in May, 1928, he and another commenced business in partnership as wireless set manufacturers, at 21, Lonsdale Road, Kilburn, his partner providing £100 as capital. In June, 1928, they supplied a quantity of 3-valve wireless sets to a customer who afterwards returned them on the grounds that they were not up to specification. Costly experiments were afterwards made to produce a set to the required standard but without success, and the debtor estimates they made a loss of £300 over this order. The debtor also states that in April, 1929 the partnership was dissolved, his partner taking over the assets, about £450, and agreeing to discharge the liabilities of £750, but the debtor has no knowledge of what became of the assets or what debts were paid. Since June, 1923, the debtor has been employed as manager to a firm of wireless set manufacturers. The debtor filed his petition in consequence of a judgment being obtained against him by one of the late partnership creditors. The debtor further states that his partner closed the business in August, 1929. The books stated to have been kept by the partnership firm consisted of bought and sold ledgers, petty cash book, and delivery book, and these were taken over by the late partner. Debtor admits that he became aware of his position in April last. As a result of the first meeting of creditors the matter remains in the hands of the Official Receiver as trustee. The following are creditors: Hughes and Co., T. A., Ltd., £580; London Radio Manufacturing Co., Ltd., £80; Six Sixty Radio Co., £81.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

320 881 C. H. Verity. Means for the synchronisation of broadcast wireless sounds and kinematograph films. (23/7/28.)
321 138 J. L. Baird and Television, Ltd. Television apparatus and the like. (31/5/28.)
309 539 Electrical Research Products, Inc. Manufacture of chromium articles. (12/4/28.)
320 959 Soc. Chimique de la Seine and V. Szidon. Methods of electrolytically depositing chromium. (28/7/28.)
320 882 Brookhirst Switchgear, Ltd., and J. A. Hirst. Method of and apparatus for starting and controlling electric motors. (16/6/28.)
320 864 W. E. Beatty (Bell Telephone Laboratories, Inc.). Driving-shafts. (20/7/28.)
320 961 W. E. Beatty (Bell Telephone Laboratories, Inc.). Television and like systems. (26/1/28.)
320 866 E. Y. Robinson and Associated Electrical Industries, Ltd., Vacuum electric tube devices. (19/6/28.)
321 154 H. D. Black. Indicator-boards of totalisators. (26/4/28.)
289 443 A. Blondel. System of distant electric control by synchronized distributers. (27/4/27.)
321 194 J. Johnston. Television systems. (3/5/28.)
321 196 J. L. Baird and Television, Ltd. Glow-discharge lamps and the like. (4/5/28.)
291 384 British Thomson-Houston Co., Ltd. Remote electric control systems. (31/5/27.)
320 979 H. H. Berry. Day and night signs. (5/3/29.)
321 144 P. D. Tyers. Electrical reproduction of gramophone and like sound records. (26/6/28.)
321 147 King's Patent Agency, Ltd. (W. B. Phillips). Switchgear for operating systems of electric lighting in railway carriages and other vehicles. (29/6/28.)
321 197 M-O Valve Co., Ltd., and B. S. Gossling. Vacuum tube electric devices. (2/7/28.)
293 323 Allgemeine Elektricitats ges. Thermionic valves and the like. (2/7/27.)
321 151 P. W. Willans. Electromechanical apparatus, such as sound reproducers or tramsmitters, oscillographs, and the like. (25/7/28.)
321 156 A. V. Tomlinson (McKenzie and Holland (Australia) Proprietary, Ltd.). Electrical point and lock detectors for railways. (26/7/28.)
321 165 Simplex Conduits, Ltd., and H. F. McLoughlin. Metallic boxes or cases such as used for the mounting of electric switches or other electrical accessories. (30/7/28.)
321 206 D. Ripley. Electric protective systems and apparatus for use therewith. (31/7/28.)
321 184 J. A. Crabtree and B. G. Harrison. Switch and other cover plates such as used in conjunction with flush-mounted and surface-mounted electrical accessories. (1/8/28.)
295 714 A. C. Spark Plug Co. Ammeter. (19/8/27.)
321 216 Automatic Telephone Manufacturing Co., Ltd., G. A. Burns, H. S. Deyes. Telephone systems. (2/8/28.)
306 520 Akt.-Ges. Brown, Boveri, et Cie. Mercury-vapour rectifiers. (23/2/28.)
304 644 Westinghouse Brake and Saxby Signal Co., Ltd. Light-sensitive apparatus. (23/1/28.)
301 056 Westinghouse Brake and Saxby Signal Co., Ltd. Light signals. (25/11/27.)
295 685 Siemens-Schuckertwerke Akt.-Ges. Electric discharge devices for use as relays. (17/8/27.)
321 223 W. T. Henley's Telegraph Works Co., Ltd., A. W. C. McArthur, and H. C. Hoban. Jointing of multi-core electric cables. (3/8/28.)
321 226 P. E. J. Eggers. Devices for interrupting and for closing electric circuits employed in connection with internal-combustion motors and other electric circuits. (4/8/28.)
295 389 Siemens-Schuckertwerke Akt.-Ges. Electrical maximum-demand indicating-device. (11/8/27.)
295 330 Allgemeine Elektricitatsges. Thermionic valves. (9/8/27.)
295 402 British Thomson-Houston Co., Ltd. Electric protective arrangements. (11/8/27.)
309 901 Submarine Signal Co. Distance or depth finding systems or apparatus. (17/4/28.)
295 640 International General Electric Co., Inc. Terminal boxes for multicore cables. (15/8/27.)
321 246 British Thomson-Houston Co., Ltd., and L. B. Ault. Sound-reproducing devices. (16/8/28.)
309 902 L. M. Ericsson Telefonaktiebolaget. Means for operating wireless sets from supply mains or machine generators. (17/4/28.)

Applications for Patents.

October 25th.

32 416 J. H. Aitchison, H. Bull, and L. Johnson. Electrodes or rods for welding.
32 501 Almeida Accumulators, Ltd. Secondary cells.
32 513 W. Ball. Means for locating electric light switches, etc.
32 507 E. Bornand, and H. A. Schlaepfer. Induced current furnaces. (3/11/28, Switzerland.)
32 448, 32 449 S. N. Bourne, ans British Thomson-Houston Co., Ltd. Electric switches.
32 465 F. H. Collis, and J. Sax and Co., Ltd. Electric switches.
32 430 A. F. Cornock, and General Electric Co., Ltd. Circuit breakers.
32 451 S. Davis, and Ormond Engineering Co., Ltd. Electric switches.
32 461 H. C. Holmes, J. A. A. Taylor, and A. Warwick. Electrical distributing systems.
32 462 H. C. Holmes, J. A. A. Taylor, and A. Warwick. Distribution of wireless programmes.
32 400 L. H. L. Lewis. Electric switch.
32 418 L. McMichael, Ltd., and E. J. Pound. Thermionic valves.
32 490 K. de Proszynski. Electric loud speakers.
32 480 R. N. Wellington. Electric switches.
32 516 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Loaded submarine cables.

October 26th.

32 452 J. H. and W. E. Doyle. Storage battery.
32 595 Electroacustic Ges. Subaqueous sound apparatus. (1/4/29, Germany.)
32 613, 32 614 Gramophone Co., Ltd., and M. Bowman-Manifold. Television, etc., systems.
32 542 J. Holmes, and Holmes (Bias Fabrics), Ltd. Electric insulating tape, etc.
32 526 N. V. Philips' Gloeilampenfabrieken. Photo-electric cells. (12/1/29, Holland.)
32 593 W. L. W. Schallreuter. Electric gas discharge vessels.
32 498 Siemens and Halske Akt.-Ges. Circuit arrangement for trunk communicationsystems. (25/10/28, Germany.)
32 561 J. Y. Walsh. Resistances.

October 28th.

32 638 A. W. Abbott. Electrical switch lock for motor vehicles.
32 639 R. J. Aiken. Control of electric switches.
32 750 F. Aldrovandi. Alternating current lighting systems. (29/10/28, Italy.)
32 759 W. Altner. Electrical indicating devices. (10/12/28, Mexico.)
32 742 Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. Electric totalisators.
32 764 Z. Bay. Operating electric illuminating tubes. (26/10/28, Hungary.)
32 667 J. R. Bayes. Primary batteries, etc.
32 677 British Thomson-Houston Co., Ltd. Electrical apparatus. (27/10/28, U.S.).
32 679 British Thomson-Houston Co., Ltd. Speed indicating systems.
32 680 British Thomson-Houston Co., Ltd. Power converting apparatus.
32 758 I. Brook. Burglar, etc., alarms.
32 725 S. G. Brown. Electric bells.
32 754 S. G. Brown. Sound reproducing instruments.
32 643 R. W. Butterfield. Electric pocket lamps.
32 721 T. W. Corbin. Electrical testing apparatus.
32 715 H. Elsner. Accumulators. (26/3/29, Germany.)
32 728 H. C. Holmes, J. A. A. Taylor and A. Warwick. Distribution of electrical signals.
32 681 Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. Electric heating units.
32 706 Igranic Electric Co., Ltd. Mercury timing relay.
32 632 F. W. Lanchester. Wireless reception, etc., apparatus.
32 756 W. Peter. Device for passing cables through roofs of buildings.
32 752 Rothsaccumulator Aktiebolaget. Electric power plants. (13/11/28, Germany.)
32 653 F. Wood. Electric pick-ups, etc.
32 706 S. R. Wright. Mercury timing relay.

October 29th.

32 887 H. P. H. Anderson and A. Henderson. Watertight gland for electric cables.
32 855 British Thomson-Houston Co., Ltd. Thermionic valve amplifying systems. (20/11/28, U.S.)
32 825, 32 826 Celia, Ltd., and J. J. Drumm. Secondary batteries, etc.
32 863 F. Ehrenhaft. Electrical transmission of talking films, etc.
32 843 Electrical Research Products, Inc. Magnetic materials. (13/12/28, U.S.)
32 865 Ever-Ready Co. (Great Britain), Ltd., and A. H. Sheppard. Electric torches, etc.
32 812 E. F. Goodman and Veloce, Ltd. Electrical equipment of motor cycles.
32 847 H. H. Henning. Receptacles for electric heating of liquids.
32 838 A. E. Honey and J. Stone and Co., Ltd. Electric regulators.
32 824 L. and L. C. King. Apparatus for use with telephone systems.
32 821, 32 822 H. Leben and A. Reyrolle and Co., Ltd. Electric protective systems.
32 823 A. Reyrolle and Co., Ltd., and G. R. Wilson. Cord grips for conductors.
32 880 E. W. Stapleton. Wireless receiving apparatus.
32 856 Telefonaktiebolaget L. M. Ericsson. Signalling systems. (30/10/28, Sweden.)
32 864 H. Vogt. Electrostatic loud speakers, etc.
32 796 Watford Electric and Manufacturing Co., Ltd. Control apparatus for spinning frames.

COMING EVENTS.

Friday, February 21st (To-day)-Friday, February 28th.

London and Birmingham.—British Industries Fair.

Friday, February 21st.

Institution of Electrical Engineers (London Students' Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. S. H. Hart on "Paper-Insulated Power Cables." 6.15 *p.m.*

Institution of Electrical Engineers (North-Eastern Students' Section).—Armstrong College, Newcastle-on-Tyne. Address by Mr. B. A. Robinson on "Electrons and Engineers." 7.15 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, Strand, London. Conference on "The Electrical Industry and the Architect." Speaker, Mr. C. H. Flower. 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Mr. E. P. S. Gardner on "The Application of Electric Welding to the Erection and Strengt hening of Steel Structures." 7.30 *p.m.*

Saturday, February 22nd.

Association of Supervising Electrical Engineers.—Hotel Cecil, Strand London. Annual dinner.

Monday, February 24th.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Institution of Electrical Engineers (North-Eastern Centre). Sopwith's Lounge, Northumberland Street, Newcastle-on-Tyne. Informal discussion. Opened by Messrs. P. B. Addison and A. G. Shearer. 7 *p.m.*

Tuesday, February 25th.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Falcon Café. Ordinary meeting.

Royal Institution of Great Britain.—John Street, Adelphi, London. Lecture by Sir William Bragg on "X-ray Determination of the Structure of Cellulose." 5.15 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, King Street, Leeds. Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch." 7 *p.m.*

Electrical Power Engineers' Association (London Technical Group).—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Mr. A. W. Crompton on "Changing d.c. Networks to a.c." 7.15 *p.m.*

Paisley Association of Electrical Engineers.—Lecture on "Automatic Telephony," by Mr. A. Thomson, and visit to the Paisley Post Office.

Wednesday, February 26th.

Electrical Contractors' Association (Croydon Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

Electrical Power Engineers' Association (Manchester Local Technical Group).—Paper by Dr. A. T. de Mouilpied on "Low Temperature Carbonisation of Coal."

Overhead Lines Association.—Georgian Restaurant, Messrs. Harrods, Ltd., Brompton Road, London. Conversazione, with exhibits, supper and dance. 8–12 *p.m.*

Thursday, February 27th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Faraday lecture on "Broadcasting by Electric Waves," by Captain P. P. Eckersley. 6 *p.m.*

Institution of Welding Engineers.—Caxton Hall, Westminster, London. Paper by Mr. J. Ryder on "The Training of Operators in the Welding and Cutting Industries." 7.45 *p.m.*

Friday, February 28th.

Institution of Electrical Engineers (West Wales-Swansea Sub-Centre).—Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch."

Electrical Association for Women.—Club Room, Kensington Court, London. Lecture by Mr. L. L. Robinson on "Tariffs." 3 *p.m.*

Imperial College of Science.—Imperial Institute Road, South Kensington. Paper by Mr. R. O. Cherry on "Field Intensity Measurements Around Some Australian Broadcasting Stations." 5 *p.m.*

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THE ELECTRICIAN, February 28, 1930.
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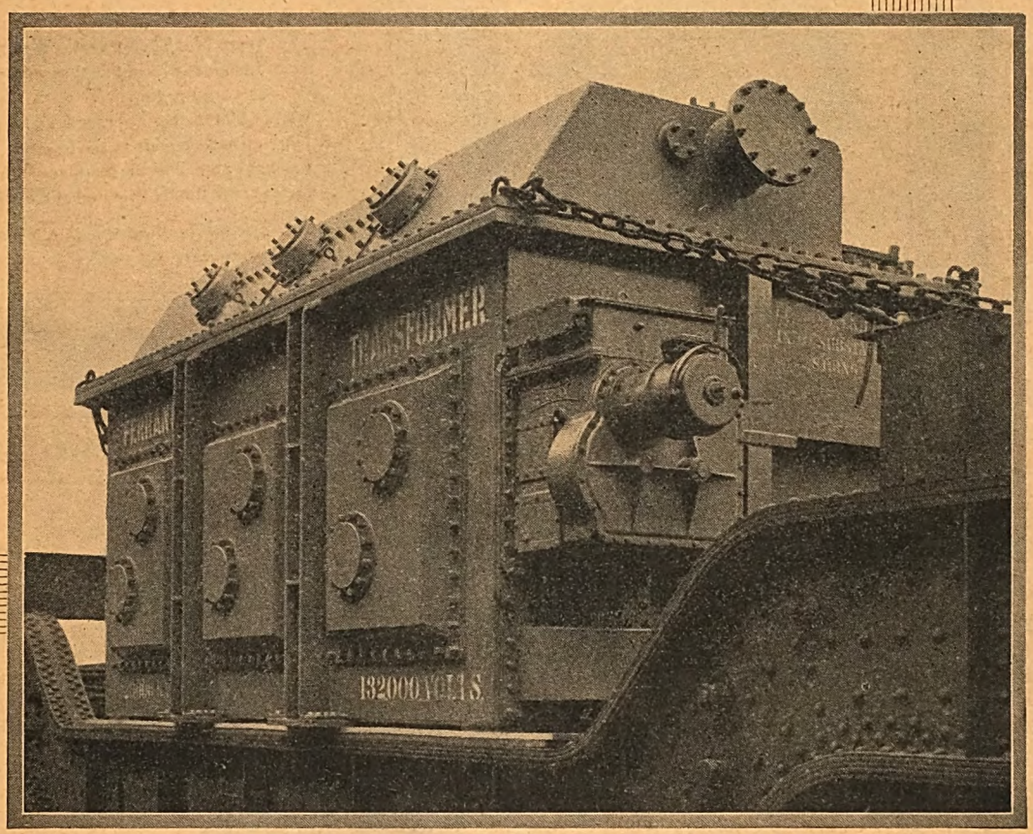
BRITISH INDUSTRIES FAIR and OVERSEAS NUMBER.

THE ELECTRICIAN

Vol. CIV.—No. 2700. Friday, February 28, 1930. [Registered at the General Post Office.] One Shilling

The First "Grid" Transformer

FOR SOUTH EAST ENGLAND SCHEME



20,000 KVA. 132 KV. 3 Phase.

The transformer with "on-load" tap-changing equipment is a complete self-contained unit, delivered to site with all connections made between transformer and switchgear

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AVERY

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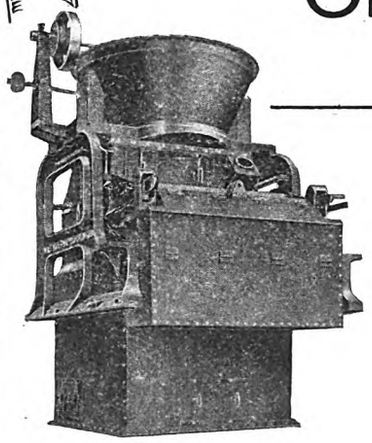

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LIST 1177.

The Avery No. 52 Automatic Weigher for Pulverised Fuel gives without dust escape, correct records of fuel consumption. The machine illustrated weighs 50 tons per hour from an Overhead Storage Hopper, and delivers to the pump. Thus, accurate records of fuel consumption are automatically kept, losses are instantly detected and economy achieved.

The Specialists in handling, weighing and blending machinery. Complete plants supplied.

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1769

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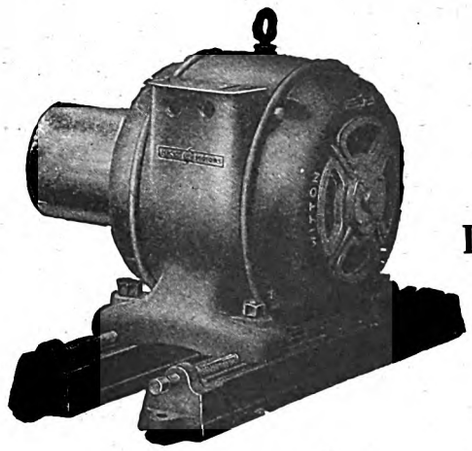
PROPRIETOR WALTER F. HIGGS, M.I.E.E.
WITTON BIRMINGHAM

A.C. D.C.



HIGGS MOTORS are the first firm in England to manufacture single phase repulsion start induction motors, fitted with brush lifting and short circuiting device (known as type "S"). With twice times full load current from the line they have the phenomenally high starting torque of three times full load torque, and in addition, they are silent in operation. They are admirably suited for driving domestic machinery, organ blowing, etc

BIRMINGHAM—EAST 1181. LONDON—TEMPLE BAR 4616. MANCHESTER—CITY 3713. BRISTOL 7902. NEWCASTLE—CENTRAL 3606. GLASGOW—CENTRAL 5863.

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

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Telephone: City 0244 (Ten lines).

[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

No. 2700. [Vol. CIV. No. 9.] Friday, February 28, 1930. **Annual Subscription, 25s. Overseas, 30s.**

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Future of the B.I.F.

EXAMINATION of the electrical stands in the Birmingham section of the British Industries Fair and conversation with the exhibitors could hardly fail to give rise to a variety of reflections, not, indeed, as numerous as the goods displayed, but ranging over a wide field. There was, even more than on previous occasions, a great deal to interest the visitor. A fine assortment of electric cookers and fires; thermostat controlled geysers and the smaller appliances associated with domestic electrification; glassware for electric lamps made in Birmingham at prices which leave Czecho-Slovakian glass behind; automatically controlled road traffic signals; moulded compositions of beautiful texture, great strength and a multiplicity of finishes; furnaces, and many other features were there to tempt the buyer not only to look but to purchase. The goods were there, but were the buyers?

It is difficult to give a general answer to that query. Now that the Fair is open to the public, with the possibility of seeing some members of the Royal Family thrown in as an additional attraction, there are always a number of people in evidence. But the Fair is not held as a sightseeing enterprise, and those who go to the trouble and expense of occupying stands are after fish of quite different species. Replies to inquiries as to the amount of genuine buying interest attracted by the Fair at Birmingham are always contradictory. Some exhibitors express satisfaction, others are non-committal, and a third category are definitely pessimistic. To some extent, this diversity may represent differences in the character, as distinct from the quality of the exhibits, and it is doubtless in part a reflection of the temperaments of individual exhibitors. On one point, however, there appears to be fairly general agreement—foreign buyers have, as in former years, not been conspicuous. And since one of the major reasons for holding the Fair is to give foreign buyers an opportunity of seeing what British manufacturers can offer them, on this head there is certainly ground for dissatisfaction with the response evoked, at any rate in the case of the Castle Bromwich section of the Fair

Two reasons are put forward in explanation. The first relates to season and the second to locality. It is recognised that there are objections to holding the Fair later in the year; but it is felt that the reputation of February in England is a serious deterrent to possible visitors from the Continent, especially from the more distant countries, and that the season is even less suitable in the case of Oversea buyers. Opinion regarding locality is less unanimous, but there is a widespread feeling that the virtual monopoly of interest secured by the Olympia section of the Fair in the London daily Press is a severe handicap. There is full recognition of the organising ability and energy displayed by the Birmingham management, but exhibitors from other parts of the country are beginning to ask themselves whether it would not lead to a considerable increase in the attendance of foreign buyers if the two sections of the Fair were both held in London.

These points will be considered by the committee, under the chairmanship of Lord CHELMSFORD, which has been appointed by the President of the Board of Trade "to examine the present situation as regards the British Industries Fair and to consider what means can be adopted to increase still further its utility to British trade." The desirability of holding a second fair in the autumn, limitation of participation to manufacturers, methods of advertising at home and abroad, finance, the possibility of holding the Fair, or sections of it, at centres abroad, and the organisation of a travelling fair on ships or trains are other points included in the scope of the committee's investigations. With experience extending over a decade to draw upon the time is ripe for a thorough inquiry into the results achieved and the policy to be pursued in the future, and the appointment of this representative committee is a wise action on the part of the Government. It is now up to exhibitors to see that their views are formulated, co-ordinated and properly presented for consideration.

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Current Topics.

Television Progress.

A RECENT report from America referred to a photograph being transmitted to Sydney, and re-broadcast, by *television*, whereas a glance at the somewhat misleading account left the instructed reader certain of one thing only—that the experiment was concerned with phototelegraphy. As electrical engineers have themselves only lately decided whether to speak of "phototelegraphy" or "telephotography" it is hard indeed for the general public to follow these modern developments. Television, at all events, is at length making some progress in this country. The Baird Co. hope to start simultaneous transmission of image and speech when the Brookman's Park tests are completed at the end of March, and if regular facilities for such broadcasts cannot ultimately be provided by the B.B.C., the Baird Co. have good reason to believe that permission will be given them to erect their own station—probably on a site in Essex. If this course is adopted, a permanent land line will be laid between the station and Savoy Hill, where a portable television transmitter will be at the service of any artist. By this means it is hoped that the present variation in the results obtained—due largely to the use of miscellaneous telephone circuits between Long Acre and Savoy Hill—will be greatly lessened.

Ship-to-Shore Telephony.

IT is much to the credit of the Post Office engineers and of the International Marine Radio Co. that a telephonic communication with the "Majestic" has been achieved so soon after the experimental success obtained with the "Olympic." It is true that preliminary experiments have been carried out for a number of years, but the difficulty of separating the incoming and outgoing waves on the ship has been overcome only lately. The receiving station is at Baldock, in Hertfordshire, which has lately been used as an auxiliary to Cupar for the transatlantic service, while Rugby acts as transmitter for both services. Short waves are used and both transmitting and receiving equipment was made by the Standard Telephone and Cable Company. The ship-to-shore charges fixed by the Post Office are considerably lower than those agreed upon by the American Telephone and Telegraph Co., for the service inaugurated by the "Leviathan." Here the minimum is £4 10s. for three minutes; the corresponding American fee is from £7 to £11, according to the telephonic "zone" occupied by the subscriber on land. It is worth noting that the charge for a British call to an Atlantic liner is only half that made for a call to New York—though the liner may be 3 000 miles across. One may hope that this foreshadows an early reduction in the transatlantic rate.

Neat Layout at Leicester.

THE City Electricity Committee and Mr. JOHN MOULD, the engineer and manager of the Leicester Central Generating Station, had a beautiful day on which to display the enlarged station to a number of interested visitors last week. It was the general opinion that Councillor SWAIN, the chairman of the Electricity Committee, Mr. MOULD and the contractors are to be congratulated on a very neat and efficient job which thoroughly deserved Sir ANDREW DUNCAN'S description of it as one of the tidiest layouts in the country. A feature of special interest is, as Mr. MOULD pointed out, that the station has been designed to burn the fuel which is at its doorstep—Leicestershire slack—"the worst coal in the country." In thermal efficiency the new Leicester station stands well at the head of the 23 large stations which burn really bad coal. Mr. MOULD and his assistants can legitimately pat themselves on the back for this achievement. The low capital cost per kW of plant—when further extensions for which the new buildings leave room have been added, it will only amount to £10·3 against an average in the United Kingdom of more than double that figure (£21·2)—is another cause for satisfaction. We understand that the Central Electricity Board's time-table contemplates the linking of the Leicester and Nottingham stations by the grid in October next.

Home Electrification.

THERE is no doubt that the Practical Course on Home Electrification arranged by E.D.A., E.L.M.A., and E.A.W. was a great success. The 135 women from all parts of the country who attended the lectures and salesmanship demonstrations were keen and enthusiastic disciples. Many appreciative letters from women who attended have since been received by Col. VIGNOLES and the gospel of domestic electrification will be spread in widening circles by these fresh missionaries. It is the housewife who can make or mar the market for domestic electric appliances and the time is overdue for a much larger programme of electrical education for women which should begin in the schools.

Construction Activity in America.

AMERICAN manufacturers may be passing through difficult times but the electric light and power utility companies are far from dismayed by the outlook, judging by their construction programme for 1930. Figures collected by the N.E.L.A. from companies representing 85% of the power industry give the total estimated expenditure on new construction in the first quarter of this year as $198 000 000 or 10½% above the amount in the corresponding quarter of 1929. Orders placed or to be placed before March 31st with manufacturers of equipment and materials will amount to $180 000 000 representing 38½% of the estimated total for the current year. This is regarded as an indication that the programme of extensions for 1930 is well in hand.

Simulating Sunlight.

DR. M. LUCKIESH, Director of the Incandescent Lamp Department of the G.E.C. Lighting Research Laboratory at Cleveland, Ohio, read a paper on "Simulating Sunlight" at a recent joint meeting of the American Illuminating Engineering Society and the A.I.E.E. He described a combination of a mercury arc and a tungsten filament in one bulb evolved by the American G.E.C.'s engineers. The components operate together in pure argon "as if they had never been engaged in a struggle for supremacy in the lighting field." This type S-1 Sunlamp is a low voltage source and the volt-ampere characteristic of the transformer is important. The glass of the bulb has a suitable spectrum cut-off. As measured in foot-candles, the S-1 Sunlamp is at least 20 times more effective than good summer sunlight. Whether, as Dr. LUCKIESH believes possible, this type of lamp will open a new era in lighting remains to be seen, but it is a very interesting development which may well have far-reaching results.

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ELECTRICAL EXPORT TRADE OUTLOOK.

Effects of British Financial Policy—More Orders Received Since the Hague Conference—Canadian Market Improving—Increasing British Penetration in Other Countries.

By HUGH QUIGLEY.

THE British electrical industry had a record volume of shipments during 1929 and, to some extent, participated in the expansion which took place in the world demand for electrical equipment. Inclusive of steam turbines and condensers, the total value of British exports amounted to rather more than £20 500 000, which was almost exactly £500 000 more than the total recorded during the previous record year, 1926. Compared with Germany and the United States, however, the expansion shown by Great Britain was comparatively small. Both of these countries increased their shipments by several million pounds each during the year in question ; but one can perhaps find an explanation for the loss of position suffered by Great Britain during this year.

In the first place, the special markets served by the British manufacturer, namely, Australia, India, South Africa, New Zealand, Argentina, Japan, and to some extent Russia, almost without exception, suffered from severe trade depression during the latter half of 1928 and the beginning of 1929, and expenditure on electrical equipment suffered accordingly. On the other hand, the special markets supplied by the United States showed a rapid expansion in imports, the most spectacular examples being Canada and Great Britain. The very large increase which took place in imports of electrical apparatus into this country must be attributed to developments in connection with sound films, telephonic and wireless communications generally, and the expansion of the market for domestic and other appliances. It is already sufficiently clear that the market in those products is large enough to justify a much more determined effort on the part of the British manufacturer to meet American competition and secure a much higher percentage of the demand than hitherto.

Again, as part of the American policy of financial penetration, especially in Europe and South America and the East, there has been a diversion of orders to American manufacturers, with its consequencies in increased shipments. The boom in American industry rendered it possible for electrical manufacturers to achieve high volume production, realise very large margins of profit and obtain financial resources for the purpose of purchasing public utilities abroad.

The German position is one of considerable interest. It is true that British manufacturers have not suffered to any great extent from German competition, since the increase that has taken place in the exports from that country has been due, above all, to the operation of reparation deliveries in kind and to the increasing hold of German manufacturers on the European demand, above all, in Central, Eastern and Far Eastern Europe. Europe, as a market, has shown much the greatest expansion of any other part of the world since 1927, and much of this expansion has been due to the special facilities and the special credits granted by Great Britain to European countries ; facilities represented by the funding of the various debt settlements and by the transfer of short term credits from London to European centres. Thus, this country has been engaged in financing European prosperity, while British industry has not had any share in such prosperity and has not benefited from such financial policy. The country which has reaped full advantage has been Germany.

Strong Competitive Power.

In view of these circumstances, the export position of Great Britain during 1929 must be considered as very satisfactory, and it does show that the competitive position of the industry is very strong. Some indication of this strength can be found in developments that have taken place since the middle of 1929, when a number of those special factors encouraging German and American exports have either been mitigated or removed. The Hague Conference, for example, has placed a very narrow limit on reparations deliveries in kind, while the credit stringency accompanying and following the American slump has rendered it extremely difficult for Germany and European countries generally to borrow in this country, either for short term or long term purposes.

The result is already evident in the very rapid expansion which has taken place in orders secured by British firms for heavy generating plant and equipment ; in the rapid decline which has taken place in the orders secured by the German firms, both on home and export account, and in the fairly severe restriction of activity which has characterised electrical manufacture in the United States. There has been, therefore, some movement towards adjustment of the international competitive position, but one may debate whether such adjustment will ultimately be of advantage to British industry.

It will probably lead to intensification of competition in a number of what might be regarded neutral markets and thus render expansion on normal lines somewhat difficult. In any case there are prospects that British export shipments during 1930 will show a further expansion on 1929 and will bring this country, once more, into line with Germany and the United States. There are sufficient orders on hand at the moment to ensure continuous activity for well over a year.

Active Markets.

The main markets in which the British electrical manufacturers have been specially active in recent months have been Europe, South America, Australia and India ; while Canada is at last showing some appreciation of the fact that reciprocity in trade is essential to trade prosperity and that support of British production must accompany the British support of Canadian production. The slump in the United States has shown that there may be danger for Canada in being too closely linked up, economically, with that country.

The most important change that can be determined from the survey of British activity has been that the British electrical product is now penetrating into a number of markets which, until only a few years ago, showed no desire for any other than German or American products. Such a penetration is due, above all, to the fact that as a result of continuous activity during ten years the British industry has established a series of very valuable records, in efficiencies and in operating results, especially in generating plant and equipment, and such a record is beginning to have an international cumulative effect. One can expect that such goodwill will be an increasingly important element in determining international competitive position and in ensuring that a fair percentage of orders, even in European markets, will come to this country.

It is difficult to prophesy with any certainty the immediate future of the electrical export trade generally. There is at present every indication of a coming international economic crisis. The first important indication of a serious position arising was the American Stock Exchange slump in the late autumn of 1929, which followed similar slumps in the Stock Exchanges of Europe and the Dominions. The American slump was due more to a very marked recession in trade than to a withdrawal of funds from New York to Europe, and it was accentuated by a severe fall in world commodity prices which took place as a result of financial policy already outlined. Such a fall has borne, above all, on the following products : wheat, coffee, tin, rubber, tea, nitrates, zinc, lead, silver, sugar, wool, cotton, and to some extent, copper. It has brought severe trade depression on the countries depending on such commodities, above all, Central and South America, Canada, the middle western States of America, Australia, New Zealand, Dutch East Indies and the Federated Malay States, India and Ceylon. In addition to this, the wholly unnecessary imposition of the gold standard on India, in place of the silver standard hitherto in operation, has converted India from a buyer of silver to a seller on a very large scale ; and the price of silver has fallen from 28d. per oz. to 19d., in not much more than one year. Such a fall has brought with it a collapse in the purchasing power of the entire Indian, Burmese and Chinese peoples, and this fall has been shown in the very severe unemployment now ruling in the textile industries of Lancashire and Europe, while it has arrested the upward industrial movement which was taking place in India.

In view of these developments it is difficult to be optimistic about the future of the export trade in any commodity, including electrical equipment. The electrical industry is affected almost at once by general trade depression, largely from the fact that it supplies equipment to all industries and electrical energy forms an increasingly important part in industrial productive capacity. There may, of course, be a revival in commodity prices, resulting possibly from a reversal of the process which has brought about such a fall ; and it is to such a revival that the British electrical industry, in common with other exporting industries in this country, must look for expansion in shipments within the next few years.

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OPENINGS IN CANADA.

Vast Power Development in Progress—Can British Manufacturers Improve their Sales in the Dominion?—Possibility of Tariff Changes.

(FROM A CANADIAN CORRESPONDENT.)

CANADIAN business during the past few years has suffered grievously from the repeated attempts of politicians in the United States to enact prohibitory duties against Canadian exports, and much anxiety has therefore been caused on the Canadian side of the line whenever these threats have assumed definite shape in Congress proposals. "Buy from those who buy from us" is now the slogan, and it is practically certain that the Budget Speech of the new Canadian Minister of Finance will contain a very large number of tariff changes concentrated mainly on the iron and steel schedule. In the case of machinery the Government has given no indication of its intentions apart from numerous hints that whenever possible without injuring Canadian industry efforts will be made to direct trade to Great Britain in preference to the United States.

Canadian imports of what are classified as "electrical apparatus, not otherwise provided for," including such items as batteries, lamps, lighting fixtures, meters, motors, spark plugs, switches, telegraph instruments, telephone instruments, wireless apparatus, etc., reached a total value in 1928-29 of $26 775 215, a large increase as compared with the $19 044 465 recorded for the previous year. Great Britain supplied products worth only $1 927 193, as compared with the huge total of $24 410 750 from the United States. In machinery, the predominance of the United States is equally evident and British manufacturers appear to have failed almost completely to make known to the Canadian public the immense improvement in the capacity of the industry here to supply up-to-date plant suitable for Canadian requirements.

The immense market developing during the next few years can be judged from the fact that new installations brought into operation last yeat totalled 378 400 H.P. of hydro-electric energy, bringing the total installation up to 5 727 600 H.P. This in addition to a considerable increase in the utilisation of small Diesel engine and fuel plants in out-of-the-way mining camps, and in large hotels, business buildings, and so on.

Wa er power developments now under active construction will, according to published programmes, add more than 1 600 000 H.P. to the present total during the coming three years, and there are many large new projects under consideration which are certain to materialise in practical decisions before many months have passed. The capital expenditure upon these power developments will be paralleled and probably exceeded by the cost of transmission and distribution, and the greater utilisation of electricity will expand the market for every type of appliance associated with this form of energy. The adoption generally of the Canadian National Electric Code should remove the obstacles to business which have undoubtedly discouraged British competition in the past, and it would be well for firms who have not yet considered the question of opening branch factories, assembly plants or warehouses, to investigate the possible advantages of doing so in the near future.

Immense Potentialities of the Market.

The figures which have been published recently by the Dominion Water Power and Reclamation Branch emphasise what is now generally agreed as to the immense power resources of Canada, and the potential market is therefore on a scale justifying unusually thorough investigation and strenuous efforts in order to secure adequate participation by British manufacturers. Whether this participation can be secured by reliance upon long-distance selling assisted by the "Preferential Tariff" is open to some doubt, though in certain lines good salesmanship may enable firms to market electrical apparatus by appointing agents at numerous points and backing them up energetically by advertising. Canadian power plants are, however, staffed by engineers who have lost, or who have never been trained in the habit of long-distance purchasing, and they would with difficulty be persuaded to place orders a long time ahead for large machinery specially made by British manufacturers unable to promise immediate delivery of repairs and spare parts when needed.

British manufacturers, established in Canadian factories and importing under the drawback system many articles free of duty, or under advantageous terms, whether for the home trade or export to countries in the North American sphere of influence, should, however, be in a good position to watch developments and to plan ahead for the business to be expected both in the provision of machinery for power plants, as well as for transformers, and the innumerable items of equipment in distribution systems, homes, factories, etc., resulting from the further use of electricity. Canada has an estimated available water power totalling 20 347 400 H.P., which could be utilised for twelve months of the year, or on the six months' basis, no less than 33 617 200 H.P., and this total is estimated to justify a total installation of about 43 700 000 H.P. The existing installation is only about 13% of the recorded resources, but as about three million H.P. is likely to be harnessed in the near future it is evident that there is no halt in development. The capital investment in hydro-electric power developments now reaches about $1 302 000 000 and the annual expenditure during the next few years will reach not less than $90 000 000. A certain amount of electricity is generated by steam-power plants, and the collieries of Nova Scotia are practically all using electricity derived from large-scale plants utilising pulverised fuel.

Mammoth Schemes Planned.

A number of mammoth schemes are peing planned, the largest being one involving the ultimate development of about 2 000 000 H.P. by the Beauharnois Power Corporation on a stretch of the St. Lawrence close to Montreal, between Lakes St. Francis and St. Louis. The initial output is to be 500 000 H.P., and a market for this has already been found among existing power interests. The establishment of new industries along the power canal is a likely possibility, leading obviously to the use of much electrical equipment of every description. The Shawinigan Water and Power Co. is enlarging its resources on the St. Maurice River, and on the Saguenay the Alcoa Power Co., Ltd., is constructing a plant to produce 1 000 000 H.P. with immense turbines of about 80 000 H.P. capacity. Every province is partaking in this progress, with the sole exception of the small farming province of Prince Edward Island, and the rapid opening up of mining in northern areas renders indispensable the establishment of larger or smaller power plants.

The load on the lines of the Montreal Light, Heat and Power Consolidated is increasing by about 15% annually, and the Gatineau Power Co.'s immense system is experiencing no difficulty in marketing all the energy it can produce at its numerous large sites in the Ottawa Valley. In the vicinity of Lake St. John 2 000 000 H.P. is being developed with every prospect of securing a market, and during the next seven years Quebec is likely to be increasing its output of power by more than 2 040 000 H.P. As the present installations total about 2 235 000 H.P., the magnitude of the advance contemplated needs no emphasis, and a power shortage of not less than 75 000 H.P. before 1936 is not unlikely.

The plans of the Ontario Hydro-Electric Power Commission for the current year contemplate a total expenditure of $40 000 000, partly on new power developments along the Ottawa River and in the northern mining districts and partly in connection with the duplication of the transmission lines bringing energy from the Gatineau power plants in Quebec. Extension of rural electric power lines will absorb about $5 000 000; 1 200 miles of new lines will be constructed. The tenth unit is to be put in at the Queenston plant on the Niagara River at a cost of $4 000 000.

It would be unfortunate if this immense opportunity for business should pass by without some benefit for the British maunfacturer, but without some energetic effort both by manufacturers, salesmen and financiers, it is inevitable that the lion's share will pass to the Canadian plants already established. The United States manufacturer also must benefit from proximity, although the public in the Dominion has never been more sympathetic to the "Buy British" appeal than it is at the present time. Ocean freight rates to the Pacific Coast, to the new port of Churchill on Hudson Bay, as well as to the somewhat limited markets in the Maritime Provinces and to points in the neighbourhood of Chicoutimi, Quebec and Montreal, should tend to offset many of the advantages possessed by engineering firms on the North American continent who have to deliver by rail.

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ELECTRICITY ON NEW ZEALAND FARMS.

Assistance Given by Power Boards—Charges for Current—Hire Purchase System for Apparatus—Cultivation of the Milking Load.

AT a meeting of the Overhead Lines Association held at the Institution of Electrical Engineers on February 19th, Mr. W. P. Gauvain described the work that has been done in New Zealand on rural electrification. He said that so far the use of electricity on New Zealand farms was limited, probably due to climatic conditions, and was chiefly confined to the driving of milking machines and cream separators, for pumping water, and to a smaller extent for shearing. In addition to the power required for these plants, extensive use was made for water heating in the milking sheds, whilst the purely domestic load consisted of lighting, cooking, water heating and the usual labour saving appliances. The paramount difficulty was the capital cost of the installation and the Power Boards, by instituting a system of financial assistance to consumers, were of considerable help to the prospective consumers, who were usually required to pay one-third of the cost of the installation in cash and the balance spread over a period of three years. Under the Electric Power Boards Act of 1918 the Boards were granted trading powers and to a great extent they carried out the complete installation with their own staffs, the resulting profits going to swell the funds of the undertakings. For successful country electrification effective service was essential and the arrangements were such, so far as the milking load was concerned, that if a motor failed during milking a spare one would be installed in time for the next milking.

In March, 1929, there were 10 200 electrically driven milking machines and a further 8 000 driven by some other method. In the milking sheds electricity was largely used for heating the water required for cleansing the machines and utensils. The element was connected to the circuit through a double-throw switch so that the heater was not in use when the milking motor was running; the current for this work was not metered but was charged on a flat rate varying from £6 to £8 per 1 000 watts *per annum*, equivalent to from 0·26d. to 0·35d. per unit during the time the heater is in operation. The sizes of these milking machine motors varied from 1 H.P. to 3 H.P., but by far the greater number were of 2 H.P. capacity and the rates were a fixed charge per H.P. of connected load, plus a unit charge. The average cost worked out at from 3d. to 4d. per unit and at these figures it was possible, when taking total costs into consideration, to compete with the petrol engine which was almost universally employed prior to the introduction of electricity. There was still room for extensive development in the domestic load in rural areas, more particularly in the use of cooking appliances; electric cookers had been installed by 7·6 per cent. of the consumers and water heaters by 11 per cent.

Power was used by the dairy factories, quarries, saw mills, flax mills, brickyards, freezing works and sundry industries. The combination of the supply to these undertakings together with the domestic and farming loads enabled a high average annual load factor to be attained, which for all distributing authorities in 1929 was 46·6 per cent., whilst several of the power Boards showed figures greatly in excess of that. The maximum charge for domestic lighting in rural areas was about 8d. per unit, and for domestic power the rates began at 3d. per unit and went down to 1½d. A number of Boards had minimum domestic power rates of 1d. but it was found that the 1½d. rate would attract cooking loads in the country areas.

Results in a Typical Area.

As indicating the results which might be attained in a typical rural area the following details from the Annual Report, for the year ended March 31st, 1929, of the Thames Valley Electric Power Board were given. The Board controls an area of 2 300 sq. miles containing a population of 40 800 or an average of 17·7 persons per sq. mile. The largest town had a population of under 5 000 and there are three towns of approximately 2 000 inhabitants, each together with a number of villages. Power is also supplied to 22 dairy factories, 9 quarries, 3 saw mills, 3 flax mills, and 2 Government workshops. The motors in use total 2 593, of which 1 793 drive milking machines, 352 are used on general farm work and 448 for industrial purposes. There are 1 278 circuit miles of distribution lines and 424 miles of service lines. The revenue was £98·4 per circuit mile. The total capital expenditure was £720 600 and the revenue £125 792 or 17·5 per cent. on the capital expended. The number of transformers in use was 437 having a total capacity of 11 219 kVA or an average of 25·7 kVA per transformer. The maximum demand on the system was 5 220 kVA, the annual load factor 66·1 per cent. the power factor ·0933 and the units sold per head of population for the year 486. Consumers number 6 968 and the revenue per consumer was £18·05 and per head of population £3·08, whilst the revenue per unit sold was 1·52d. The units sold per route mile of distribution line totalled 28 700. Capital charges amounted to 47·5 per cent. of the total costs, purchase of power 33·1 per cent., and management, distribution and maintenance 19·4 per cent.

Financial Return.

The capital expended by the Government on hydro-electric schemes to March 31st, 1929, amounted to £8 468 000 whilst the expenditure by Power Boards only, exclusive of other supply authorities, totalled £12 010 000. Forty-three Power Boards were constituted of which thirty-eight were distributing power. After paying interest and sinking fund on capital expended, together with operating and maintenance costs, the profit amounted to £100 500. The total length of distribution lines of all supply authorities was 17 760 route miles, the number of consumers per route mile was 15, the maximum power demand 8·15 kilowatts, and the sales 30 600 units producing a revenue of £211.

The relationship between the Boards and the public works and other Government Departments, such as the post and telegraphs and railways, was happy and was fostered by the appointment of standing committees which met periodically, and by annual conferences at which all debatable points were fully discussed. The regulations regarding the supply of electricity were periodically reviewed and were not altered or modified until the Boards had had the opportunity of stating their experience on the points raised, and placing their views before the Department.

It was gratifying that the majority of electrical plant installed in the Dominion was of British manufacture, and the Boards were most anxious that this state of affairs should continue.

Mr. GAUVAIN, replying to the discussion, said it was difficult to say how far practice in New Zealand could be applied in this country. The milking load had been cultivated and he wondered why it had not been developed here because there were 18 000 milking machines in use in New Zealand and no farmer with 20 cows or more would think now of adopting the old method of milking. The average size of storage tank in the milking sheds was 10 to 20 gallons and the load was simple to handle because the water was only required at certain times during the day, and during the intervening period the heating up was going on. In the houses the tanks were about 30 gallons capacity, the current being switched on for two hours in the morning and two hours in the evening, off the peak load. The elements were usually 750 to 1 250 W.

The price obtained for current was not so high as might seem at first. The charge for milking was 3d. to 4d. per unit and for water heating 0·3d. per unit, so that if the two were taken together the average for the milking shed came out to about 1d. per unit, and although farmers used to complain that the price was high in comparison with the cost of running an oil engine, it was found that the comparison was made without taking into account the cost of repairs or spare parts and cartage of the petrol from the railway station. As to 17½% revenue on the capital expenditure being rather low, the Power Boards were not out to pay large dividends. All they had to do was to pay interest and sinking fund and depreciation, and none of the Boards were allowed to raise money at a higher rate than 5½% without special permission of the Minister of Finance. There were very few 3 kW transformers in use and only a few on the 11 000 V lines. They rather liked to group farms together and use a larger transformer. An air break type of switch was used and the fuse was made in New York and was known as the S. and C. type. In New Zealand it was practically always dark by 8 o'clock in the evening, even in the summer time, and 10 units per month was a good lighting consumption of farm premises. The l.t. supply was 415/240 V. People in New Zealand seemed to like to feel that they owned the apparatus, and for that reason hire purchase had been cultivated.

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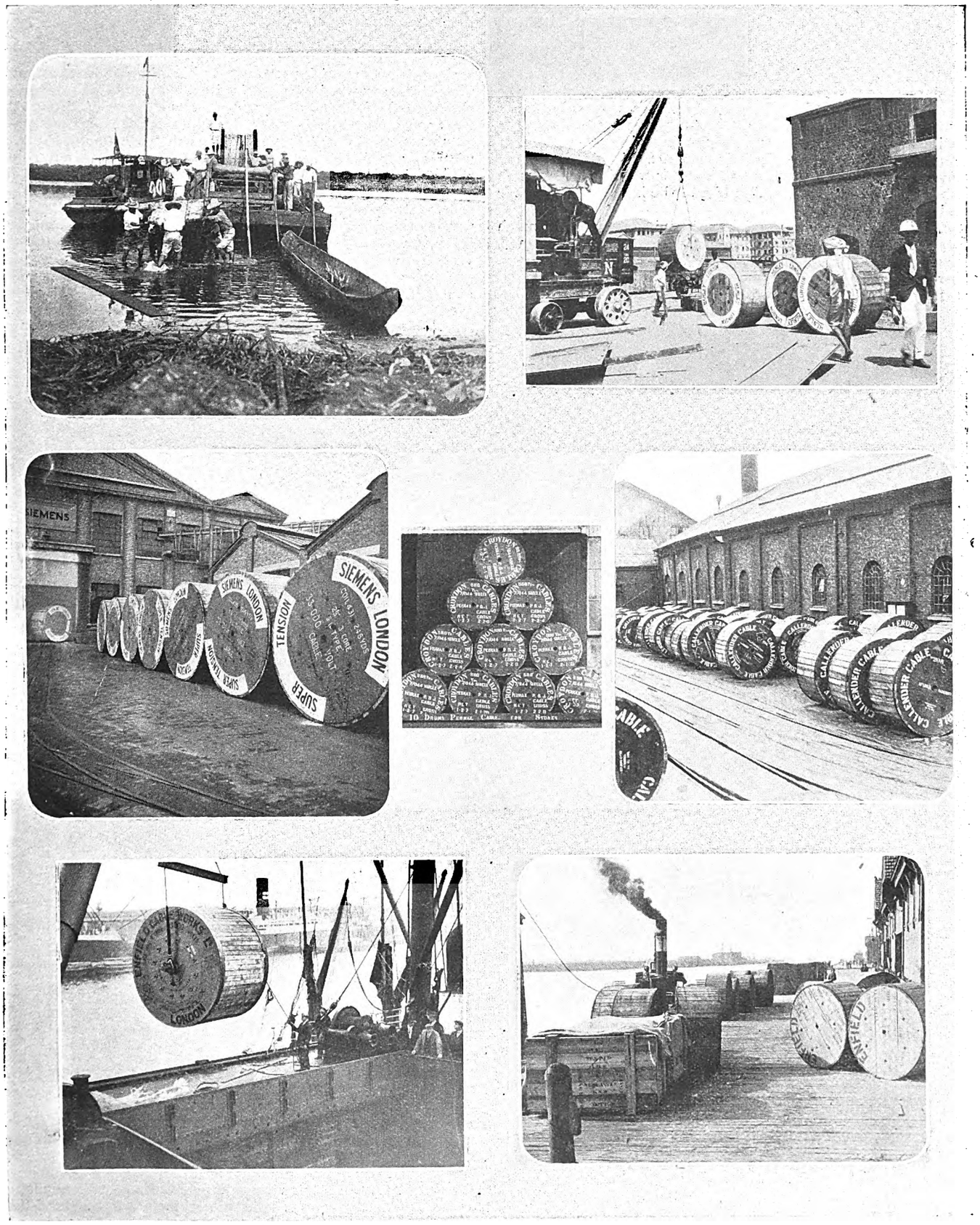
BRITISH CABLE FOR OVERSEA MARKETS.



Top (left) Henley's submarine telephone cable being laid—Mexico ; (right) Henley's cable being landed at Bombay docks.
Centre (left) 33 kV Siemens cable at Woolwich ready for dispatch to Sydney ; (centre) Permax cable at Croydon for shipment to Sydney ; (right) a consignment of Callender's cable for South America.
Bottom (left), Enfield cable being loaded in the Thames for Sydney ; (right) landing cable at Newcastle, N.S.W.

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POWER SUPPLY IN BELGIUM.

Many Generating Stations—Soil Conditions which Favour Use of Underground Lines—Co-operative Supply in the Liège District.

(FROM A CORRESPONDENT.)

BELGIUM is one of our nearest neighbours, it is the most densely populated and most industrialised state in the world; it was celebrated in the middle ages as a centre for textile industries, before our Tudor sovereigns adopted a national policy to encourage the making of woollen goods at home; in fact, such was the influence of British wool over the Low Countries that the Lord Chancellor at Westminster still sits on the Woolsack to remind him of the importance of trade and industry.

The Belgian workman works hard, and has never paid much attention to the ca' canny agitators who, in some lands, encourage the "killing of the goose" to create that unhappiness and unrest on which they naturally live. There has been, therefore, a great demand for power; a material proportion of the total power generated per year is from private works power stations.

There are quite a large number of central stations, which some people in other countries might consider an obstacle to the supply of cheap power; low grade coal, which can be supplied in many regions by rail or canal, is very cheap, condensing facilities are often of a limited character and power is wanted, so to speak, close to the door of the power station, so it has been said with reason that "the transport of large quantities of energy at very high tension cannot be economically justified."* The concentration of consumption in some regions is so great, for example in the Sambre area around Charleroi, that within range of primary distribution pressures, clients can be found requiring power to the extent of 25 000 kW for 3 500 to 4 500 hours a year. "It is realised that once an output of 25 000 kW is arrived at, the reduction of the cost of energy from the use of larger power units does not compensate for the extra expenses from transmission at very high voltages."* In the Meuse area and lower Scheldt a number of central stations exist, the multiplicity of such stations leading to the desirability for interconnection. Fig. 1 shows a map of interconnections taken from a report by M. Uytborck presented to the High Tension Conference in 1929.

A little over three years ago, in our Parliament the situation in Belgium was extolled, non-technical members of Parliament being given to understand by implication that the power consumption in that country put our supply authorities almost to shame, and that the country was equipped with a vast grid system fed with power from super stations. The figures then used were obtained by ignoring the analyses available showing that much of the power included in published statistics was that used in private works, the huge power stations and most of the grid system existing only in the fertile imaginations of professional politicians.

Before and after the war a material proportion of the power systems of Belgium has been in the hands of undertakings allied to the group formed by the late Baron Empain, who also owned the largest cable works in the country. A material

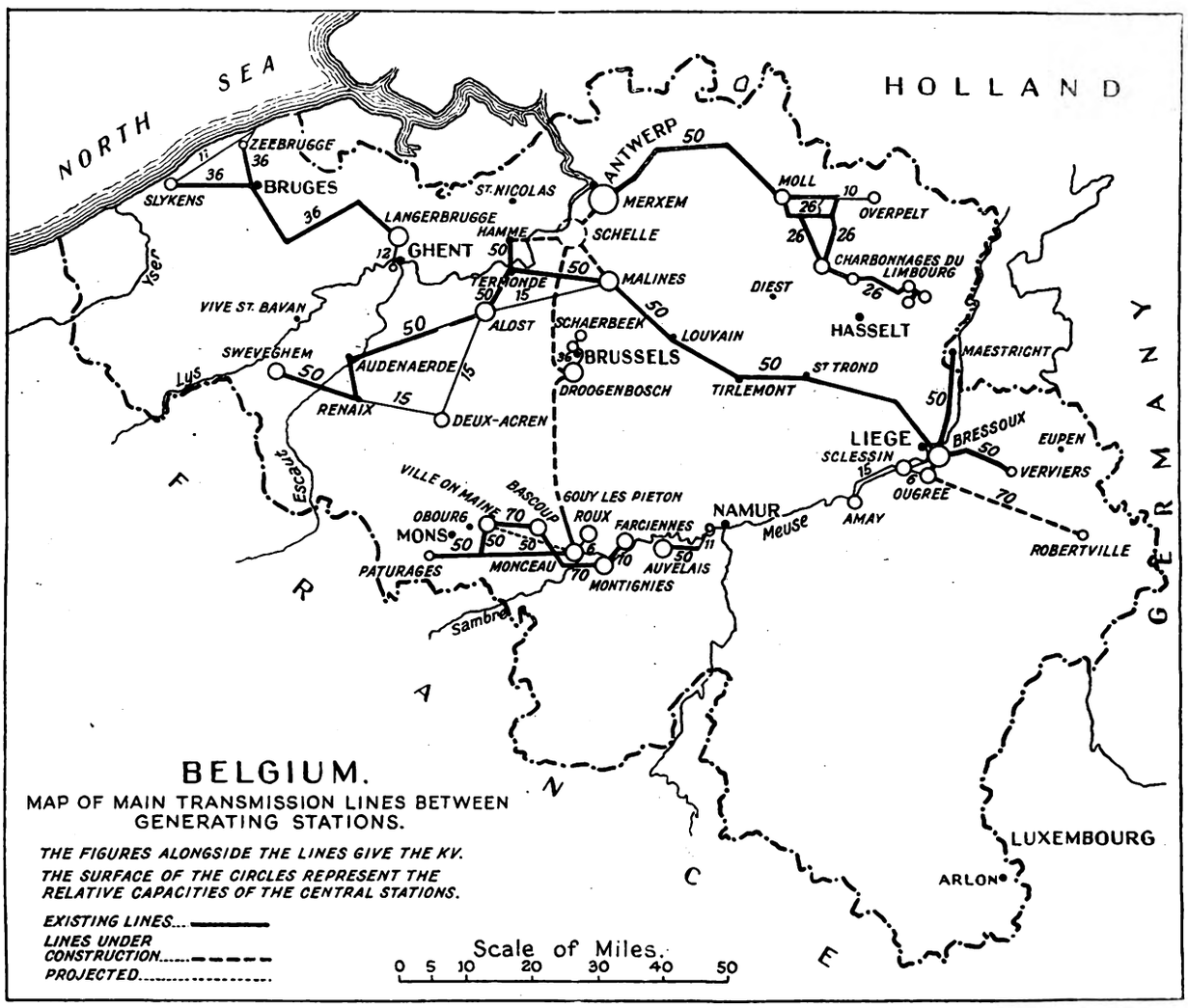

Fig. 1.—Interconnections of Belgian generating stations.

*Remarks made by M. Uytborck in his report to the High Tension Conference in Paris 1929.

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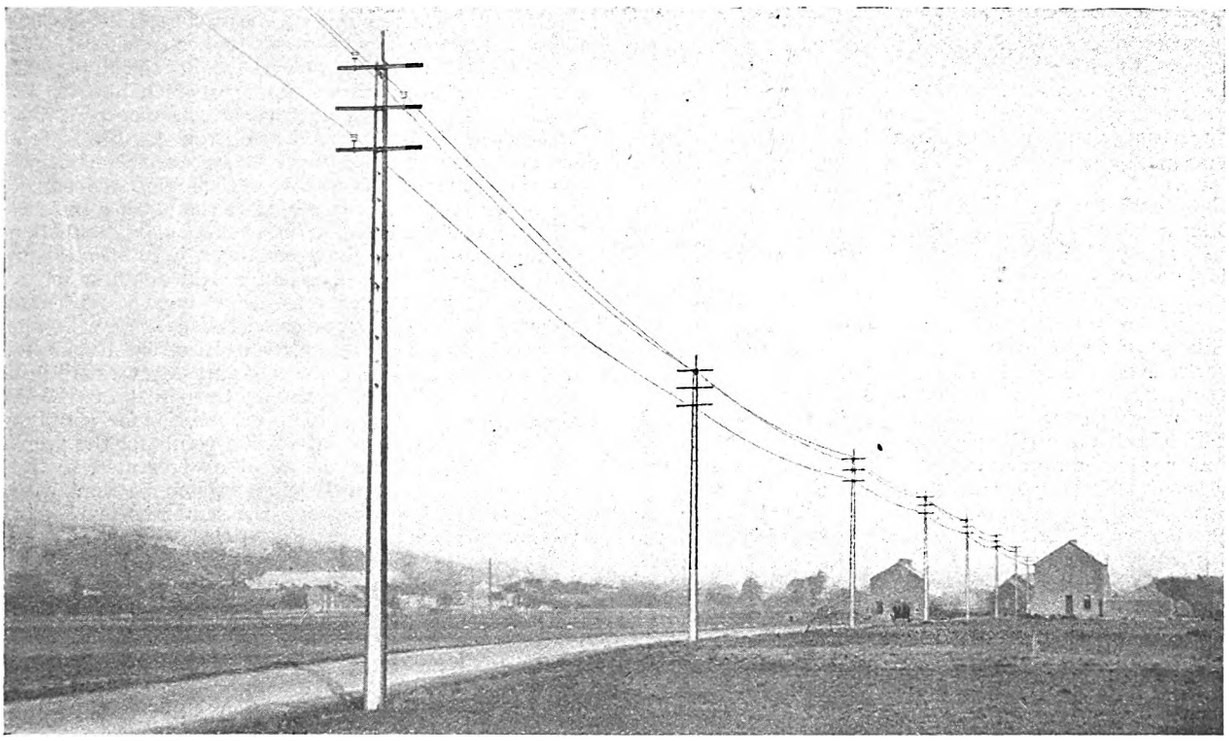

Fig. 2.—Steel and concrete pole line in the Liège District.

number of comparatively long cable lines have been put down, and in some ways the regulations regarding overhead lines have been more stringent than those in France; on the other hand, conditions regarding subsoil, as in Holland, favour cable construction. A cable line 60 km. (37 miles) long joins Langerbrugge with Zeebrugge at 36 kV, a similar pressure being used in cable between Ostend and Bruges. During the last few years about 305 km. of interconnecting overhead line has been put up at 50 kV, and in 1929 87 km. (54 miles) at 70 kV. The cost of the interconnecting systems, including that under construction with that of transformer and linking up stations, reaches about 120 million Belgian francs, and in 1927, despite an increase in output of 22%, the plant capacity in public cum private industrial stations only increased by 7%. The cost of the interconnection, after allowing for interest and upkeep, is 0·01 frs. per kilowatt hour. "One cannot claim to solve the problem of the electrification of a country like Belgium by constructing a system of interconnecting lines at very high tension receiving its energy only from five or six central stations."*

It is not expected that the creation of a number of inter-

* See note on previous page.

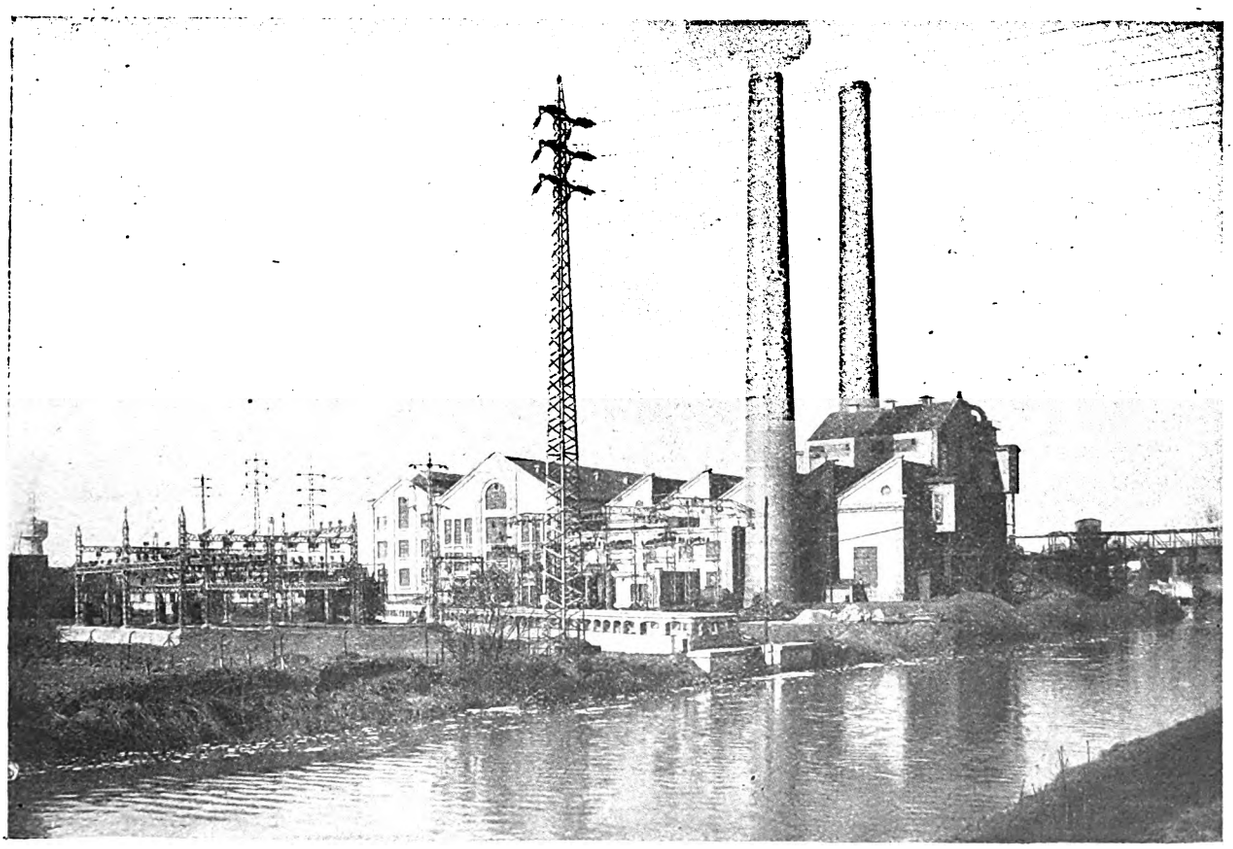

Fig. 3.—Central generating station at Alost, Belgium.

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connecting lines will profoundly modify the production characteristics. The operation in parallel of central stations has not given rise to special difficulties; it is anticipated that some lines at 120 kV will be constructed later.

Although the power stations in Belgium are small it does not follow that they are out of date, for example M. Herry, of the Langerbrugge station, near Ghent, has carried out pioneer work regarding high pressure steam turbines, with a two-stage pipe range.

Fig. 3 shows the central station at Alost of the Société Intercommunale Belge d'Electricité. It is operated with pulverised fuel, as can be seen, a step-up transformer station and outgoing line at 50 kV; the type of trelliswork steel tower shown is much used in Belgium.

Fig. 2 is a line of the Liège District Company. The standards are made up of two channels filled in with concrete, in construction it is something like the Australian Stoby pole.

In the Hainault district a number of centrifugal concrete posts are in use on lines of 70 kV; they were made in France on the "Forclum" system.

The nature of the country affects the type of line construction adopted. The northern half of the country is low lying, water can usually be found within almost a few inches of the surface, whereas in the south the ground is more hilly and in the rural areas of the Ardennes very rocky. The question of the foundations for large supports is a matter of interest; some are made of concrete blocks nearly cubes in shape, others are made of concrete slabs 50 cm. (20 in. thick) placed 20 in. below the surface; those supports which have to resist an overturning moment of 25 tons have slabs 10 ft. by 10 ft., with the aid of 20 in. of soil placed on the top. Aerial conductors for high tension must be stranded; chain insulators are the rule at 50 kV and over. Generally, with high tension lines, an earth wire is placed above the conductors.

Around Liège a number of steelmakers, and others owning works power stations, have arranged a co-operative mutual supply organisation quite apart from the public supply system, on lines somewhat similar to a system in the French Briey ironworks area, which was described a few weeks ago in a paper read before the Institution of Electrical Engineers. The power stations are interconnected and surpluses are utilised.

Cordial thanks are due to M. Uytborck, of the Belgian Union of Power Authorities of Brussels, for supplying the writer with a number of interesting points for the preparation of these notes. A report by him, presented to the High Tension Conference on Belgian Interconnection, with plan, was also utilised, from which the sentences marked with an asterisk are taken.

LINE ACCESSORIES.

Switches and Fuses—Precautions against Interference.

DURING the last ten years a material demand has sprung up at home for appliances for use with overhead lines, and while Continental and American influences can be seen in many designs, yet the difficult climatic conditions, the gusty winds, the dampness, fogs, and salt-laden atmosphere met with in places, and in some areas the fumes and greasy soot, make careful design and construction a *sine qua non*.

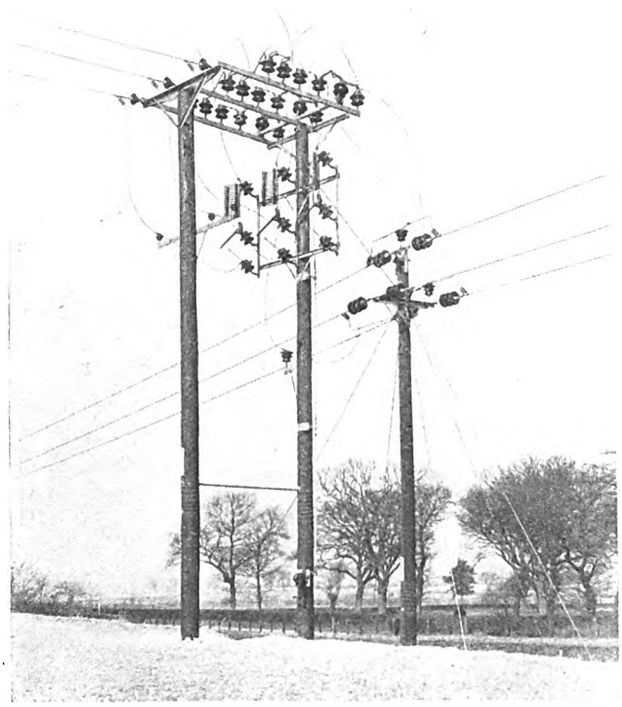

Fig. 1.—Aerial switch at head of a branch.

Oil switches of the normal type are expensive, especially for 33 kV and upwards, and there are many positions where their cost would not be justified. Aerial switches are useful as section links and as branch and transformer isolators, and are employed at substations in connection with busbar combinations.

A set of gear for use at the head of a branch at 11 kV is seen in Fig. 1. The line on the right is designed for 33 kV. The branch connections first pass through an aerial horn switch to which a horn arrester and solid resistance is connected; the circuits pass through choke coils and J. P. bomb fuses and then to the outgoing line on the left. By opening the aerial switch from below the main gear can be made dead. The layout is designed so that the 11 kV branch can be connected through a transformer to the main line, which will then operate at 33 kV.

There are various forms of fuses used on overhead lines; for some time abroad porcelain tubes with contacts at both ends and silver fuse wires had considerable vogue, some makes nowadays use bakelite tubes instead of porcelain as being less likely to burst when dealing with a short.

The Horn fuse, a modification of the original Siemens lightning discharger, utilising the magnetic outwards-blowing effect to clear the arc, still has some popularity at home and abroad. The Carbon Tetrachloride fuse, which had its origin in America, which uses the power of a released spring to drive the quenching liquid into the arc, has seen material development; it is perhaps more desirable out of doors than under cover.

Messrs. Johnson and Phillips have recently developed a bomb fuse (Fig. 2) and have put it on to the market after a series of severe tests. The fuse made of lead wire breaks circuit inside a brass tube with a bakelite extension, lined with a special cement. When fusing, owing to the great heat, the gases expand with explosive violence, blowing out the arc and breaking the circuit effectively. The fuse can be quickly rewired, the lead wire is threaded through and connected to a screwed plug in the explosion chamber.

A type of aerial switch made by Messrs. Isenthal and Co., of Acton, is of interest; Fig. 3 shows one phase section. There is one set of fixed and a set of moving contacts which swing backwards about an axle mounted in bronze bearings. The contacts are fixed to the insulator heads by means of malleable clamps, made in halves and screwed up at the sides, a layer of lead being used to prevent excessive local mechanical pressure. The caps are made so that the clamp rings do not carry the main current. The horns which are of the loop type, are made with a slight twist to give stiffness. The connection between the swinging insulator and the fixed

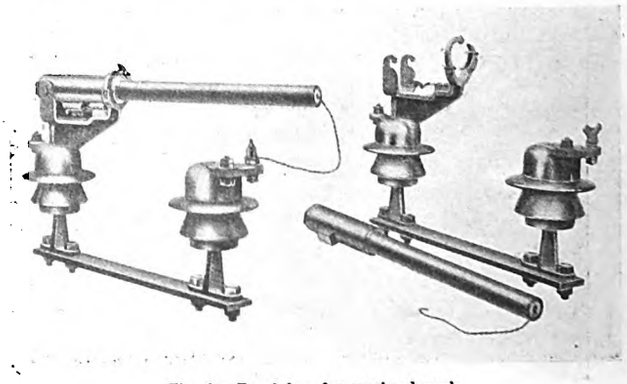

Fig. 2.—Bomb fuse for overhead work.

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insulator on the right is by means of a stiff flat strip of phosphor bronze. The figure shows the 33 kV type; the insulators are of the triple type cemented together, the petticoats being arranged to give high flash-over values. The rocker can be actuated by rods or chains; when using the former to obviate the necessity for a loose handle and to make the operating gear more proof against interference, a type of gear with folding-in handles has been designed, which has proved to be satisfactory in service (Fig. 4). The handles open out of a locked-up chamber with a dished cover. When closed and padlocked the spindle cannot be got at and the rods and therefore the switch cannot be moved when the door is shut and padlocked.

As can be seen in Fig. 5, outdoor switching stations can be surrounded with simple railings; the guardwork is used to separate the circuits.

Some years ago, in America, a system was adopted of making air-break switches horizontal. The blades are fixed at the ends of long arms pivoted at the centre; for three phases there are, therefore, three horizontal switches operated through cranks. This system has recently been used in Europe.

On the Continent individually-operated aerial section links have been used to a large extent, but in Great Britain aerial switches with horns are often adopted for the same purpose. When they are linked up by means of cross-shafts and cranks one can be certain that all the phases are being opened or shut at the same time.

For line protection horn dischargers with resistances have lost their former vogue as protectors against lightning, but surge absorbers are being used in some places to take the vice out of steep-fronted waves resulting from various shocks coming on to the systems.

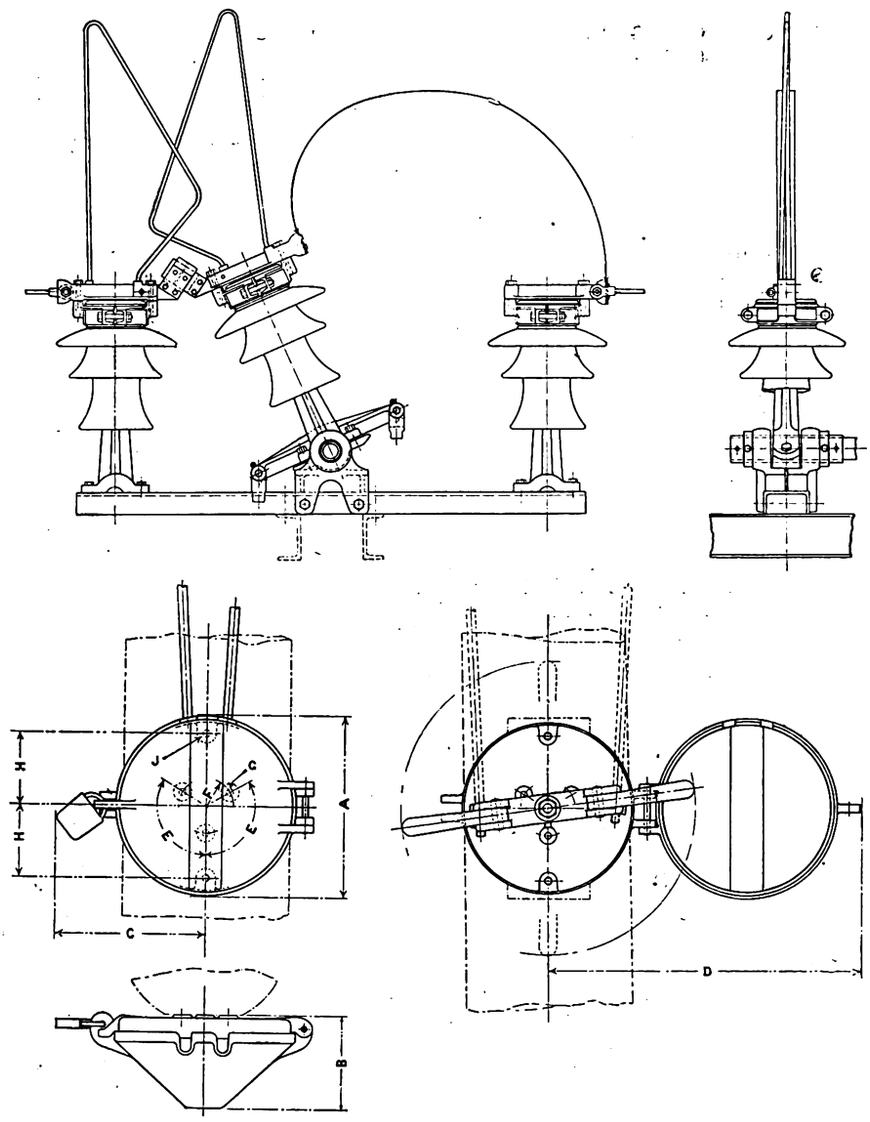

Fig. 3 (top), 33 kV aerial switch; Fig. 4 (bottom), operating gear with folding handles.

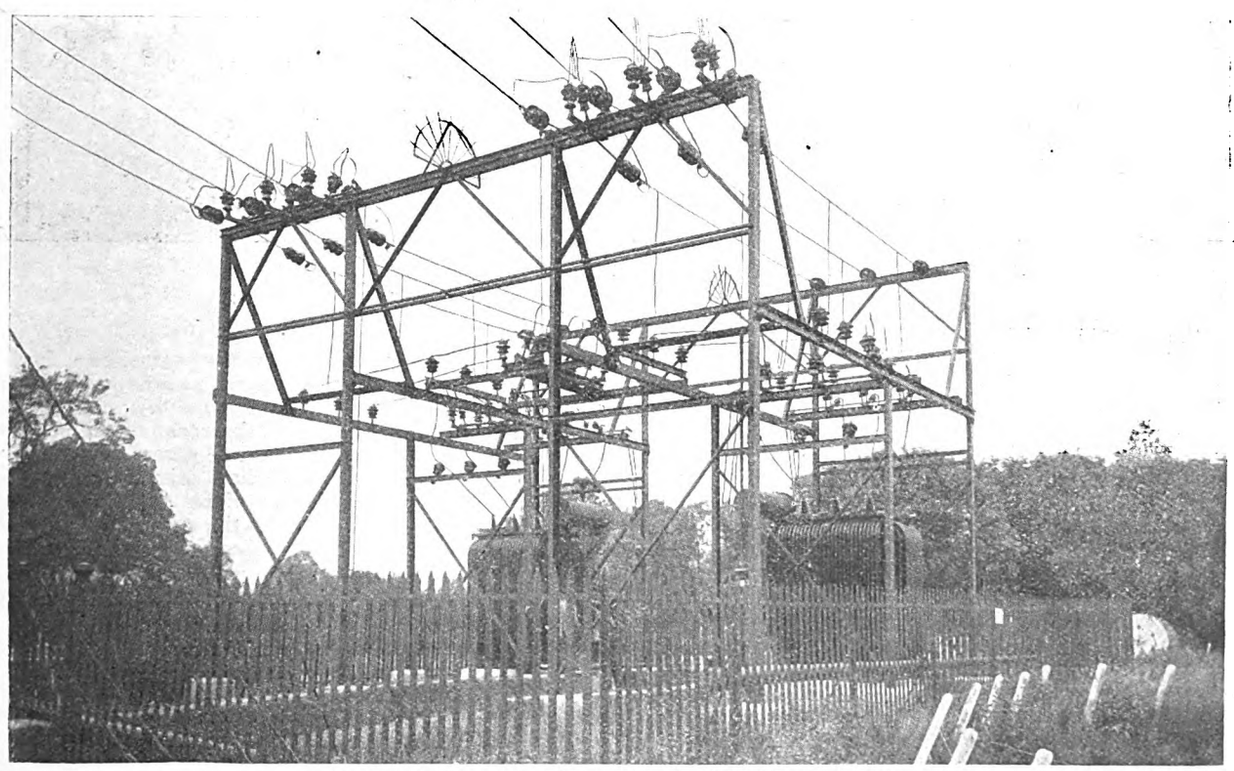

Fig. 5.—Outdoor switching station arranged with Isenthal aerial switches.

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ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.

Annual Dinner at the Hotel Cecil—The Invasion of American Capital—Presentation to Mr. Donkin.

THE annual dinner and musical evening of the Association of Supervising Electrical Engineers was held at the Hotel Cecil on Saturday. More than 250 members and guests spent a very enjoyable evening, which was enlivened by bright speeches followed by a surprise item and a first rate variety entertainment.

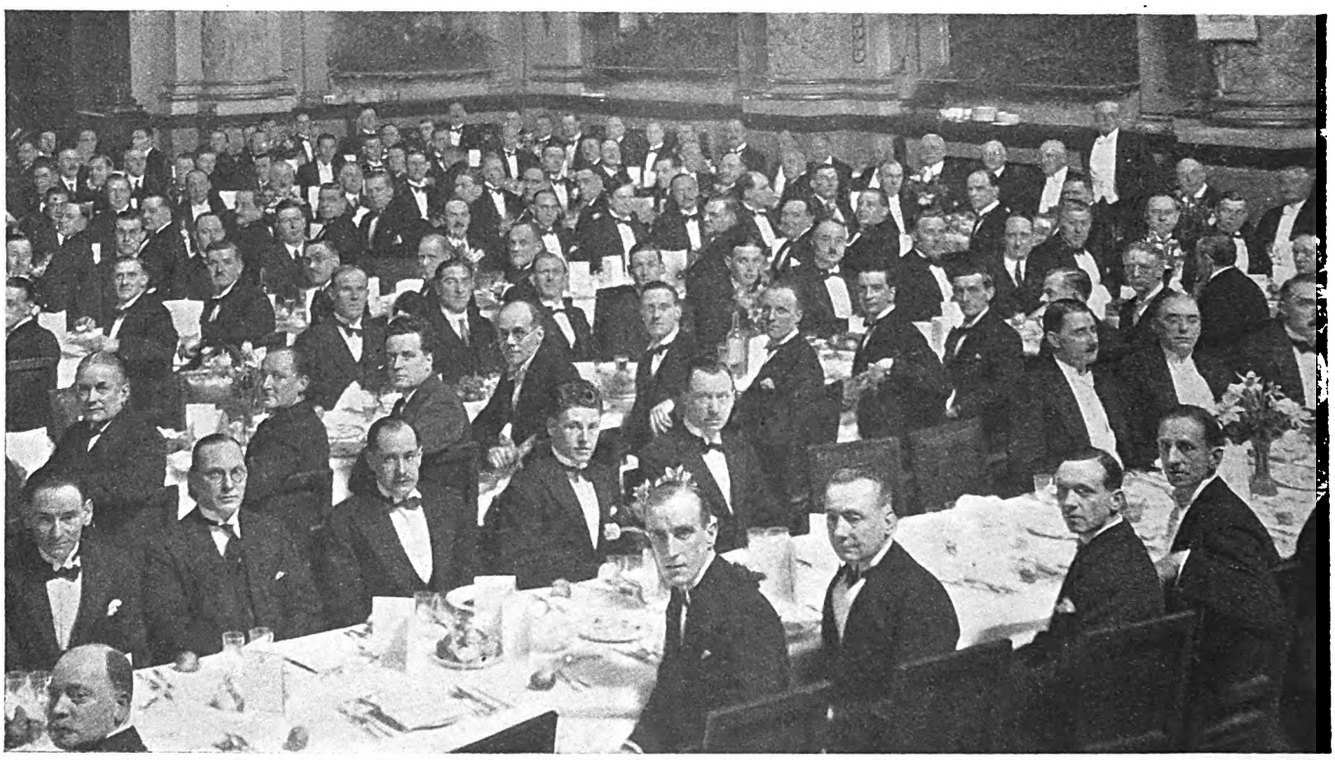
Mr. S. B. Donkin, president of the Association, was in the chair, and was supported by Col. Sir Thomas Purves, Sir Archibald Page, Mr. A. V. Watlington, Mr. J. S. Highfield, Mr. W. W. Lackie, Sir William Noble, Mr. P. Rosling, Col. R. E. Crompton, Mr. G. Scott Ram and Mr. G. Latham, M.P.

Proposing the toast of "The Electrical Industry," Mr. Donkin mentioned a number of ways in which various branches of the industry could assist its progress. Improvement of the load factor, simplification of wiring in houses, the apprenticeship scheme, the work of the British Engineering Standards Association and of the Electrical Research Association were touched on. In regard to the apprenticeship scheme, Mr. Donkin said that it was not too much to hope that by improving the way in which young men were learning their job they would get better work and at the same time much cheaper cost. The Electricity Commissioners' experimental scheme in Bedfordshire was going to demonstrate that there would be a big demand for electricity in rural areas.

Referring to the invasion of American capital in the supply field, Mr. Donkin said that we wanted to know what the motive was behind it. If, as Sir Felix Pole had said, this invasion was to provide co-operative expansion we need not mind, but if on the other hand it was to compete with us or take away orders from British manufacturers, then it was up to all our boards of directors to resent the invasion. If our country was to survive we must keep up our export trade. It was the duty of manufacturers to try to reduce their costs to improve means of selling their goods and to arrange for an easement of the labour situation.

Mr. Watlington, responding, said that what the electrical industry needed to-day was co-operation from one end of it to the other. The electrical industry was exporting something like 25% of its production—worth about £20 000 000 a year. Exports could be encouraged by standardisation—"don't ask for too many different types." If supervising engineers would determine to sink their own individual wishes for the common good it would be a tremendous help. Manufacturers realised that they depended on the users, and that it was no good standing on a height and telling people: "This is what you must have." The electrical industry was one of the bright spots. Unemployment was negligible, only 2%, but it had a great excess of manufacturing capacity of which probably not more than 60% was employed. If we could put that extra 40% to work it would help us enormously.

Mr. Rosling also replied, and said that success could be divided into two parts. The first was the most important and meant adequate remuneration; the second might be designated as "x"—it might represent honours or something else. Other professions had a satisfactory standard of remuneration. Lawyers, doctors, and so forth did not have to tender for the work they preformed, but if a house in a village was to be wired half a dozen tenders were called for, and as the occupier usually knew nothing about the subject the cheapest tender was usually accepted. We did not buy our bread or clothes on that principle. Instead of considering the electrical contractor as an enemy we should regard him as a friend.



Members of the Association of Supervising Electrical Engineers and their guests at the annual dinner.

Mr. Highfield, who proposed the toast of "Our Guests," referred to Col. Crompton as having served for 28 years continuously on the Council of the Institution of Civil Engineers and, apropos the presence of Sir Archibald Page, told of an old lady who was much upset about the proposed erection of a pylon in the neighbourhood, she having heard that a python was concerned. After a long argument with a friend, the conclusion was reached that the pylon was a post from which a python was to be suspended, but further complication was introduced by a parson who insisted that the word pylon came from the same root as pyre, on which, he explained, widows were burned, and it was eventually concluded that the object of the whole business was to destroy widows and so save the country the cost of their pensions.

Sir Thomas Purves, replying, hoped that the pylons would act as excellent lightning conductors for his department by directing public attention from his "modest wee telegraph

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poles." The Central Electricity Board had made a profound psychological mistake in adopting that sonorous word pylon. The Board's electricity made the most abominable noises in his telephone circuits and provided beds of prickly thorns into which his wires fell when they broke. His cables never did any damage to anybody and were absolutely devoid of any kind of vice. They were so ubiquitous that trouble could hardly happen anywhere without their being in it.

Sir Archibald Page also replied, and referred to himself as the second act of the "Two Macs" (of which Sir Thomas Purves had provided the first). He said that he had tested the Association in a number of ways, but had never been disappointed. The possibility of electrical development was limitless. We were very fortunate in comparison with the other staple industries, but we had corresponding responsibilities. It must not be assumed that because we were reorganising the productive side of the industry that that was the last part of the job. The machinery of the Central Electricity Board could only function to its fullest extent if utilised in conjunction with rapid expansion on the distribution side. This meant that satisfactory provision must be made to give service to the public in the fullest sense of the term. There were a few outstanding instances to-day, but the leaven needed to be spread considerably. The grid in Central Scotland was due to be officially opened at the end of April, but large sections were already in use. The progress made by the Board was all that could be desired.

Mr. B. C. Garman, chairman of the A.S.E.E., contributed an effective and much appreciated surprise item by presenting Mr. Donkin with the first medallion (in gold) to be struck representing the official emblem of the Association. On the one side the medallion bears the emblem with the motto, "Ease the Path to Progress," and on the reverse is the inscription: "Presented to our president, S. B. Donkin, Esq., February 22, 1930, No. 1." Numbered silver medallions are to be provided for the use of members of the Association. The presentation to Mr. Donkin was accompanied by musical honours.

PROTECTION OF TELEPHONE LINES.*

Problems Raised by the Grid—Communication Circuits and Earth Faults—Difficulty of Calculating Mutual Induction—Protection of Crossings.

By COL. SIR THOMAS F. PURVES, O.B.E. (President of the Institution of Electrical Engineers).

EFFORTS to devise means of safeguarding the existing and essential art of electrical communication have been reflected in various Acts of Parliament, and much has been written of the so-called conflict between the "weak current" and "strong current" interests in the past. Solutions of many difficulties, which appeared to be almost insurmountable in the early days, have now been found, but the urgent public need for the increase of both power and communications services continuously presents new difficulties in more and more acute forms and the subject is still of great interest and importance.

Many of you know that there has now existed for some years an international organisation called the "Comité Consultatif International des Communications Téléphoniques à Grande Distance," fortunately capable of being referred to, in brief, as the C.C.I. The C.C.I. consisted at first of representatives of the various telephone administrations of Europe, but more recently, the field of membership has been extended and made practically world wide.

An important special matter which has been the subject of continuous study by the International Committee is the protection of communication lines against interference set up by power circuits in their vicinity. Questions of electrolytic damage and inductive interference have hitherto been given most consideration, and in arriving at its conclusions the C.C.I. has had the advantage of co-operation with representatives of the power side of the industry through certain international bodies, including the Union Internationale des Chemins de Fer (the International Union of Railways), Conférence Internationale des Grands Reseaux Electriques à Haute Tension (the International Conference on High Tension Electrical Lines), Union Internationale des Producteurs et Distributeurs d' Energie Electrique (the International Union of Producers and Distributors of Electricity), Union Internationale de Tramways et Chemins de Fer d'Intérêt Local (the International Union of Tramways and Local Railways).

Isolation or Drainage?

The "Recommendations" issued by the C.C.I. in connection with the protection of cables against corrosion due to electrolytic action follow Continental practice in that the "isolation" system is favoured, in preference to the system of "electrical drainage" or the connection of cable sheaths and pipes with the negative return or busbar. At the moment there is a decided difference of opinion among engineers as to the best way of tackling the universal problem of protection against electrolysis set up by stray currents from tramway systems. One school advocates the "isolation" system, and the other "drainage." In this country, although the regulations of the Ministry of Transport appear to aim at an isolated system—except that the negative busbar or the points of connection of negative feeders to the rails have to be earthed—the practice of connecting the sheathings of their cables to the rails and/or to the negative busbar has grown up amongst tramway undertakers. The "drainage" school claim that their method tends to ensure immunity from electrolytic action by stray currents, whilst the advocates of "isolation" say that drainage systems extend the danger area and thus jeopardise and increase the danger to the cables and pipes of other users of the soil. It should be observed that the Advisory Committee on Railway Electrification appointed by the Ministry of Transport, advised isolation for electric railways in this country.

Apart from the question as to which method of providing protection is the more effective, it is clear that the "isolation" system places the responsibility for maintaining satisfactory stray current conditions upon the traction authority, whilst the "drainage" system shifts the responsibility to the shoulders of the cable or pipe owner, who is burdened with additional and recurring expenditure for maintenance and supervision of drainage connections.

In connection with the inductive interference problem the C.C.I. has issued "Directives" (guiding principles) which indicate the best practice to be followed by the power industry and by the telephone administrations in order to minimise trouble.

Many Questions to be Investigated.

Whilst the "directives" cover the subject so far as up-to-date experience and research has taken us, there are many outstanding questions which require further investigation, and arising out of this an international body has been set up to carry out research into problems that jointly concern the power and communication interests. This offshoot of the C.C.I.—the "Commission Mixte International" (C.M.I.)—is composed of representatives of the C.C.I. and of the international bodies already mentioned. Responsibility for necessary investigations has been distributed between the various European telephone administrations and the power interests, and a programme of work has been drawn up.

At the last meeting of the C.M.I., it was decided to extend the programme to include the protection of pipes and cables against electrolytic and chemical action, and to enlarge the membership to embrace the gas and water industries. Further, it was decided to include a class of "Associate Members," as a very large proportion of the electrical industry is not represented by the international bodies now acting.

The problem of adequate representation of the electric light and power industry of Great Britain has been a matter of considerable concern to me, since the international association mentioned do not appear to receive any considerable degree of support from this country. The formation of the Associate membership class of the C.M.I. appears to afford a way out of the difficulty. The Institution of Electrical Engineers has itself joined as an Associate member.

The outstanding problem at the moment in connection with inductive interference is concerned with "dangerous" induced effects. The great increase in the use of electrical energy for power and traction purposes, and the transmission of such power by means of overhead lines working at very high pressures, has brought about conditions which may endanger not only telegraph and telephone plant and apparatus, but also the engineering and operating staff, and the members of the public using the communications circuits, even when

* From the presidential address delivered to the Sheffield Sub-Centre of the I.E.E., on February 19th.

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there is no direct contact between the two sets of plant. Operators and telephone users may be adversely affected by "acoustic shock." Serious acoustic shock, is caused when voltages sufficient to operate the lightning protectors (about 350 V) are induced in the two wires of the telephone circuit.

When this occurs, it is certain that the lightning protectors, one of which is in each leg of the circuit, will not act simultaneously, and the charge passes through the operator's set. The ear may be damaged, and, even if it is not, frequent disturbance of this kind adversely affects the nerves, and in the case of telephone operators, may cause such loss of morale that continued work is impossible. In Germany and America, where power systems are highly developed, the amount of trouble caused in this way has been very serious.

It should be observed that "acoustic shock" appears to be chiefly associated with the operations of 3-phase systems employing an unearthed neutral point, as with this type of system, "arcing grounds" may be set up by the failure of an insulator, and these may persist without the circuit-breakers coming into action. The unearthed neutral system has, however, an advantage over the earthed neutral in that it is not necessary with the former to arrange for such great separating distances in cases where the power lines run parallel with communication circuits.

With the earthed neutral system, which is the common practice in this country, the occurrence of a fault to earth, on any phase, results in the passage of a considerable current between the fault and the earthed neutral point. This current, passing through the faulty phase and earth, acts by electro-magnetic induction on neighbouring communications circuits, and may produce very dangerous effects. This problem is of first rate importance at the moment in connection with the installation of the "grid" by the Central Electricity Board, which is to be operated at 132 kV with the neutral point directly connecting to earth at all feeding points.

Permissible Longitudinal Voltage.

The Post Office has adopted the figure of 300 V, given by the "directives" as the maximum longitudinal voltage that can be allowed in a communication circuit on the occurrence of a fault to earth. The calculation to determine whether under any given condition this voltage will be exceeded is a matter of great difficulty. Formulæ for the calculation of the co-efficient of mutual induction have been developed by Breisig, Rudenberg, Pollaczek and Carson. These formulæ agree with experimental results in certain circumstances, but none of them can be said fully to meet the general case. Further, in applying the formulæ one of the principal factors, the specific resistance of the earth, is difficult to determine, since the earth is not homogeneous, and in any case the measurement is difficult. In the first instance, the C.C.I. recommends that the Rudenberg formulæ should be used, with an assumed value of 20 000 ohms per centimetre cube as the resistivity of the earth.

Subsequent to this recommendation a number of investigations were carried out in Germany, and in this country, which go to show that the formula of Pollaczek gives results more in agreement with those obtained by actual tests, and further that 20 000 ohms per cubic centimetre is too high a figure for general use. On the other hand, investigations in Sweden show that the earth resistivity of 20 000 ohms is exceeded in some parts of that country. The higher the specific resistance of the soil the greater will be the induced voltage.

The investigations in this country were carried out in co-operation with the Central Electricity Board, utilising for the purpose, the British Electrical and Allied Industries Research Association and, as a result, it has been agreed that when calculating the probable inductive effects on the occurrence of earth faults on the Board's 132 000 V overhead lines, Pollaczek's formula shall be employed. The resistivity of the earth will, in general, be assumed to be 4 700 ohms in accordance with a modification of the directives adopted at the plenary meeting of the C.C.I. held in Berlin in June last. It is stipulated, however, that where power lines are projected in neighbourhoods where it is known that geological conditions point to higher soil resistances, tests will be made to ascertain whether a higher figure should be taken.

The calculation of the values of earth fault currents to be expected where an extensive and complicated network is concerned appears to be a matter of some difficulty. Although fault currents to earth as great as 5 000 amps have been suggested as possible, the engineers of the Central Electricity Board are at the moment somewhat non-committal. To ensure safe conditions for such large currents the power lines and communication circuits would have to be separated by great distances if the routes ran parallel for a long way.

With the existing extensive system of Post Office overhead and underground lines it is a difficult matter to find routes for the "grid" which will avoid parallels with relatively close separation. The design of the Central Electricity Board's "Grid System" includes a high conductivity steel cored aluminium earth wire, connected to every tower and thereby to earth. It has been proved, both theoretically and by experiment, that a reduction of about 33 per cent. in the induced voltage is brought about by this arrangement. Making due allowance for this, however, the position is not free from anxiety which only working experience can remove.

The construction of the "grid" has confronted the Post Office with a difficult problem as regards satisfactory protection to Post Office lines where crossed by transmission lines.

It has been urged that the factors of safety used in the construction of the "grid" are so liberal that risk of a breakdown which would result in direct contact with Post Office circuits, is so small that it might be ignored. The breakage of conductors from various causes which are not covered by factors of safety cannot, however, be ruled out of the range of possibilities, and in view of the consequences of an accidental contact, especially as regards risk to life of Post Office personnel and to users of the telephone system, it is felt that the absence of any specific precautions would be condemned in the event of a serious accident.

In the case of subscribers' circuits, there is no particular difficulty in following the normal procedure of putting the Post Office circuits underground at the crossing points, but the position as affecting trunk lines gave rise to some concern.

In the past, every effort has been made to avoid the degradation of the transmission efficiency of important aerial trunk lines produced by the insertion of short intermediate lengths of underground and protection has been provided at high tension crossings either by placing the power line underground or, where this course was not feasible, by the erection of a cradle guard beneath the power line. Neither of these measures is practicable in the case of the "grid" and the alternative of placing the trunk circuits underground at the danger points has had to be accepted.

In deciding on this procedure, we were also influenced by apprehension of the disturbance likely to be produced by electrostatic induction where an aerial telephone line is crossed by an overhead line carrying 132 kV. German experience and calculations have indicated that where voltages exceed 100 kV, and there is more than one crossing, excessive noise will be produced in the telephone circuits during normal operation of the power line, with the possibility of acoustic shocks on the occurrence of faults.

It can be taken that an induced difference of potential of 5 milli-volts between the two sides of a telephone circuit will result in excessive noise when frequency of induced current is of the order usually produced by power circuit harmonics.

Unfortunately, the main roads in this country along which telephone trunk lines have been built are on the whole rather tortuous, and consideration of the routeing proposed by the Central Electricity Board showed that many important telephone trunk circuits would be crossed several times. The effect on telephone transmission of a number of short underground lengths is serious, but it was reluctantly decided that there was no reasonable alternative to burying the Post Office lines at the crossing points.

Need for Co-operation.

The placing of trunk telephone circuits underground at crossings is in practice being effected by the use of a number of 8 pair, 70 lb. Star Quad cables appropriate to the size of the overhead route. This cable has a specially low wire to wire capacity designed to alleviate somewhat the prejudicial effect of the underground section. The use of a number of small cables in place of a single cable large enough to carry all the circuits should tend to limit the possible effect of damage to the underground should the overhead line suffer from the effects of lightning. The difficulties will necessarily be accentuated as the use of electricity expands and greater and greater power has to be transmitted over long distances.

No doubt new problems will also arise and, if they do, I trust they will all be tackled on the lines I have described, that is, by co-operation between the interested parties. The "Commission Mixte International" is an attempt to provide the machinery for such co-operation. It is solely concerned with the solving of technical problems, and has nothing to do with any legal questions that sometimes unfortunately arise.

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ELECTRIC HEATING LOADS AND COSTS.

Limits of Price—Load Curves—The Heat Pump—Heating of Buildings—Suitable Selling Methods Necessary.

By R. ALAN S. THWAITES, M.Inst.C.E., M.I.E.E.*

THE potential heating load in this country is estimated to be of the order of 10 times the total load of all kinds which is at present connected to the various public supply systems. In the case of many applications, the advantages of electricity are so great that prices in line with those prevailing for motive power can be obtained. But like every other class of load, if we wish to obtain the whole load, the price for certain applications must be very low. It is well to consider, therefore, how long a price the supply industry can justify offering, and to what extent restrictions as to use can be made to assist in this respect.

The price provisionally quoted by the Central Electricity Board to Supply Undertakers for supplies of the order of 10 000 kW and upwards—commonly known as " Grid Price " —varies somewhat for different electricity areas, but averages about £5 per kVA per annum, plus 0·2d. per unit.

Seeing that an early date all supply authorities in Great Britain will be purchasing the whole of their current either

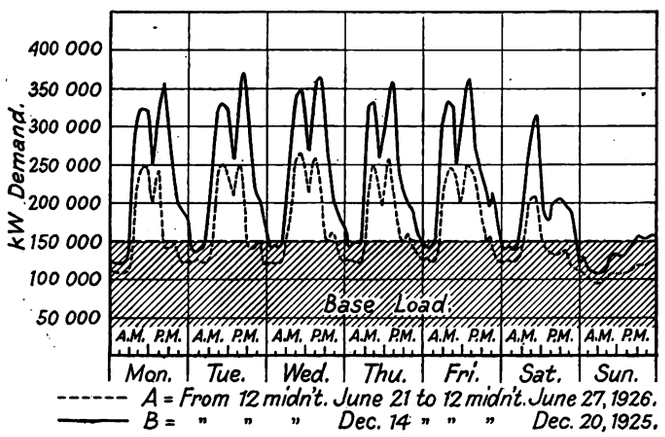

Fig. 1.—Mid-East England Electricity Scheme. Aggregate load curves summer and winter weeks.

directly or indirectly from the Board, it is convenient to take this as a basis on which to make a few simple calculations. If we consider first, entirely " off peak " load, the current costs the supply authority 0·2d. per unit, and in order to include a contribution towards the expense of distribution and management together with a profit (which in the grid price are included in the standing charge), the usual figure offered to-day for large " off peak " supplies is 0·3d. per unit to 0·35d. per unit. Where, on the other hand, the heating load is not restricted as to times of use, then this load must bear a due proportion of the standing charges both on generation and distribution. At say, a 20% load factor, the cost of current at grid price is 0·63d. per unit. To this we must add our proportion of distribution charges, management and profit. On the other hand, diversity comes to our aid—often to a considerable extent—with the result that the load factor of a group of heating supplies may be high, although the individual load factor may be comparatively poor.

It must not be overlooked, however, that as the individual load factors improve, so the diversity diminishes, and at 100% load factor there can be no diversity. The resulting average price per unit from the grid tariff at 100% load factor is 0·28d. per unit. This must be regarded merely as the cost of generation or its equivalent.

Fig. 1 shows typical winter and summer load curves taken over a week in the case of the combined electricity undertakings of the Mid-East England Area, and it may be assumed that the load curves of other areas in this country are very similar.

In order to sell current for heating purposes cheaply we must so arrange matters that the result is to improve the load curve of the system. Suppose, by making suitable arrangements, we were able to obtain a level load on the system day and night (i.e., to obtain 100% system load factor). What does this imply ?

Firstly, there will be no more " off peak " available units until additional load for other purposes has been obtained ; and secondly, the consumers for lighting and motive power purposes will expect to share in the benefit resulting from the low cost of generation brought about by the high load factor.

At Berne, in Switzerland, the load factor has already been reached, about 90% due to the growth of heating load, with the result that the time of the " peak " now tends to move about. It is accordingly the duty of certain officials periodically to alter the time switches controlling various heating supplies, so as to keep the " peak " under control.

Certain supply undertakings are inclined to the belief that if they obtain something a little more than their coal cost for current for heating purposes, they are doing quite well. This point of view is unsound, and it is necessary to have regard to the other considerations to which I have referred.

An interesting application in regard to heating is the heat pump, and results of tests on plant in operation were given in a paper recently read by Mr. T. G. N. Haldane before the Institution of Electrical Engineers.

The principle of the heat pump is well known. It is a reversed cycle heat engine, and due to the thermal operation, by drawing heat from the atmosphere, it is possible to send out far more heat than is equivalent to the electrical energy supplied to the pump. This is only applicable to low temperatures of the order of 120° F. This application is at present mainly of scientific interest.

Heating Load in America.

A report by the Industrial Heating committee of the National Electric Lighting Association of America gives as an estimate that in 1929 no fewer than 6 000 000 000 units of electricity were sold in the United States for industrial heating purposes. These figures show what has been achieved in one country, and as this is only a fraction of the load which can be obtained, it seems quite clear that the sales organisations of supply undertakings in this country can with advantage devote considerable attention to obtaining this class of load, particularly in industrial areas. In this respect the Birmingham undertaking has been particularly successful.

The electricity supply industry fully appreciates (and it is up to us to pass the point of view on to the user) that a mere comparison of heating sources on a thermal basis means nothing without a complete investigation of the total costs. In many heating processes the heat applied to the intended purpose is small compared with the total heat supplied.

To take an extreme case. A metallurgist requires to heat 10 grammes of a substance to 1 000 deg. C. for a period of

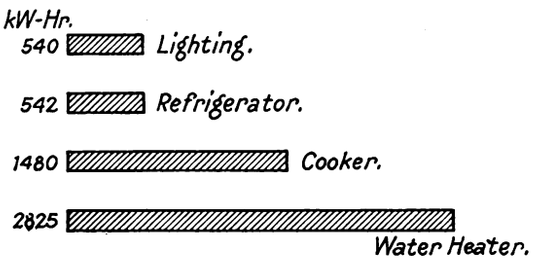

Fig. 2.—Annual energy consumption of domestic appliances. (Detroit, U.S.A.).

one hour. The heat absorbed in raising the temperature of this 10 grammes of material is minute. The process is usually carried out in a muffle furnace weighing many pounds. Sufficient heat must be applied not only to heat the crucible and its contents, but to raise the temperature of the muffle furnace and also to make up for the heat losses while maintaining the temperature. The use of electricity for heating enables furnaces to be so designed as to result in a high efficiency of utilisation. What better example could you have than the insertion of an immersion heater in a domestic hot water cylinder ?

Electric heating is particularly advantageous where intermittent heat is required. The indirect advantages are to-day

* Paper read at the Electrical Development Association Conference, British Industries Fair, Castle Bromwich, on February 20th.

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fairly well known, at any rate to the supply industry, but it is perhaps worth enumerating a few of them :—

Automatic control reduces labour in operating.

A higher grade product obtainable.

Fewer spoilt articles.

No fuel handling, or ash-handling and no chimneys, flues or fuel bunkers to provide.

More comfortable working conditions for the operators.

The heating of large buildings by means of a system of thermal storage appears to be quite practicable with current at approximately 0·35d. per unit for "off peak" use. In this connection there seems to be considerable scope for reducing the heat losses from buildings by taking special precautions in their design and construction.

Coming to the question of hot water, it may be said that possibly its greatest immediate application is in the home. The most recent tests on a large scale appear to be those which have just been published by the Detroit Edison Company; these appeared in an article by Mr. Harry A. Snow in "The Electrical World" of January 11th, 1930. The figures have been obtained by aggregating the load curves of 1 000 electric water heaters so as to obtain the effect on the power station of such a load. Tests have been taken under service conditions on water heaters installed in typical homes in rather moderate circumstances.

Fig. 2 shows the average annual consumption of different appliances in the home, from which it will be seen that the use to be expected from water heating averages approximately double that taken by an electric cooker. It seems to be the general experience that for a moderate size of house sufficient hot water will be available if the number of gallons of water in the water heater multiplied by the maximum rating in kW is approximately 60. Thus if a 2 kW heater is used, the tank should hold 30 gallons; if a 3 kW heater, 20 gallons, and so on. The question of the ratio of gallons to kW is referred to later.

Fig. 3 shows the average daily load produced by 1 000 electric water heaters, and it will be seen that the maximum load is 750 kW, or ¾ kW per heater.

When we turn to Fig. 4, which represents the load on wash day, we find the maximum load has risen to just over 1 300 kW, or 1·3 kW per heater. This peak occurs during the morning, and does not therefore coincide with the evening lighting peak. The heaters which were tested were mostly so interconnected with the coke furnaces on the various premises that a certain amount of heat in the winter time was obtained from that source. This explains the higher consumption during the summer than in the winter. This suits supply undertakings very well, as it tends to level out their annual load curve. Average conditions would probably be something like 16 gallons and 4 kW. The peaky nature of the load curve is very marked; but even so, the combined load factor of 1 000 heaters is 49%. In the case of 1 000 low capacity heaters (probably on the average about 1½ kW and 40 gallons), the load curve is far more smooth, and the combined load factor is as high as 73%. It is to be noted that the load between 4 and 6 p.m. (which for most undertakings is the time of "peak" load), is nearly double that taken during the same period by highly-rated water heaters. This result at first sight seems surprising, but further consideration of the circumstances enables one to appreciate the reason, namely, that with the highly-rated water heaters the hot water used for washing up after lunch is made up fairly rapidly, whereas with the low capacity heaters this is not the case. Use of electricity for water heating is rapidly growing, mainly because it is so very convenient, especially in the summer time, but we can certainly sell far more current for this purpose by adopting suitable methods, and an important consideration is that this is a class for which a fairly good price is obtainable. As Mr. C.H. Smith stated at a recent E.D.A. conference, "At a 1d. per unit there is some hope; at three-farthings there is a lot of hope, and at a halfpenny it is easy."

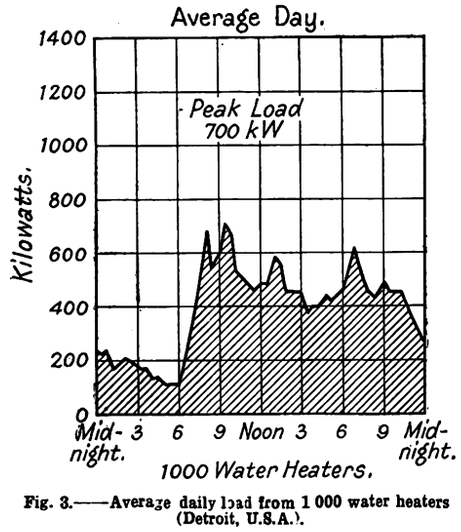

Fig. 3.—Average daily load from 1 000 water heaters (Detroit, U.S.A.).

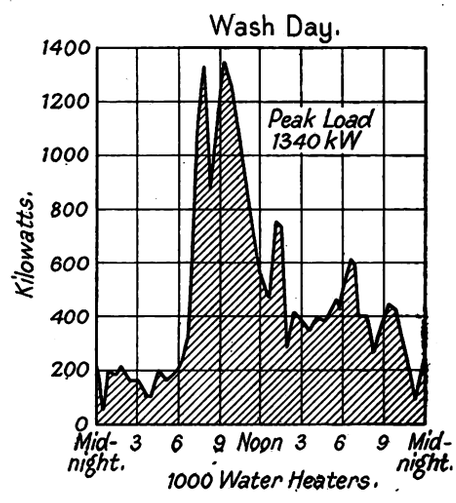

Fig. 4.—Wash day load.

The question of water heating has become so important that a special Sub-Committee of the E.D.A. has been formed within the last few weeks to deal with this matter.

In the ensuing discussion, Mr. W. Y. Anderson, commercial engineer to the Birmingham Electric Supply Department, said his department had for a long time realised the importance of the heating load, both domestic and otherwise. They had been careful to bring the price as low as possible. Under an extra high tension scheme of supply to manufacturers, who took their supplies in bulk, the department was now supplying current for electric furnaces at ½d. per unit. Up to the present this had been the means of raising the load for this purpose approximately 8 000 kW. This was primarily a day and a night load, and its value therefore could be readily appreciated. Similar progress had been made in connection with the supply of current for domestic water heating. By the adoption of a special rate, this was now being sold for ½d. per unit. The step had been successful from its inception, and the department was doing exceedingly good business in this direction. The total domestic heating and cooking load had, in fact, increased from 16 060 kW to 40 870 kW during the past three years, a growth of approximately 250 per cent.

This was one of the most successful electrical conferences yet held at the Fair, and was attended by upwards of 150 delegates.

ELECTRIC WELDING.

Some Recent Applications—Fringe of Field Barely Touched.

IN reviewing the progress made in the application of electric arc welding to the strengthening and fabrication of Steel structures, Mr. E. P. S. Gardner, B.Sc., addressing the Junior Institution of Engineers recently, stated that although the process had already been applied in many directions, the field of application was so great that little more than the fringe has yet been touched. Concerning certain bridges on the London and North Eastern Railway it was stated the cost of strengthening by electric welding was one-fifth the estimated cost of renewal, and there was no delay to traffic. The process had also been applied to the strengthening of gasholder crowns by steel strips applied as radii over the crown, cross connected by concentric rings of steel strip.

Recent progress had been marked by the erection of structures designed from first principles entirely for welding, and in which little or no trace of accepted forms of construction employed in riveted practice could be found. In a theatre recently erected on the Continent the roof trusses were designed, as "three pin arches" and built up entirely of plates and flats; all joints in the flange plates and webs were butt-welded without cover plates; changes in flange section being effected by varying the width of the plates. The flanges were attached to the webs by light 4 mm. continuous fillet welds. The saving in material as compared with trusses of similar rivet construction was estimated at 23% and the saving in total cost at 28%.

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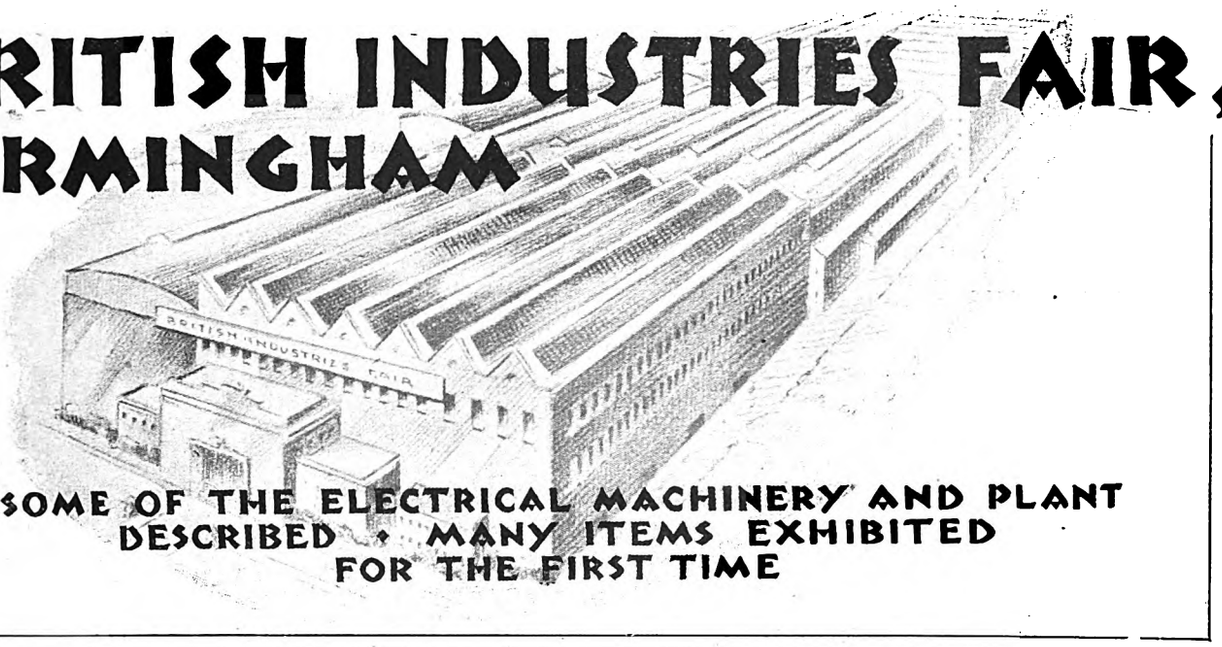
BRITISH INDUSTRIES FAIR, BIRMINGHAM



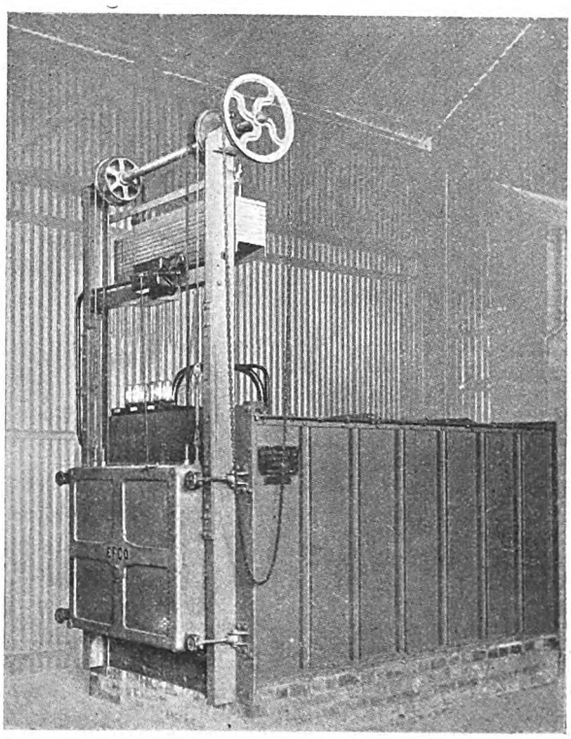
SOME OF THE ELECTRICAL MACHINERY AND PLANT DESCRIBED • MANY ITEMS EXHIBITED FOR THE FIRST TIME

WE continue below our review of the electrical stands at the British Industries Fair, and deal this week with the heavy exhibits, including traction, generation and distribution.

The STURTEVANT ENGINEERING CO., LTD. (147, Queen Victoria Street, London, E.C.4), exhibit, on Stand 13D-3, special portable vacuum cleaning equipment for boiler-houses and other places where a large quantity of material is required to be picked up. This machine is fitted with a primary receiver, hoppered at the bottom, so that the material can be sacked off periodically. Any fine dust carried over from the primary receiver is caught in a dust separator with textile filter screen, with removable dustbin at base. The necessary large air volume at the correct vacuum is produced by a multi-stage turbo-exhauster, driven by a 4 H.P. electric motor. This machine should be of special interest to all users of pulverised fuel. Other exhibits include vacuum-cleaning plants, both portable and stationary, for business and industrial buildings; also turbo-blowers and exhausters for supplying clean, dry air at suitable pressures or vacua, for various purposes. A common use for these machines is for clearing electrical equipment.

DAVIS AND TIMMINS, LTD. (York Road, King's Cross, London, N.1), Stand 16G-5. The exhibit here consists of a case showing metal thread screws, bolts, nuts and terminals turned from the solid rod, examples of repetition work in all metals, for electrical and general engineering, motor and other trades, and as supplied to the Admiralty, War Office, Post Office and other Government Departments, the Crown Agents, etc.

J. H. TUCKER AND CO., LTD. (King's Road, Tyseley), are showing, on Stand 20J-4, a number of new products, including the "Tucker-Titan" 5A capacity "all-insulated" tumbler switch, with moulded "Telacite" cover on porcelain base. This switch became available for sale to the trade with the opening of the Fair. Among other standard lines are tumbler switches, solid-link and quick make-and-break patterns; a complete range of plugs and sockets in wood, china, and moulded "Telacite" distribution boards in iron and teak cases; ironclad switch and fusegear in both watertight and non-watertight patterns, together with an assortment of their most popular lines in flush plates, in both metal and insulated patterns.



A general purpose annealing furnace by the Electric Resistance Furnace Co., Ltd.

The CHLORIDE ELECTRICAL STORAGE CO., LTD. (Clifton Junction, nr. Manchester), Stand 19M-6. Storage batteries for a variety of electrical purposes are exhibited by the Chloride Electrical Storage Co., and representative types displayed at the stand are in four main categories: (1) Batteries for stationary installations, such as country-house lighting plants and central power stations, and for marine work. These are also designed for the emergency-lighting equipment of theatres, cinemas, shops and public buildings. (2) Batteries for high tension and low tension wireless purposes, talking film installations and sound projector systems. These include a comprehensive range of unspillable cells for portable wireless sets, and also unspillable cells for miners' handlamps. (3) Batteries for marine work; and for land traction, such as the propulsion of electric vehicles, trucks and cranes. (4) Batteries for lighting railway trains. Among the particular applications of batteries, attention is drawn to the Chloride Company's switch-tripping service demonstrated on the stand. A working model of a high-tension switch is shown being tripped by a small battery of Exide "Mass" type cells. The Exide trickle charger is also displayed. Particulars are obtainable at the stand concerning 8 000 Exide service stations, established throughout the world, for the repair and maintenance of all makes of batteries. See page 279.

RUSTON AND HORNSBY, LTD. (LINCOLN), Stand 15H-1. Another interesting exhibit may be seen on this stand, where pride of place is given to the first engine sent out from the Hornsby works, at Grantham. At the Fair may be seen a 9½ B.H.P. engine which has been in constant service since 1892. The satisfaction which the engine continues to give may be gauged from the fact that the engine has merely been loaned for the period of the British Industries Fair, having been brought direct to Castle Bromwich from the factory at which it was normally installed, and to which it will be returned immediately at the close of the exhibition. Alongside this historic engine are seen modern engines by the same builders. Visitors to the Fair who require compressed air for any purpose will be interested in the air compressor, which is run primarily for

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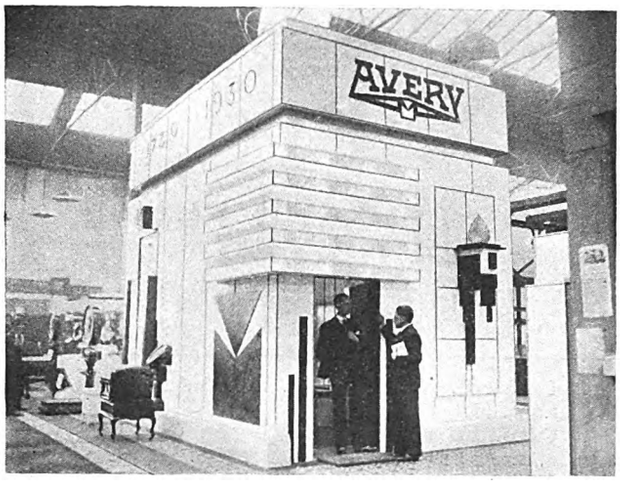
the purpose of providing compressed air for starting up the company's oil engines. This is a single-stage compressor, which starts on petrol and afterwards runs on either petrol or paraffin, and is capable of giving a maximum air pressure of 300 lb. per square in. Capacity 10·6 cubic ft. of free air per minute at 560 r.p.m. With a view to demonstrating the wide application of the modern oil engine, another special exhibit on this stand is a "Ruston" crude-oil road roller.

W. H. ALLEN, SONS AND CO., LTD. (Queens Engineering Works, Bedford), show, on Stand 19F-2, two examples of the



The modern lighting effects on the stand of W. and T. Avery, Ltd.

"Allen" airless injection Diesel engines, one capable of developing 100 B.H.P., and the other 200 B.H.P. The smaller of these is running direct-coupled to an "Allen" d.c. dynamo. The 100 B.H.P. engine is representative of a range made with 2, 3, 4, 5 and 6 cylinders, the outputs ranging from 65 to 200 B.H.P., the speed in each case being 500 r.p.m. The engine exhibited is of the 3-cylinder type, and occupies space 7 ft. 8 in. long by 4 ft. 2 in. wide, the overall height being only 6 ft. These engines are of the vertical, four-stroke, airless injection type, and start from cold without the use of blowlamps, cartridges, electrical device or other external source of heat, the compression pressure being about 430 lb. per square in., which is sufficient to ensure ignition of the charge under all conditions of running. This engine, together with its dynamo, is illustrated on page 273. The dynamo is of the direct current, multi-polar, open type, designed for continuous working without undue wear of the commutator or bearings. The general construction complies with the latest requirements of the British Engineering Standards Specification. The dynamo is capable of an output of 65 kW, and is of the compound wound type arranged for 220 V. A cast iron baseplate is provided to carry both the engine and the dynamo. The larger engine on the stand is representative of the type, with two, three, four, five or six cylinders, from 130 to 750 B.H.P. output. The particular engine shown is designed for a speed of 400 r.p.m., and is also of the vertical, four-stroke type, arranged for starting from cold. The engine is exhibited direct-coupled to a d.c. dynamo similar to the one described above, but capable of an output of 132 kW.

The BRITISH-THOMSON HOUSTON CO., LTD. (Rugby), Stand 19J-1. Apart from the exhibits mentioned in our issue of February 14th, various motor startors and controllors for both a.c. and d.c. reversing and non-reversing motors also occupy positions of prominence. These equipments range from examples of this company's control pillars for large motors, down to motors of fractional H.P. rating, in forms for either wall or floor mounting. An improved form of oil-immersed a.c. control panel is the type ATM, form T, which is being shown for the first time. This is designed for starting and protecting three-phase, slip-ring induction motors up to 15/20 H.P. at any voltage up to 550 at 25 and 40/50 cycles, maximum stator current 30 A, including the B.E.S.A. overloads and rotor current not exceeding 75 A. It is suitable for starting three-phase induction motors against full load torque twice per hour. Over-current and under-voltage features are incorporated, and the connections are such that the motor may be stopped at a distance by means of push button when desired. The thermal type, oil-immersed motor startor and circuit breaker, which can be seen operating, has been developed for the direct starting of squirrel-cage motors taking current up to 30 A on voltages up to 660, and giving protection against every kind of fault on all phases. This startor measures only 8¾ in. high, 7⅝ in. deep by 6 in. wide, has a dust and drip-proof enclosure, and is under push-button control, either local or remote. A typical totally enclosed a.c. pillar type contactor starting equipment is also shown, suitable for controlling a non-reversing 25 H.P. slip-ring induction motor against twice full-load torque with remote push-button control. See page 286.

The GENERAL ELECTRIC CO., LTD. (Magnet House, Kingsway, London, W.C.2), Stand 19L-1. This company's industrial exhibits were referred to in our issue of February 14th, and mention may be made here of the attractive arrangement of the stand. The company has sub-divided the space of 10 ft. wide by 90 ft. long into three sections. The centre takes the form of a lounge, and both the end sections are assigned to electric furnaces in operation. In the lounge the illumination entails floor standards and a special centre fitting representative of the products of "Magnet" works, and on the outside of the lounge are affixed two brackets similar in type to those supplied to the liner "Bermuda." Six of the seven wall panels in the lounge are occupied by aerial photographs of the company's principal works, each flanked by photographs of representative products of such works; the seventh panel bears a composite photograph of the company's head offices, research laboratories and home and overseas branches.

PETTERS, LTD. (Yeovil), Stand 18J-3. The automatic electric lighting plant exhibited by this firm is of special interest, as it embodies an improved type of controller. The Auto-Petter-Light is known to many of our readers, and it has already received the award of the British Dairy Farmers' Association, London Dairy Show, 1929. Briefly stated, the plant consists of a 2 B.H.P. Petter two-stroke petrol engine fitted with magneto ignition, and directly coupled to an efficient compound wound dynamo generating 950 W output at 110 V. The plant, which is mounted on a continuous baseplate, is (with the exception of a small 12 V starting battery) independent of storage batteries. The engine is fitted with a standard type self startor and Bendix drive, similar to those in use on motor-cars. The speed is controlled by a governor of the centrifugal type, fitted in one of the flywheels, which regulates the consumption of petrol in proportion to the number of lamps in use. Having a power impulse at every revolution of the crankshaft (due to the two-stroke cycle of operations upon which the engine works) greater regularity of motion is assured than is obtainable with a four-stroke engine. The control switches may be placed, as frequently, and as conveniently, in the house, as may be desired. To obtain light, the nearest control switch is pressed downwards to the "start" position, causing an electro-magnet in the controller to close contacts, by means of which the motor startor sets the engine running.

Some of the exhibits of the Micanite and Insulators Co., Ltd.

The existing "earthed" condition of the magneto—which had come into operation when causing the previous close down—is now automatically removed, and regular ignition takes place in the cylinder. As soon as the engine gathers speed the lamps whose switches are "on" (i.e., those left burning at the previous shut down) begin to glow. The operator then releases the switch, and the starting controller windings are cut off from the 12 V starting battery. Simultaneously with generation by the main dynamo, a robust

(Continued on page 270.)

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cut-out—part of the controller—automatically puts the starting battery on " trickle " charge at a low rate. To turn off the lights, it is only required to press the nearest control switch into the position marked " stop," the lights quickly become dimmed, the switch can be released at once, and the engine comes to rest.

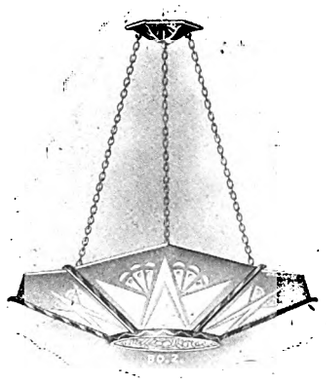
The HARLAND ENGINEERING CO., LTD. (196, Greengate, Manchester), Stand 19G-3 and 4. Here is shown a 5 000 A triple pole oil circuit breaker, arranged for manual operation, and it is stated this is probably the largest low tension circuit breaker which can be closed by hand with comparative ease. Each phase throughout the switch consists, in effect, of three distinct sections, insulated and well spaced from one another so that the eddy current loss in the conductors is reduced to a minimum, allowing a more free circulation of oil, with the consequent improvement in the cooling of the contacts. Another exhibit is an 11 000 V, 300 A, 200 000 kVA rupturing capacity truck type cubicle. This follows conventional lines, but incorporates a novel design of isolating socket, which, it is claimed, ensures positive contact and true self-aligning features. The lay-out of the cubicle is such as to enable nine current transformers to be accommodated, at the same time retaining a clean arrangement of main connections. The cubicle is fitted with automatic shutter mechanism and full interlocks. Other exhibits include a 2 000 A back-of-board (dead-front) type switch, mechanically operated; various types of oil circuit breakers; distribution boards; current transformers; cable boxes; and a general line of air break switchgear.

STUART TURNER, LTD. (Henley-on-Thames), at Stand 19N-3, exhibit new designs of small lighting and pumping plants. Their 250 W plant forms a bungalow lighting set and is of small dimensions, enabling this to be accommodated in the minimum space. The 500 and 750 W plants are popular sizes for farms and country house lighting and these sets are again of compact design. In all cases switchboards are mounted on the plants. Ball and roller bearings are provided throughout, and as these engines are of the two stroke type there are no valves or valve gear to require attention. The 500 and 750 W plants have a pulley enabling other machinery to be driven from the engine. The Stuart pumping plant shown consists of a 1 H.P. engine direct coupled to a vertical double ram pump with an output of about 800 g.p.h. and 100 ft. head. This output and the substantial design makes this new plant a popular one for providing water supply for country house, estate or farm.

A. REYROLLE AND CO., LTD. (Hebburn-on-Tyne), Stand 21 H-1, are showing one of their ring main isolating switches fitted with a switch-fuse so that a connection can be easily and economically teed off a ring main to a small consumer. The isolating switches are of the oil-immersed quick-make and break type, and are suitable for pressures up to 11 000 V. Other exhibits are samples of the company's 60 A and 100 A metal-clad switch-type fuse boxes. These switch-type fuse boxes are used for a large variety of purposes, both in domestic and industrial service. The draw-out principle has been embodied in the design by mounting the fuse on the lid, and so providing a combined switch and fuse. When the lid of the box is open the fuse and its terminals are dead, and the re-wiring of the fuse may be carried out with safety. Examples of unit-type distribution gear, which afford an illustration of how the metal-clad principle may be applied to every part of the control gear, right down to the last stage of the distribution, is also shown. Unit gear is designed for currents of from 30 to 350 A at pressures up to 660 V, and can be assembled to include switches or fuses or combined switches and fuses as may be required. It lends itself to easy extension; wall space only is required; and should one wall become full, an extension can be carried on along the next wall at right angles, a right angle coupler being inserted to make the necessary connection. If automatic features have to be provided for the protection either of the incoming feeders or of one or more of the outgoing circuits, standard oil-break switchgear can be built into the complete arrangement in conjunction with the unit gear. The distribution board exhibited is composed of two 60 A switch and fuse units arranged one above and one below a common busbar chamber to which four 30 A fuse-box units are also connected. The incoming supply is fed into the end of the busbars through a cable dividing box, while an end box effectively seals the other end of the busbar chamber.

The ELECTRICAL POWER ENGINEERING CO. (BIRMINGHAM), LTD. (Ward End, Birmingham), Stand 20J-1. Here are shown d.c. and a.c. motors and, with respect to the latter, these are arranged so that outputs and all essential dimensions are interchangeable with the range of d.c. motors, whether single-phase, two or three-phase squirrel cage or two and three-phase slip ring, at standard speeds. With regard to the squirrel

DOMESTIC ITEMS SEEN AT THE FAIR.



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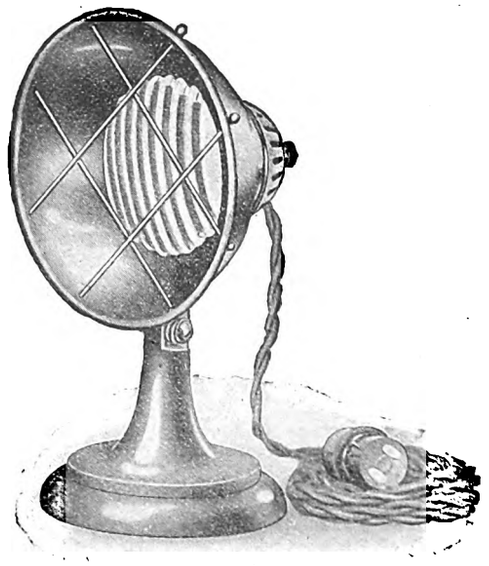

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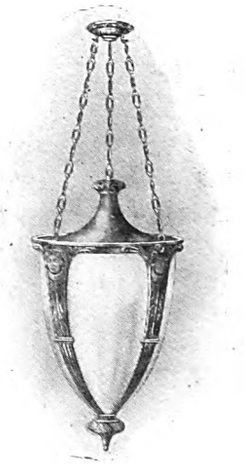

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(1, 2 and 3) Some of the attractive domestic lighting fittings to be seen on the stand of Hailwood and Ackroyd, Ltd. (4) The "Red Rose" fire exhibited by Sturge and Baker, Ltd.

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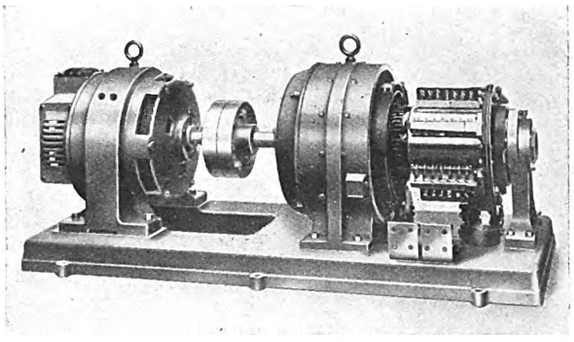
cage motors, the rotors are of aluminium bars and end rings being cast integral and of such design that an unusually high starting torque is obtainable without sacrifice to power factor and efficiency on load. The heavy current generators shown comprise a new E.P.E. feature specially developed to meet the demand at present existing for generators for chromium, cadmium and similar plating. In the case of generators up to 2 000 A, reverse ventilated single commutator type is employed with improved disposition of active material giving rigid construction with ample shaft diameters and heavier type ball and roller bearings. Interpoles and equaliser windings are used where necessary, a special application of these being useful where the voltage is required to be reduced to a low value by field regulation, i.e. from 10 to 2 V. This range can be obtained whether separate excitation or self excitation is used. For machines over 1 000 A a special design of armature reduces the possibility of circulating currents in the brushes to a minimum, thus also reducing the number of brushes, and therefore brush friction losses, making for increased efficiencies. All strand and cable connections have been superseded by a minimum number of strap connections, thus giving a neat appearance. Brush gear is of the sliding box type and on machines over 1 000 A brush holders are of girder section bolted firmly to busrings, these have wide seatings on a large diameter. A metallic pointer indicates the correct position of brush-gear. On smaller machines terminal sockets are bolted direct on to the brush rocker—on larger generators a broad simple arrangement is adopted terminating in B.E.S.A. standard copper strap joints mounted on thick Sindanyo insulating base, firmly clamped to base-plate, and easily accessible for attachment or removal of users connections. Generators of 3 000 A and over are of the dual commutator type with similar features to the others except that a special ventilating scheme is incorporated.

R. A. Lister and Co., Ltd. (Dursley), Stand 17G-1. Small lighting and power plants in 250 and 500 W sizes are offered here together with 1 and 1½ kW fully automatic equipments. The 250 and 500 W plants are intended to supply the needs of those who require a small electric generating and mechanical power plant in country houses, farms, amateur workshops, on board yachts, for pumping operations, and in places generally remote from access to main-line electrification. The engines are 2-stroke in operation, rated conservatively at ½ and 1 B.H.P., and are fully water-cooled even to the cylinder-head which is specially machined to obtain geometrical precision in the clearance volume of the cylinder. The petrol system of fuel supply and lubrication has been chosen, since, apart from the advantages of inherent simplicity which it possesses, the simultaneous cessation of fuel supply and oil are definitely ensured, so that there can be no fear of seizing from lack of lubrication. The smaller engine has a bore and stroke of 2 in. and 2 in. respectively, and carries a fuel tank of one gallon capacity, while the larger model has dimensions for bore and stroke of 2 7/16 in. and 3 in. respectively, the fuel tank being 1¼ gallons in capacity. Cooling is on the thermo-syphon principle, and either engine may be run for extended periods unattended. The engine speeds have been kept low, that of the small engine being 1 200 r.p.m., while the larger engine runs normally at 1 000 r.p.m. Ignition in each case is by M-L high tension magneto, while the carburetter is of the float type, and has been developed specially for this engine.

132 kV Insulators.

The Micanite and Insulators Co., Ltd. (Empire Works, Walthamstow, London, E.17), Stand 19J-2. The main feature of this firm's comprehensive display of electrical insulating materials is a complete range of high voltage condenser type bushings for outdoor service for use on both transformers and oil circuit breakers. The exhibit includes typical examples of bushings for various working pressures up to and including 132 kV manufactured in connection with the schemes of the Central Electricity Board. These bushings are provided with facilities for the assembly of current transformers, some of which are shown in position. The illustration on page 273 shows a 132 kV outdoor condenser type transformer bushing for the "grid," four of which are exhibited on the stand. The display also includes representative examples of the various applications of paxolin varnish-paper insulation and Micanite in which the firm specialises. A comprehensive range of paxolin varnish-paper boards, from the thin material used for punching up to heavy panels for control gear, and tubes for all purposes including formers for wireless applications, are included, together with samples of mica and Micanite used in the manufacture of electrical apparatus.

Davey, Paxman and Co., Ltd. (Aldwych House, Aldwych, London, W.C.2), are exhibiting on Stand 17H-1, one of their "4VKE" vertical heavy fuel oil engines with normal power of 265 H.P. at 333 r.p.m. and overload for an hour's duration of 305 H.P. The engine is of the enclosed forced



One of the exhibits of the Electrical Power Engineering Co. (Birmingham), Ltd., a description of which is given on the previous page.

lubrication type with exterior oil sump, and the design incorporates the "spring injection" system of fuel injection and the Paxman patent eccentrically operated exhaust valve gear. The lubrication to all main working parts is under pressure, a special oil baffle being provided to promote extreme economy. The cylinders are provided with detachable heads —which can be removed with all gear—and separate liners which prevent any stress due to varying working temperatures, etc. The engine is shown running under its own power at the reduced speed to demonstrate the ability of the injection system to function independently of the engine speed or load. Also exhibited is a Paxman patent all-steel sectional hot water boiler.

Stewarts and Lloyds, Ltd. (41, Oswald Street, Glasgow), Stand 14E-2. The exhibits here include tubular steel poles and a large variety of tubes with joints of all descriptions, covering all the needs of a power station; from flanged steam pipes for a working steam pressure of 815 lb. at a total temperature of 830 deg. F. to tubes of large diameter with spigot and socket, or light flange joints suitable for circulating water systems. Probably electrical engineers will find more interesting the copper sheathed steel tubes. The copper covering was originally intended, like those of the tin and lead covered tubes in the same group, to protect the steel against unusually corrosive influences, but the composite tubes have now been put to use as busbars in electric power plants. The copper sheathing is designed to carry the full current, and the steel tube to have the strength necessary to support the busbar between its terminals. In this way the copper required is greatly reduced from that necessary in a plain copper conductor where the cross section of copper has to be sufficiently great to provide the necessary strength and stiffness. Such composite tubes have been approved by the Central Electricity Board.

The Pritchett and Gold and E.P.S. Co., Ltd. (50, Grosvenor Gardens, London, S.W.1) are showing on Stand 19M-2 batteries for all purposes, including central stations, country house lighting, train lighting, etc. Last year this firm made a feature of their closed top cell which had just been introduced and this particular type is again given prominence. A range of both high and low tension batteries for wireless purposes is also on view.

Voucher, Ltd. (Auto Tools Works, Walsall), Stand 18E-4. This stand is of electrical interest in view of the fact that it includes specimen machines of the Electric Construction Co., Ltd., of Ingersoll House, Kingsway, London, W.C.2. Some of the products of this company are illustrated on page 273.

George Ellison, Ltd. (Perry Barr, Birmingham), Stand 20L-1.. This is a switchgear exhibit comprising metal-clad cubicle, truck, drop-down and draw-out types of high tension units for sub-stations; pole mounting switches for overhead lines; various types of low and medium pressure metal-clad switchboards for industrial installations; totally-enclosed industrial and flameproof circuit breakers of air and oil-break types, and a variety of motor starting and controlling apparatus. See page 273.

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CROSSLEY BROTHERS, LTD. (Openshaw, Manchester), Stand 16M-3, have this year concentrated upon their new vertical compressorless Diesel engine and show two examples, one, type RVD4, representing a four-cylinder engine with a normal rating of 220 B.H.P. at 350 r.p.m. It is shown in running operation and is suitable for power transmission by belt or ropes, or for direct coupling to an electric generator.

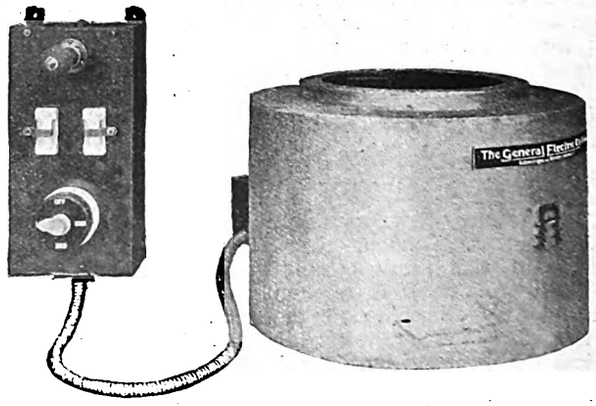
The stand of the Edison Swan Electric Co., Ltd.

The second example, also shown as a running exhibit, consists of a three-cylinder vertical Crossley Diesel engine, type OVD3, which has a normal rating of 62 B.H.P. at 450 r.p.m. It is complete with extension shaft and belt pulley for an industrial drive. These two engines have cylinders of 27½ and 55 B.H.P. capacity respectively, and are built as engines having one, two, three, four, five or six cylinders. Suitable compressed air starting equipment is provided, consisting of direct coupled petrol engine and compressor with M.S. receiver.

The HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., and the HEWITTIC ELECTRIC CO., LTD., are exhibiting together on Stand 20H-4 a special point of the exhibits being a display of a large number of drawings and photographs illustrating the latest developments of transformer and rectifier equipments. The stand itself is close to the exhibition sub-station which is equipped with mercury arc rectifiers manufactured and supplied by the Hewittic Electric Co., Ltd., and the sub-station is open for inspection by interested engineers on application at the company's stand. A representative selection of smaller types of mercury vapour apparatus and descriptive literature is available on the stand, and samples of the patented "Hackbridge" thermal relay are also on view.

DONOVAN AND CO. (47, Cornwall Street, Birmingham), Stand 19G-7. The exhibits here comprise ironclad switchboards, open type switchboards, Home Office fuse and distribution boards, d.c. startors, regulators, fan regulators, and dimming switches, Home Office wall sockets and plugs, etc. A new type of isolating link is shown for the first time. This isolating link is of novel design and construction made under the company's patents and provides a rapid means of isolation combined with a contact of negligible resistance. These links are particularly suitable for the isolation of motor control gear, transformers, etc., under Home Office Rule No. 11, and can also be used as a quick, cheap, and efficient means of jointing cables. See page 284.

The HIGHFIELD ELECTRICAL CO., LTD. (Faraday Works, Stoney Stanton Road, Coventry), Stand 21H-3. This firm specialises in dynamometers for the testing of internal combustion engines, gear boxes, chassis and back axles, etc., and they have perfected a range of dynamometers to deal with engine powers up to 1 000 B.H.P. The dynamometer equipment may be divided roughly into two classes, viz., production type and research type, and there are exhibited a typical production type "B" and research type "J," arranged to be coupled together through a patented form of torsion dynamometer. In the production type, the entire power developed by the engine is arranged to be pumped back in the form of electrical power on to the works mains, and, according to the makers, the saving thus gained ensures that in a very short time the dynamometers will liquidate their own capital cost. With regard to the research type of dynamometer the manufacturers state that before the advent of their dynamometer, the accurate definition and measurement of many of mechanical losses known to be present in internal combustion engines were impossible, and while they were allowed for in the past, the relative magnitude of each was a matter of conjecture. By the use of the research dynamometer these losses may be individually deduced, enabling the mechanical efficiency of the engine to be intelligently studied and thereby improved upon. The measurement of power is by the torque reaction method, the dynamometer being in the form of a heavy cast iron bedplate on which are mounted cast iron pedestals housing large journal ball races in which the field magnet system of the dynamo is free to rock or swing. The armature spindle passes through bearings provided in the field magnet assembly, and situated inside the bedplate journals, one end of the spindle being extended to take couplings for connecting up the apparatus to the crankshaft of the engine which is to be tested. It should be noted that there is exhibited a dynamometer incorporating a single dynamo which is the general form of set for testing comparatively low-powered engines, but the company also manufactures apparatus in which a compound form of two dynamos in tandem is employed, arranged by patented means, so that they can be connected in either series or parallel in order to give the widest possible range of speed and loading. Starting up of the engine is effected by push button controls mounted on a desk type panel, in accordance with specification. Whatever power is developed by the electric motor when driving the engine can be measured directly in torque reaction by a convenient form of weighing apparatus, as also can the torque of the engine when running under its own power. The readings of torque obtained may be transferred into values of B.H.P. according to the speed in r.p.m., and the variation in speed and load at any time may be obtained in fine increments by the operation of push button and hand wheel controls mounted on the control desk. After a series of tests have been made in order to obtain sufficient data for accurate B.H.P. loss and I.H.P. curves, a detailed analysis of the loss curve may be made by stripping one part at a time from the engine and repeating the motoring test, the difference between the readings obtained with and without any particular component, of course, denoting the losses due to the member removed. For the measurement of the torque there have been standardised two forms of weighing apparatus, one incorporating spring balances and the other an automatic electrically operated steelyard, the latter being the one on view at the Fair. The steelyard type consists of two circular cast iron pillars mounted adjacent to or, as in the case of the show model, across the dynamometer bedplate. These pillars support the steelyard, which has its fulcrum at the centre of one of them. The steelyard carries weight which, by the oscillation of the steelyard caused by the variations and reversals of torque in the dynamometer, is automatically driven backwards or forwards to a point of balance. To the travelling weight is fixed an indicating finger travelling over a graduated scale which is arranged to be as open as possible to give most accurate results for laboratory work. In addition, so that the testing may be entirely done by remote control, the desk



The lead melting pot shown by The General Electric Co., Ltd.

type panel containing all the controls has mounted on it a specially constructed circscale instrument scaled the exact equivalent of the scale on the steelyard. Another exhibit consists of a standard electric drill modified to include a switching device to disconnect the electric supply from the drill motor in the event of excess torque such as occurs for instance when breaking through a hole in a thin metal plate. To accomplish this, the torque reaction principle of the research dynamometers has been adopted, and the stator of

(*Continued on page 274.*)

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the drill motor is mounted within a system of bearing rings in such a manner as to be capable of rotational movement. The stator is restrained from rotation by means of an adjustable spring bearing on a bracket projecting from the surface of the stator at a suitable point. The bracket is connected with the toggle mechanism of a quick acting switch connected in series with the circuit supplying the motor, so that an excess of torque over that for which the restraining spring is adjusted, will result in a movement of the stator, which will immediately disconnect the motor.

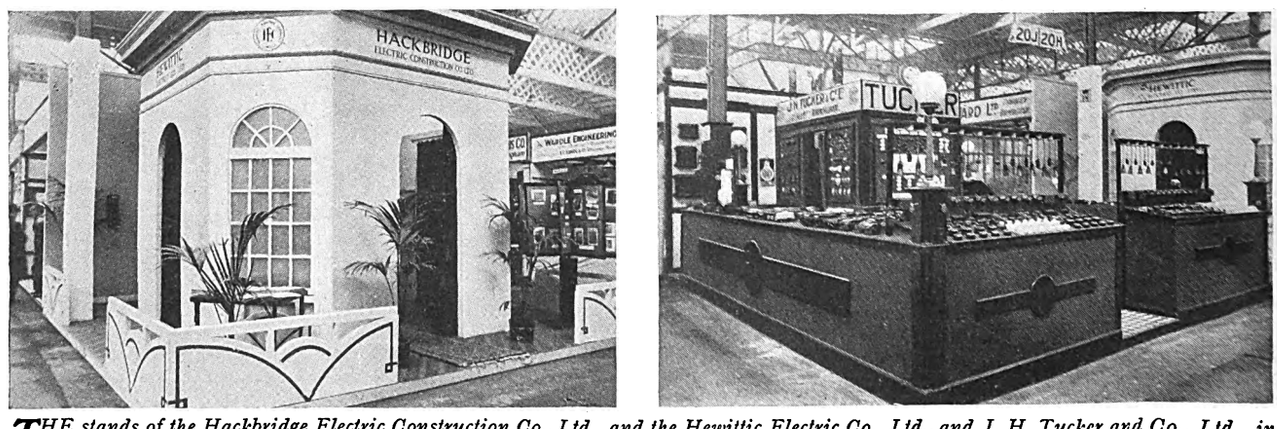
The ALPHA ELECTRICAL APPARATUS Co. (Percy Road, Greet, Birmingham), Stand 20 G/4. Here are shown Alpha electric irons, automatic kettles, storage water heaters, etc. An electric geyser made in sizes from 1½ to 12 kW, for domestic purposes, and larger for industrial use, is included in the exhibit. A flow meter is used as a protective device against damage being caused by the heater left on circuit when the water has been turned off; this acts as a relay to operate a contactor. The elements are insulated by mica from the copper tubes carrying the water, and they are arranged in 1 kW steps, so that the heat can be connected to two or three wire or three-phase supply.

JAMES AND FREDK. HOWARD, LTD. (Bedford). The exhibits here can be divided into three main sections: (1) Petrol locomotives; (2) road making equipment; and (3) abattoir fittings. Two of their smaller sizes of petrol locomotives, of 2 and 3 tons respectively, representing a range from 2 to 12 tons, are shown. While the larger sizes provide an economical means of speeding up shunting on main line sidings, the purpose of these smaller machines, for 24 in. gauge, is for internal transport in works, use on constructional contracts, in quarries, etc. The power unit is a 4-cylinder petrol engine, developing 20/28 B.H.P. in the 2-ton size and 25–36 B.H.P. in the 3 ton. The drive is taken by machine-cut, case-hardened, spur and bevel gearing, running in oil, in a two-speed gearbox and by roller chain to the front axle, and thence again by roller chain to the rear axle, giving a 4-wheel drive. The driver is provided with a comfortable seat and has a clear view to the front and rear. His controls are conveniently grouped before him, and require very little skill in operation.

BULL MOTORS, LTD. (Ipswich), Stand 19H-2. Here are two generators built to recent orders from well-known firms. The first is a d.c. slow speed generator, for coupling to a "Paxman" oil engine, and has been built for the works of E. H. Bentall and Co., Ltd., agricultural engineers, of Maldon, Essex. The dynamo is rated at 120 kW 220 V d.c. It is compound wound and runs at 300 r.p.m. The other generator on this stand is a vertical spindle dynamo, for coupling to a water turbine in connection with a water power scheme in Ireland. It is compound wound, and runs at 200 r.p.m. The output is 52 kW 220/260 V. It is fitted with a specially heavy spherical seated ball thrust suspension bearing at the top, and is capable of operating under a continuous load of 4½ tons. This vertical generator is of special interest, as machines of a similar type can be used as vertical motors for pumping installations. Two arc welding plants are also shown and demonstrated on the stand, a welding cubicle being provided for this purpose. One of these machines is the Bull "Midget"—a 100 A portable plant consisting of d.c. motor driving a d.c. welding dynamo with standard control gear comprising startor, shunt and series field regulators, instruments, and reactance mounted in a sheet steel cubicle above the machines. A noticeable feature is the design which enables all control gear to be enclosed in the sheet steel cubicle and renders the set easily portable. A 200 A arc welding plant, of the stationary type, is also shown. It is complete with 200 V driving motor, startor, shunt and series field regulators for dynamo, instruments, etc. In addition to the above main exhibits, Bull Motors, Ltd., show a number of their small standard a.c. machines.

The PREMIER ELECTRIC WELDING Co., LTD. (Abbey Wood, London, S.E.2), Stand No. 15C-2, are showing a complete range of plant specially built to distribute current for arc welding. This comprises examples of their well-known drooping characteristic single operator machine, driven by a four cylinder Dorman engine in one case and also by d.c. and a.c. motors. These plants are built up from the "Premier" single operator unit which is noteworthy among welding plants in that the whole of the switchgear is enclosed in a weatherproof steel box, and so arranged that there is no exposed wiring of any kind. A range of welding transformers with choke coil regulators is also shown, the two principal examples being a 200 A transformer of the air-cooled type, and a small 75 A transformer specially designed for welding thin sheet metal. As this latter transformer has an open circuit voltage of only 40 V on the secondary side, its energy consumption is almost negligible, and it can be placed without difficulty in any ordinary a.c. single-phase lighting circuit. It should appeal very strongly to manufacturers of thin sheet metal equipment and garage proprietors, especially as the first cost is comparatively low. Multiple operator type machines are represented by a two-operator motor generator welding plant, constructed on the well-known "Premier" principles. It is claimed that this plant, which delivers d.c. welding current at 35 V to a number of welders, is one of the most economical and efficient at present on the market. A large range of samples showing the special applications of the "Belfinish" electrode are included in the exhibits. Among these samples are the original test pieces which were made to the requirements of Lloyds Register and which resulted in approval being given for the use of the "Premier" system of welding on ship constructional work. A new process which will be of interest is the "Premag" process for welding copper. This process, which has been worked out in conjunction with I.C.I. Metals, is an oxy-acetylene process for welding copper, and gives excellent results. The process is demonstrated on the stand, and a number of commercial examples are exhibited.

BIRKBYS, LTD. (Liversedge, Yorkshire) are exhibiting on Stand No. 20L-4. Their principal exhibit is "Elo," a synthetic resin product comprising mouldings, moulding powders, insulating varnish and resin, largely and increasingly used in one form or another for electrical work, mechanical engineering, scientific instrument manufacturing, and kindred trades. The principal properties of the material in so far as they concern the electrical trade are:—Specific gravity, 1·33 to 2·0; dielectric strength, 30 000 to 40 000 V a.c. on ⅛ in. thickness; tensile strength 4 000 to 5 000 lb. per sq. in.; unaffected by temperature up to 400 deg. F., and has no softening point; does not support combustion; resistant to weather, water, steam, oil, acid, and alkalies; chemical stability; takes a high finish and is available in various colours.



THE stands of the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., and J. H. Tucker and Co., Ltd., in the Electrical Section of the Fair, at Castle Bromwich.

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LUNCHEON TO ELECTRICAL VISITORS.

The Industry and its Needs—More Pleas for Co-operation.

A LUNCHEON was given by the president and council of the Birmingham Chamber of Commerce and the Fair Management Committee in the Bradford Room at Castle Bromwich, on February 20th, in connection with the official visit to the Birmingham Section of the British Industries Fair of the Council of the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, the British Electrical Development Association, Inc., the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Association, the Municipal Tramways and Transport Association, Inc., and the Tramways and Light Railways Association.

Mr. T. R. Martin, chairman of the Electrical Section Advisory Committee of the B.I.F., presided and proposed the toast of "The Electrical Industry." He said that the Fair was larger than ever with a thousand exhibitors and stands covering 450 000 sq. ft. The organisers had concentrated their efforts and expenditure more on the improvement of the general layout and amenities rather than on building extensions. The Government had appointed a Committee under Lord Chelmsford which would consider means to increase the utility of the Fair and that committee would also look into the question of date. The management of the Fair were unanimous in believing that the principle of an annual fair was of value in increasing sales. There were few things wrong with the electrical industry to-day that could not be put right by effective co-operation in its own ranks. He paid a tribute to the work of Mr. Jennings and expressed gratitude to the E.D.A. for arranging the conference held that morning on electrical water heating.

Lt.-Col. K. Edgcumbe, replying, said that the country was beginning to realise that its general prosperity depended on industry. There had been a great change in public opinion even during the past eighteen months. Under present fiscal conditions there was anything but a free exchange of goods. The present exchange was about as free as the exchange between a bag snatcher and his victim. Why should we not adopt the commonsense method of directing trade into proper channels and making the foreigner pay his share. Exports were not an end in themselves. All exports over and above the quantity required to pay for essential imports of food and raw materials only went to pay for other imports and were not in themselves an advantage; in fact, they were a disadvantage because the prices we obtained for our exports to-day were so low. People were tired of "Support Home Industries" slogans. It was now the psychological moment to put the position before the public.

Alderman W. Walker, who also replied, said that progress in domestic electrification now depended very largely on manufacturers producing appliances that are absolutely reliable in unskilled hands and at prices that would tempt the user. All houses within reach of electric supply were being wired but the people living in them were not able to buy expensive cookers and other apparatus. Standardisation of sizes and parts was required to effect an enormous reduction in prices and do away with the need for locking up large amounts of capital in the stocks of spare parts carried by undertakers. They didn't want improvements that were merely "talking points." On the supply side development was taking place extremely rapidly. The technical difficulties of the grid had been mastered by Sir Archibald Page and his colleagues. Manufacturers, salesmen and undertakings must co-operate. That feeling existed to-day. Let them develop it to its fullest extent and in that way they would derive the fullest benefits.

Electrical Power Engineers.

Approximately 200 members of the Electrical Power Engineers' Association were present at a luncheon in the Fair buildings on Saturday. Mr. G. N. Guest, the deputy chairman of the Fair Management Committee, proposing the toast of "The Guests," said that manufacturers at present were experiencing not a little difficulty in the matter of overhead charges. In this connection the value of a good supply of cheap current for both power and lighting could scarcely be exaggerated.

Responding, Mr. A. V. Sendell, president of the Electrical Power Engineers' Association, expressed the view that cheaper electricity was bound to come, having regard to the greatly increasing efficiency of generating stations.

Yesterday there was a large attendance of members of the Electrical Contractors' Association (Inc.) and the Electrical Wholesalers' Federation, Ltd., at a conference at the Fair, at which there was a discussion on "Distribution Developments—Looking Ahead."

STORAGE BATTERIES.

I.E.E. Discussion—Iron and Lead Types—Advantages of Nickel.

AT the informal meeting of the I.E.E. on February 17th the subject for discussion was "Batteries and their Uses." Mr. E. S. Ritter presided over a very full meeting.

Mr. W. E. Warrilow said that the nickel-plated steel type of construction made for rigidity, mechanical strength, retention of active material in the plates, and ability to withstand exceptionally heavy charge and discharge rates. The nickel-iron cell, because of the absence of any chemical action on the plates during off-circuit periods, could retain its charge over several years. He emphasised the need for the revival of the commercial electric vehicle using a standard voltage equipment. The adoption of a standard voltage would do away with the confusion in the minds of vehicle buyers, which has been created by the present use of one voltage for nickel-iron and another for lead-acid batteries. The nickel-iron battery was in service for all purposes except submarines, sub-stations, radio and motor car starter work.

Mr. M. E. Fox said that the nickel-iron battery of to-day could give an efficiency of 15 watt-hours per lb. of complete cell, which for traction purposes was quite satisfactory.

Mr. E. C. McKinnon said the lead-acid batteries in some few applications were in competition with alkaline batteries, but, broadly speaking, there was no application served by alkaline batteries which was not equally or better served by lead batteries. No one type of battery was suitable for all applications. At least five factors dictated design and type: Nature of duty, first cost, space, weight and durability. Of lead-acid batteries one firm alone manufactured more than 500 sizes covering 10 distinct types. A life of over 10 years had been obtained repeatedly from lead batteries in submarine service. For switch tripping, lead batteries and alkaline batteries were competitive. For aeroplane duties lead-acid cells with feather-weight Faure plates were employed. A life of 80 cycles could be obtained from a plate less than 1/16 in. thick. Extreme cold, at high altitudes, narrowed the choice to one least affected by temperature changes. An average life of two to three years was all that could be expected from a cheap light-car battery, whereas with a more expensive design six to seven years was obtained; batteries were still on the road after 14 years' service.

For traction work the low first cost, cheap renewals, and, above all, the volts-amperes characteristic on discharge, gave the lead battery an unassailable predominance. A light-weight pasted type was preferred for passenger-car service, and a more robust and more durable lead-acid type for rough road and heavy locomotive service. The capacity of lead batteries at slow rates was more than double that obtained at a heavy continuous rate.

Mr. A. J. Bousfield said the instructions issued with nickel-iron accumulators were important and rather troublesome—he felt that unless a firm were large enough to train and keep a man for the duty it would not be carried out.

Mr. A. C. Hardy said that the mercantile marine would be making extensive calls for batteries in the near future, and he thought a special accumulator might have to be designed.

Mr. S. B. Jackson called attention to the fact that, in hot latitudes, the paraffin wax in wooden battery casing melted.

Mr. A. F. Evans asked whether there was any other way of testing the nickel-iron battery except testing each cell with a voltmeter. This battery gave unusually good results. In a sunken vessel raised after a fortnight the batteries proved unharmed. Mr. McKinnon replied that during the floods in London two years ago the lead-acid batteries of certain supply stations were under Thames water for days without injury.

Mr. W. A. Erlebach said the cell makers spoke of 13 or 14 watt-hours per lb. of cell. He calculated that the theoretical efficiency of a lead cell was at the utmost 80 watt hours, but with nickel-iron it appeared that purely active material might produce 150 watt-hours.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Eaton Socon Church Fire.

[To the Editor.]

Sir,—The "Daily Mail" of February 10th, referring to the recent fire at Eaton Socon Church, stated that "the stove was not alight at the time." It has since been definitely proved and agreed by the assessors and all concerned that the fire did start at the heating chamber, which was certainly in use at the time and was stoked up half an hour or so before the fire broke out.

Visitors to the church since the fire have made the remark that it could not have been due to the heating arrangement, because they had seen in the daily papers that the stove was not alight at the time, and it must therefore have been a fused wire that caused the fire.

I wrote to the "Daily Mail" drawing attention to the inaccuracy of the statement regarding the stove but no notice was taken. I think this is a case where one must appeal to the Electrical Press to make it known that this fire undoubtedly originated with the heating apparatus and not through any fault in the electrical installation.—I am, etc.,

H. J. Smith,
District Engineer, Bedfordshire, Cambridgeshire, and Huntingdonshire Electricity Company.

St. Neots,
February 17th.

Technical Abbreviations.

[To the Editor.]

Sir,—Although the international standard abbreviations are possibly justified theoretically, the fact remains that 90% of the letters I receive from "engineers" contain non-standard abbreviations, such as KWh, kWH, etc. They try hard, but it is obviously too much for them. Why not, therefore, have a simple, easy-to-remember, set of abbreviations, viz., KWH, KVAH, KV, instead of kWh, kVAh, kV ?—I am, etc.,

H. H.

London,
February 17th.

Symmetrical Components.

[To the Editor.]

Sir,—I have taken the opportunity of reading Mr. Hague's contribution to the Selected Engineering Papers of the Institution of Civil Engineers which I have not previously seen. I think he will admit, howsoever, that these publications have a very restricted circulation.

So far as the origin of this method goes, I think it is doubtful whether Stokvis or Fortescue was the real originator, their chief contribution being to state a well-known principle in a manner suitable for certain particular problems.

Dr. Gunther Oberdorfer's "Das Rechnen Mit Symmetrischen Komponenten" is the second German book I have reviewed on the subject within a year. The notation and development in the two books are entirely different and also differ from that used in other articles on the subject, which leads me to wonder whether the subject is yet sufficiently clearly settled to be included in an ordinary technical school syllabus. To quote from my review, "The main thing is—does it justify inclusion in an average electrical engineer's technical equipment ? . . . As to the degree of utility of the system, the reviewer prefers for the moment to keep an open mind. It is neat and mathematically attractive, but the student has so much to learn to-day that unnecessary mental luggage must be rigorously avoided." At the moment I feel that an advanced student should know the existence of this principle but has no time to learn its details, since my experience has been that so far as distribution calculations are concerned the data is never sufficiently accurate to warrant the amount of arithmetical computation necessary to obtain a numerical result. The method is certainly valuable in the theory of the magnetic field of a machine, and its equivalent has been in use for a very long time.

So far as the question of stability of interlinked power systems is concerned, the study of this is becoming so highly complex that I consider it a matter for the specialist, not for the "average engineering student."—I am, etc.,

Crouch End, N. W. F. C.
February 17th.

BOOK REVIEWS.

"Mechanical World" Electrical Pocket Book, 1930. (London and Manchester: Emmott and Co.) Pp. 326 and Diary. 1s. 6d. net.

This useful pocket book contains new matter relating to heavy electrical engineering, a page of data relating to condenser calculations and various new tables. All the former sections have been retained, but those dealing with lighting circuits and switching have been entirely revised and the portions concerning lamps and lighting have been rewritten and brought up to date. Much of the matter in the early sections has been rewritten and extended to cover d.c. generators and motors, synchronous induction motors, auto-synchronous, synchronous-induction and traction motors.

The Soviet Union in Reconstruction. By Louis Segal (London: Blackfriars Press.) Pp. 65, paper covers. 1s. net.

This small book includes a brief account of the five-year plan for the electrification of the Soviet Union, which is intended to provide a system of 57 regional stations with a capacity of 4 555 000 kW, of which 48, producing 2 955 000 kW, would be available by 1933. It is stated that an output of 1 945 000 000 kWh in 1913 was increased to 6 700 000 000 kWh in 1928–29, and that the estimates for 1929–30 are for 9 000 000 000 kWh, with an increase to 19 000 000 000 kWh in 1932–33. The capital investment under the five-year plan is given as approximately £300 000 000.

Motorist's Electrical Guide. By A. H. Avery. (London: Sir Isaac Pitman and Sons.) Pp. 162. 3s. 6d. net.

Planned with the object of providing the motoring public with "a nodding acquaintance with working principles" of the electrical side of motoring, this guide includes a short account of the underlying theory of the apparatus, together with a practical illustration representative of type with hints for adjustment and repairs. First principles in electricity are illustrated with the help of the familiar water analogy; there are chapters on magnetism and electricity; the generation of electricity; accumulators; magneto ignition; coil ignition; dynamo lighting; electric starters; lamps, instruments and circuits, electric horns, screen wipers and speedometers; sparking plugs and electrical accessories; and a glossary of terms. The average owner-driver for whom the book is primarily intended will find it a useful companion.

BOOKS RECEIVED.

"Catalogue of Scientific Books." No. 340. (Cambridge: W. Heffer and Sons.) Pp. 110.

"Hydraulics." By E. N. Digweed. (London: Draughtsman Publishing Co.) Pp. 48. 2s. net.

"Markets of Empire." By W. H. Willson. (London: Effingham Wilson.) Pp. xv+280. 7s. 6d. net.

"Principles of Radio." By Keith Henney. (London: Chapman and Hall.) Pp. xii+477. 17s. 6d. net.

"Commercial A.C. Measurements." G. W. Stubbings. (London: Chapman and Hall.) Pp. xvi+325. 15s. net.

"The Economics of the Coal Industry." By R. C. Smart. (London: P. S. King and Son.) Pp. xi+268. 12s. 6d. net.

"Electric System Handbook." By C. H. Sanderson. (London: McGraw-Hill Publishing Co.) Pp. 1 167. 25s. net.

"Journal of the Institution of Electrical Engineers." Vol. 68, No. 398. February. (London: E. and F. N. Spon.) 10s. 6d. net.

"Electric Overhead Travelling Crane Design." By W. A. Barson. (London: Crosby Lockwood and Son.) Pp. vii+120. 15s. net.

"Electrical Wiring and Contracting." Vol. II. Edited by H. Marryat. (London: Sir Isaac Pitman and Sons.) Pp. 240. 6s. net.

"La Décharge Electrique dans le Vide et dans les Gaz." By Maurice Leblanc and Son. (Paris: J. B. Ballière.) Pp. 375. 70 fr.

"List of Members of the Institution of Civil Engineers." Addresses corrected to January 1st, 1930. (Westminster: The Institution.) Pp. 337.

"The Practical Electrician's Pocket Book, 1930." Edited by Mr. F. H. Robinson. (London: Odhams Press, Ltd.) Pp. 616. 2s. 6d. net.

"Commercial Review and Handbook of the Republic of Columbia." July, 1929. By J. Garnett Lomax. (London: H.M. Stationery Office.) Pp. 147. 4s. 5d., post free.

Science Abstracts, Secs. A and B. Vol. 33, No. 385, January. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s. 6d.; annual subscription 35s. or 60s. for both sections.

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NEWS IN BRIEF.

Prison Lighting—Automatic Telephones for Iceland—Indian Government and Broadcasting—Engineering Course for Women at Loughborough.

A LADY assistant is wanted for Burnley Corporation's electricity showroom.

Newport (Mon.) Corporation requires a station superintendent and an installation engineer.

The sixth report of the Steam Nozzles Research Committee was read before the Institution of Mechanical Engineers on February 21st.

"Modern Incandescent Lighting in Kinema Studios" was the title given to a lecture by Mr. W. H. Villiers, before the Illuminating Engineering Society on February 18th.

The first of 32 police call boxes is being erected at Paisley.

The Abbey Park Italian Gardens at Torquay are to be electrically illuminated.

Manchester tramwaymen have contributed £3 210 12s. 8d. for local hospitals during the past year.

The transmission of electricity from Norway to Germany on a large scale is being considered.

Glasgow tramwaymen have decided to defer until June next the question of demanding a seven hours' working day.

A Post Office service of picture telegraphy between Great Britain and Denmark was opened on February 20th.

An electrically-operated coaling plant has been put into operation at the North-Eastern Railway locomotive depot, at Coatbridge.

On February 18th Mr. Wm. McGregor (Chalmers, Ltd.) delivered a lecture to the Paisley Association of Electrical Engineers on "Electrical Engineering as applied to Cinemas."

Kent County Council is to adopt electric lighting in the Stanhope School, for which a Government grant of £230 has been made; and at the Tenterden Poor Law Institution, at a cost of £63.

The Home Secretary (Mr. J. R. Clynes), speaking at a trade union dinner at Cardiff last Saturday, said prisoners at Strangeways Gaol, Manchester, had petitioned him for the substitution of electric for the present gas lighting.

A report on telephone progress in the London area in 1929, states that direct exchange lines increased from 181 606 in 1921 to 384 739 in December last, when the total number of telephones in the area was 661 997. During the year 16 new automatic exchanges were opened.

The General Electric Co., of New York, is having Photophone projectors installed in each of its ten district offices, to enable salesmen and customers to see the latest developments in apparatus and hear descriptions of the processes of development and methods of application by the persons best fitted to describe them.

On February 14th the staff of the Sheffield office of Metro-Vick Supplies held their annual supper dance at the Tudor Cafe, Sheffield. The entertainment included a whist drive, and dancing was in progress before supper, from 7.30 to 9.30, and after supper until midnight. Amongst those present were Mr. P. F. Crinks, general manager, Mr. E. G. Sellers, district manager, and Mr. R. G. MacLaverty.

The Iceland Telephone Department has decided to modernise its telephone system and will adopt the Swedish L. M. Ericsson automatic system. The Swedish company, through its agents, the Elektrisk Byra, in Oslo, has contracted for the delivery of automatic telephone exchanges primarily for the town of Reykjavik and the adjacent town of Hafnarfjoerd, with a total number of 4 300 subscribers. Telephonic communication between the two towns, which are about 10 km. apart, will be entirely automatic.

After three months' discussions, a modified programme for speeding up the Sunderland Corporation tramways service has been agreed upon by the management and the men.

At a meeting of the North-East Coast Institution of Engineers and Shipbuilders on February 21st, Rear Admiral W. Scott Hill read a paper entitled "Powdered Coal for Ship Propulsion."

The Government of India has secured the approval of the standing Finance Committee of the Legislative Assembly to its plan for buying the Indian Broadcasting Corporation from the liquidator and carrying on broadcasting itself.

Croydon Corporation Health Committee is to provide an X-ray plant at the Cheam sanatorium, at a cost of £400.

Middlesex County Council requires an electrical inspector to advise regarding electrical installations in entertainment halls, etc.

Mr. W. Richardson delivered a lecture on electric heating at a recent meeting of the Institute of Metals, at Newcastle-on-Tyne.

At a meeting of the Birmingham Electric Club this (Friday) evening Mr. W. J. Belsey will read a paper on "Electric Propulsion of Ships."

Mr. L. E. Buckell delivered a lecture to the Electrical Association for Women, at the offices of the General Electric Co., at Bristol, last week, on "Colour Lighting as a Decorative Medium."

Fare reductions are granted by British and German railway companies and steamship services to visitors to the Leipzig Spring Fair, from March 2nd to 12th. Particulars from the London office, 1, Gower Street W.C.1.

The annual examinations for a Faraday scholarship of 80 guineas per annum, tenable for two years in college and one year in manufacturing works, and for a Maxwell scholarship of 60 guineas per annum, tenable for two years in college and one year in works, will be held at Faraday House, London, on April 8th, 9th and 10th, 1930. Exhibitions may also be awarded to candidates who acquit themselves creditably, but who do not obtain the necessary number of marks to qualify for the scholarship.

The report on the work of the Department of Technology of the City and Guilds of London Institute for the session 1928–29 has been issued by John Murray, Albemarle Street, London, W.1; price 1s. net. It contains details of examinations, including examinations overseas, the change of the title "electrical engineering" to "electrical engineering practice," the division of electrical installation work between three courses: (a) for junior electricians from 14 to 16 years of age; (b) leading up to an electrician's certificate or electrician's interim certificate; and (c) leading up to an electrician's extra certificate or interim extra certificate, etc.

A second course in simplified engineering has been inaugurated at Loughborough College, Leicestershire, for women wishing to train as factory inspectors, and for administrative and managerial posts in industry. This is a day course, lasting twelve weeks, and the students will not only attend lectures but be able to get practical workshop experience in the College. Application for this special training should be made direct to the Principal, Loughborough College, Loughborough. The Women's Engineering Society wishes to make it clear that this training does not in any way act as a substitute for training as an engineer. It has been devised for those women who wish to have some knowledge of modern engineering methods as a help in their own particular professions.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of February 28th, 1880, recorded a successful telephonic conversation over a distance of 410 miles in the United States.*

Artificial production of small diamonds for the first time was reported to have been successfully accomplished by Mr. Ballantine Hannay, of Sword Street, Glasgow.

The use of electric light by the P.L.M. Railway for making blue prints was mentioned.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of February 24th, 1905, published a summary of the argument between the Postmaster-General and the National Telephone Co. regarding the purchase of the Company's plant in the London Area on the termination of the Company's licence (on December 31st, 1911).*

The intention to widen Kingston Bridge was announced, to permit the laying of a double line of tramway track over the bridge.

An electrical exhibition was being held at Bexhill, Sussex, at which electric heating and cooking was a feature.

The "Financial Times" was about to substitute electric for steam driving plant in its printing works.

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MR. CAMPBELL-SWINTON.

AS announced in our last issue, Mr. A. A. Campbell-Swinton died on February 19th, at the age of 66 years. Mr. Swinton entered Sir W. G. Armstrong's Elswick works in 1882 as a pupil, and in 1884 succeeded to the position of electrical engineer of the company, in which capacity he superintended the electric lighting of all the war vessels built at Elswick up to 1887. During this period he introduced the system of wiring ships with lead-coated cable. He was consulting engineer to the Metropolitan Police, was managing director of the Scarborough Electric Supply Co,. Ltd., and a director of the Cambridge Electric Supply Co., Ltd. He was a member of the original syndicate which built the "Turbinia," the first turbine vessel on the Parsons system. He interested himself in electric power distribution and was joint engineer for the Cleveland and Durham Electric Power Bill passed in 1901, and for the Kent Electric Power Bill of 1902. More recently be joined the boards of Edmundson's Electricity Corporation, Ltd., of the Kent Electric Power Co., and of Crompton Parkinson Ltd. In electric traction he was engineer to the Scarborough Tramways Co., joint engineer to the Falkirk and District Tramways and was a director of Bath Electric Tramways, Ltd. After Röntgen discovered X-rays in 1895, he was one of the first in this country to use them for taking photographs. In 1908 he suggested the possibility of television, by means of cathode rays, and he returned to the subject more recently. In 1914 he proposed a method of recording signals, and at an early date had a wireless telephone at work between his office in Victoria Street and his house in Chester Square. It was largely through him that the apparatus with which Professor D. E. Hughes had in 1879 made experiments in electric wave telegraphy, before Hertz had demonstrated the existence of such waves, was placed in the Science Museum at South Kensington, which also contains examples of his own inventive work on X-ray tubes and the telephone. He was a member of the Institutions of Civil, Electrical, and Mechanical Engineers and a Fellow of the Royal Society, he was elected president of the Röntgen Society in 1911 and of the Radio Society of Great Britain in 1913 (then the Wireless Society of London), and he served as chairman of Council of the Royal Society of Arts in 1917-19 and again in 1920-22. He was chairman of the British Scientific Instruments Research Association and a member of the general board of the National Physical Laboratory.

The late Mr. A. A. Campbell-Swinton.

MODERN ELECTRIC WIRING.

New Publication of Interest to Contractors.

THIS is the title of the new publication issued on behalf of cable makers associated in research. It was designed primarily to appeal to the householder-consumer, but, from its reading, we are of the opinion that its appeal will be wider.

The text opens with a soliloquy by a tired housewife, wishing for electricity in the home while "drudging" in the dust-ridden atmosphere brought about by old methods of illumination and heating. The story develops by brightly written dialogue between the housewife and the doctor, and, later on, between the wife and husband. Electric light is the desired conclusion.

The argument for surface wiring is amplified by half-tone illustrations of buildings in which have been installed one of the surface systems manufactured by member firms.

The whole publication is well produced throughout, with a cover lithographed in five colours; the reproductions of fine pencil drawings illustrating the dialogue portion of the text add "taste"; and the half-tones showing examples of neat runs of surface wiring furnish convincing testimony that surface wiring can be installed so as to be almost invisible.

The brochure is being issued to electrical contractors for re-issue to consumers, and may be obtained from Commercial Secretaries, Ltd., Cable Research House, Silver Street, London, E.C. The last page is left blank for over-printing.

PERSONAL.

AYLESBURY T.C. has appointed Mr. F. Bent, of Bolton, as superintendent of the electricity works.

Ald. Major Hall-Thompson has been elected chairman and Ald. Nixon vice-chairman of Belfast Electricity Committee.

Mr. J. Walsh, electrical engineer, Blackburn, has been elected to serve on the executive committee of the Blackburn Chamber of Trade.

Mr. E. Jacob, who was one of the founders, and for many years managing director of the Tudor Accumulator Co., Ltd., recently joined Britannia Batteries, Ltd., as managing-director, jointly with Mr. E. G. Lind.

Mr. G. C. Allingham, who was for a number of years an engineer with the Tudor Accumulator Co., Ltd., recently left the service of Metro-Vick Supplies to take up the position of sales manager of Britannia Batteries, Ltd.

Mr. P. H. Nye, of the Shanghai Branch of the General Electric Co. of China, Ltd., is returning to England, and Mr. N. G. Beale, who for some years has been chief engineer for the company in China, has been appointed to succeed him as general manager in that territory.

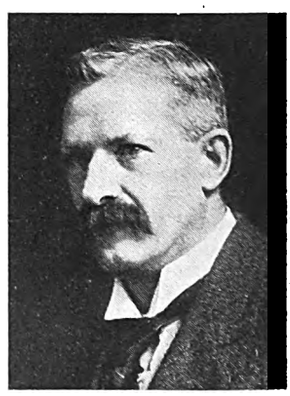
Mr. J. J. Murphy, who has resigned from the chairmanship of the Irish Electricity Supply Board, has been invited by the Irish Free State Government and has accepted the offer to continue as a part-time member of the reconstituted Board. It is understood that Mr. R. F. Browne, an official of the Free State Revenue Commissioners' Office in Dublin, has been appointed to succeed Mr. Murphy. See page 285.

Mr. John Christie, engineer and manager to Brighton Corporation, has resigned after 30 years' service. Mr. Christie, who was appointed in 1900, is a native of Glasgow, and commenced his business career as a marine engineer. Later he became associated with Crompton's works at Chelmsford, where his ability was early apparent, and a spell with Siemen Bros. and Co. at Woolwich was followed by his appointment to the post of second engineer to the Glasgow Corporation electricity works. This appointment was followed by his selection for the position of chief electrical engineer under the Londonderry Corporation. This was in 1894 and Mr. Christie remained in Ireland for four years before returning to Glasgow as power house superintendent.

Obituary.

ALDERMAN ALEXANDER SINCLAIR, on February 18th, aged 69 years, chairman of Swansea Electricity Committee for 25 years. He took part, when with Siemens Bros., in the manufacture and laying of the Mackay-Bennet submarine cable to America. Among the early houses to instal electric light in London, he assisted in the lighting of the late Sir George Newnes' (" Tit-Bits ") house on Wimbledon Common. He was a member of the Institution of Electrical Engineers.

MR. CHARLES H. W. GERHARDI, on February 17th, aged 60 years. His training was obtained at the Old Central College, and he received an appointment on the Metropolitan Electric Supply Company's staff at their original station at Whitehall Court in 1889 and had continued in that company's service ever since. He established a testing department at the old Sardinia Street station now demolished, and all the transformers used in the house connections of the company's original h.t. system passed through his hands. He was also responsible for metering, and the company's instruments generally, but made an especial study of metering with all its intricacies. He was an authority on any matter relating to measurements by integrating instruments, and his methods of recording the history of the thousands of instruments under his care was of the greatest use. He was a member of the Council of the Meter Engineers' Technical Association, now absorbed by the Institution of Electrical Engineers in their Instrument and Meter Section, and he represented the Institution on the Meter Committee of the British Engineering Standards Association. He was the author of " Electricity Meters, their Construction and Management."



The late Mr. C. H. W. Gerhardi.

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IN PARLIAMENT.

Suggested Consideration of Transfer of Post Office Work to a Corporation.

IN the House of Commons on February 12th Mr. H. Ramsbotham called attention to the condition of the postal, telegraphic and telephone services, which he regarded as unsatisfactory, and moved that it was desirable to appoint a Committee of business men to inquire whether it would be for the public advantage that all or any of the Post Office services should be transferred to an *ad hoc* public corporation. Mr. H. Mond said the Postmaster-General had his hands tied by the Treasury, and had no control over his staff. The engineering staff were highly skilled men, and could form the nucleus of a much larger organisation and provide the country with the type of telephone service which it needed. Mr. J. W. Bowen said the beam wireless under Post Office direction had compelled a lowering of cable rates throughout the world. He moved an amendment that the Post Office be maintained as a national institution, and this was carried without a division.

Electricity Orders Approved.

On February 18th the House of Commons approved Electricity Supply Special Orders in respect of (1) part of Loddon and Clavering rural district; (2) Ashburton and Buckfastleigh urban districts and parts of Newton Abbot and Totnes rural districts; (3) Hornsea urban district and part of Skirlaugh rural district; (4) part of Pontardawe rural district.

Replies to Questions in the House.

The number of Electricity Commissioners is five, of whom one was appointed during the past two years.

No steel or concrete telegraph or telephone poles suitable for general adoption have been brought to the notice of the Post Office.

About 470 000 miles of wire in underground cables were provided by the Post Office during 1929, at a cost of about £3 900 000.

Employees in the Post Office engineering department on January 1st, 1930, numbered 31 544, against 32 389 on January 1st, 1929.

Electricity Commissioners are not allowed to have any share or interest in electricity undertakings, except as ratepayers. Similar conditions apply to whole time members of the Central Electricity Board, but not to part time members.

A reduction of telephone installation rental to a nominal figure would necessitate a substantially increased call rate and a relatively high minimum number of calls, which the Postmaster-General does not think would prove attractive.

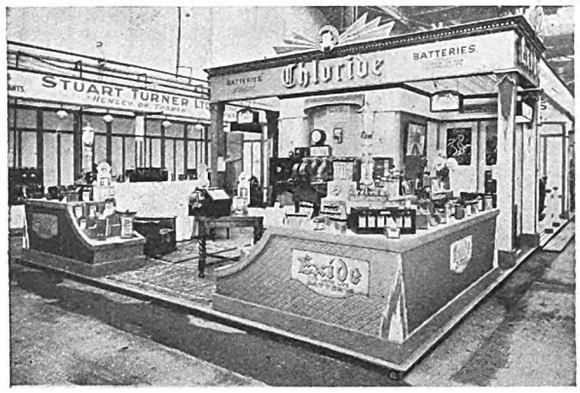
The Imperial Communications Advisory Committee is a body on which H.M. Government in the United Kingdom is not exclusively represented and in such circumstances publication of its proceedings in a reply in the House would be inappropriate.

THE AUTOMOBILE ELECTRICAL ASSOCIATION.

THE first positive step towards consolidation of the automobile electrical service industry was taken at a committee meeting of the Automobile Electrical Association held last week, when the reservation of membership of the Association to those whose business is mainly that of servicing the electrical equipment of automobiles and other electrical services, but not engaged in the repair of engines, chassis or coachwork, was confirmed. Next, the consideration of how best to make the Association of real and practical help to its members was considered and an unusually practical scheme was evolved. The Secretary's office is to be made a clearing house for information of use to members, any of whom is entitled to go there or to write for information and help of any kind relative to his business. The Secretary is compiling a register of sources of special information of the kind which experience will show is most in demand. This part of the work is of necessity of a confidential nature. It is to be supplemented by the issue of a monthly bulletin, the circulation of which will generally be confined to members and which will contain such information as may be circulated in that form, as well as useful, practical articles and notes from members generally on trade and technical developments. The address of the association is 2, Tichborne Court, High Holborn, London, W.C.1, and the Secretary is Mr. H. Scott Hall.

BUSINESS ITEMS.

THE KENT ELECTRIC POWER CO. has opened offices and showrooms at 110, High Street, Sittingbourne, to which district a supply of electricity has just been given.



THE stand of the Chloride Electrical Storage Co., Ltd., at the Birmingham Section of the British Industries Fair. *See page 267.*

The TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., announce that their Leeds branch has moved to Britannia House, 74, Wellington Street (corner of Britannia Street).

With reference to the radio filter of L. McMICHAEL, LTD., on page 234 last week, this firm is not showing at the British Industries Fair, the inclusion of the description on that page being an error.

The LANCASHIRE ELECTRIC POWER CO. is removing to new offices, and from March 3rd the address will be National Buildings, St. Mary's Parsonage, Manchester. Tel., Central 6595 (three lines).

To meet the expansion of business in the Newcastle area, the associated firms of the LONDON ELECTRIC WIRE CO. and SMITHS, LTD., FREDERICK SMITH AND CO., and the LIVERPOOL ELECTRIC CABLE CO., LTD., announce that their Newcastle branch has removed to 27, Oxford Street.

The ENGLISH ELECTRIC CO., LTD., Queens House, Kingsway, London, W.C.2, has received three new orders for trolley buses. The first order for Pontypridd is for seven single-deck saloon type vehicles mounted on 3-axle type chassis; each trolley bus will have seating capacity for 32 passengers. The equipment will consist of a DK.121 60 H.P. motor fitted with roller bearings and "English Electric" contactor type foot-operated controller. The second order for Southend Corporation comprises two double-deck top covered trolley buses mounted on 3-axle type chassis with air brakes operating on all wheels. A group system of lubrication is incorporated in the chassis by means of which all lubricating points are in groups in such a fashion that they will readily be accessible for charging. Each vehicle will have seating accommodation for 59 passengers. A special feature of the body is the inclusion of an extra exit on the near side front thereby facilitating the quick unloading of passengers during rush periods. A further notable feature incorporated in the design of this vehicle is the low loading whereby passengers may enter direct to the platform without any step arrangement, the platform being 1 ft. 2 in. from the ground. The equipment will consist of an "English Electric" DK.122 twin type 80 H.P. motor fitted with roller bearings and contactor type foot-operated controller. The third order is for Christchurch, N.Z., and is for six complete 3-axle trolley bus chassis and equipments.

BRITISH INDUSTRIES FAIR COMMITTEE.

The President of the Board of Trade has set up a Committee to examine the present situation as regards the British Industries Fair, and to consider what means can be adopted to increase still further its utility to British trade. The Committee is composed of Viscount Chelmsford (chairman), Lord Barnby, Mr. John Beard (president, Trades Union Congress General Council), Sir Percival Bower (Birmingham), Sir John Corcoran (National Union of Manufacturers), Sir Robert Donald, Sir William J. Larke (National Federation of Iron and Steel Manufacturers), Mr. Guy Locock, C.M.G. (Federation of British Industries), Sir Sydney Skinner, Sir Gilbert Vyle (Association of British Chambers of Commerce), and Mr. Robert Waddington.

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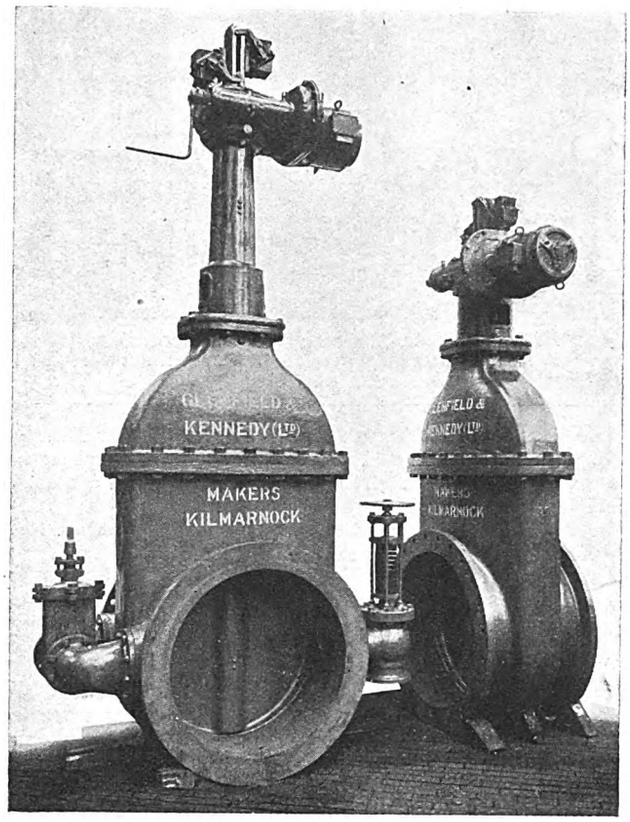
WATER VALVES.

A Striking Electrically-Operated Installation for Mexican Waterworks.

WITH regard to the rapidly growing use of the "distance" electrically controlled valve, of considerable interest is a contract that has just been carried out by Gwynnes's Pumps, Ltd., London, for the City of Mexico waterworks.



Illustrating the sluice and multiple flap reflux electrically-operated valves for the waterworks at Mexico.

This is all the more noteworthy, because it was secured against severe competition from the United States on a guarantee of shipment in two months, which no American firm could undertake. The contract was duly completed within the time named, Messrs. Gwynnes themselves manufacturing the pumps and Glenfield and Kennedy, Ltd., Kilmarnock, acting as sub-contractors for the necessary valves.

This latter equipment consisted of two 36 in. diameter electrically operated sluice valves, one 12 in. electrically operated sluice valve, one 6 in. relief valve, and one 36 in. multiple flap reflux valve with 6in. bye-pass and valve.

These sluice valves also include the latest type of the firm's electrical gear, in which the motor is bolted to the face of the worm-gear housing, constituting a very neat arrangement. The current for the motor is controlled by a set of push button controllers situated in the engineer's office, the valve being automatically stopped at the extreme position of its travel by one or other of the limit switches provided, situated on the indicator hood and operated by a pointer.

The methods of valve construction follow the firm's usual practice, the body being of grey cast iron moulded in dry sand, which produces a very smooth finish. Heavy gunmetal faces are fitted to the valve body and door, being securely held in position by screwed brass pins and hand-scraped to form a perfectly tight joint, while the operating screw is accurately machined from a forging of high tensile manganese bronze with gunmetal nut screwed to the valve door. All the gears are machine cut and operate in oil, while ball-bearing anti-thrust washers, circuit breakers, and reversing controllers are also included in the installation.

Valves of this type are manufactured in all sizes up to 108 in. diameter, and for any desired head, those for the higher pressures being constructed with cylindrical bodies, while the principle of distant electrical operation from any desired position, now being more and more used, is equally suitable for controlling water systems, and exhaust, low, or high-pressure steam, in power stations for example.

LEGAL INTELLIGENCE.

Case of Oxford Electricity Undertaking Again Mentioned in Court.

THE case in which Oxford Corporation and Oxford Electricity Co. are concerned in consequence of the Corporation having given notice of their intention to purchase part of the company's undertaking was again mentioned to Mr. Justice Bennett in the Chancery Division of the High Court on February 21st. Acting in accordance with the Oxford Electric Lighting Order, 1890, the Corporation had served notice on the company requiring them to sell the undertaking, and litigation ensued when the parties were unable to agree on the method of ascertaining the purchase price. Judgment had been given in favour of the Corporation's contention as to the method that should be adopted.

Mr. Tyldesley Jones, K.C., for the plaintiffs, now stated that the parties had agreed that the questions to be settled should be referred to a special referee, Sir William Plender.

Mr. Craig Henderson, K.C., for the company, asked that they be given an opportunity of considering whether there was any definite factor to be added to the terms of the declaration. The defendants' financial advisers stated that before they were called upon to state the factors for consideration they would require financial details of the undertaking which were not yet available, and it was their experience that in an inquiry of this kind there emerged factors which might become of vital importance but which could not be foreseen at the outset. In the circumstances counsel submitted that the declaration should be wide enough to cover such matters, though he was not in a position to add any specific factor which ought to be added. It was difficult at present before the parties had gone into the details to state what was proper for consideration, and he (Mr. Henderson) suggested that the proper order was that declaration "B" should be deleted and there should be an inquiry as to the amount of the purchase price of the undertaking. If the declaration could not be omitted, it ought to include the words "and such other factors and circumstances as are material to the case."

Mr. Tyldesley Jones, K.C., said he did not desire to exclude anything that ought to be considered, but he asked the Judge to make the two declarations as they stood. If his Lordship thought that on the order as drawn the defendants would be hampered in bringing forward any relevant matter, and that there was a danger of injustice, counsel suggested that the declarations should remain unaltered, but the matter could be dealt with in the inquiry as to the amount of the purchase price having regard to the declarations and any other material factors.

The Judge said the order must stand, as the defendants had been given an opportunity of suggesting a specific addition and they had been unable to do so.

Mr. Craig Henderson applied for a stay of proceedings on the order pending an appeal to the Court of Appeal as to the interpretation of the section of the Order. He said it seemed useless to proceed with an inquiry which would not be required if the defendants were right.

The Judge granted a stay for a week on the condition that notice of appeal was given in that time, and if the appeal was set down with an undertaking to prosecute it a stay pending the hearing of the appeal.

E.D.A. CARNIVAL.

The electrical carnival organised by the British Electrical Development Association at the Oxford Galleries, Newcastle-on-Tyne, on February 14th, proved to be one of the greatest social successes held in Newcastle. The carnival began at 8 o'clock, and each 15 minutes brought some fresh novelty. The first three-quarters were counted off with treasure dances, and the fourth with community singing and later with a cabaret in which five ladies gave exhibitions of dancing, and all the time a double hunt was going on for the mystery guests—Major Alec Tricity and Miss Eda, the Electric Girl. The ladies present were asked to find Major Alec. Tricity and the gentlemen to find Miss Eda. The finder of each was presented with a valuable prize. In all there were some 80 prizes generously given by the electrical industry for the various events. These prizes were presented by Mrs. R. E. Robson and Mr. R. E. Robson (chairman of the North East Area E.D.A. Committee). Among those present were:—Mr. V. Dale, Mr. and Mrs. S. E. Monkhouse and party, Mr. H. W. Clothier and party, Mr. L. J. Couves, Mr. Page, Mr. Smith, Mr. and Mrs. Parnall, Miss Sloan, and Miss Anna Holm.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

GRANGEMOUTH CORPORATION.—Electrical work in connection with north third waterworks, near Stirling. Schedules from Mr. J. C. Wallace, burgh engineer, Town Hall, Grangemouth.

ASHFORD (KENT) URBAN DISTRICT COUNCIL, February 28th.—Vertical, solid injection, heavy oil engine, with alternator (about 900 kW), suitable for 6 600 V, three-phase, 50 periods. Tenders to Mr. J. Sudlow, clerk of the Council, High Street, Ashford.

GLASGOW EDUCATION AUTHORITY, February 28th.—Electric light installations in Globerhill Temporary, Rotherwood Avenue, and Knightswood Schools and in Govan Secondary School extension, Langlands Road, Govan. Specifications, etc., from Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s. per specification.

WEST RIDING EDUCATION COMMITTEE, February 28th.—Electric light installation in Southowram Withinfields Council School. Specification, etc., from Mr. G. Dodgson, Education Office, Huddersfield Road, Elland.

LITTLEHAMPTON URBAN DISTRICT COUNCIL, March 1st.—Supply and installation of automatic operating, electrically driven air compressor. Specification, etc., from the Engineer, Town Offices, Littlehampton.

MANCHESTER GUARDIANS, March 1st.—Supply of electric cables required at Styal Cottage Homes, Styal, near Manchester. Particulars from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints', Manchester.

OXFORD CORPORATION, March 1st.—Manufacture and erection of engines and pumps, including two oil-driven auxiliary engines each driving an electric generator; electric light installation, etc. Specification, until noon on March 1st, from Sir A. Binnie, Son and Deacon, Artillery House, Artillery Row, Westminster, S.W.1; deposit £10.

BELFAST CORPORATION, March 3rd.—Twelve months' supply of materials to the electricity department, including electrical accessories, lamps, carbon brushes, bitite strip, tapes, joint box compound, street box frames and covers, feeder and section pillars, copper cable connectors, electricity meters and instrument transformers, maximum demand indicators, automatic time switches, cut-outs, transformers, cables, wires and flexibles, etc. Forms and tender, etc., from Mr. F. H. Whysall, city electrical engineer and manager, East Bridge Street, Belfast.

CENTRAL ELECTRICITY BOARD, March 3rd.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme. Specification (No. S.E.E.—P.F. 5) from the secretary and solicitor, Mr. R. H. Fox, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Cable Supplies.

DOVER HARBOUR BOARD, March 3rd.—Twelve months' supply of electric cables, electrical sundries, etc. Schedules, etc. (2s. 6d.), from the office of the Register, Castle Street, Dover.

HALIFAX CORPORATION, March 3rd.—Electrician's work at public conveniences. Specification, etc., from the Borough Engineer, Crossley Street, Halifax; deposit £1 1s.

HOVE CORPORATION, March 3rd.—Supply of electric lamps, etc., for one year. Forms of tender from the Town Clerk.

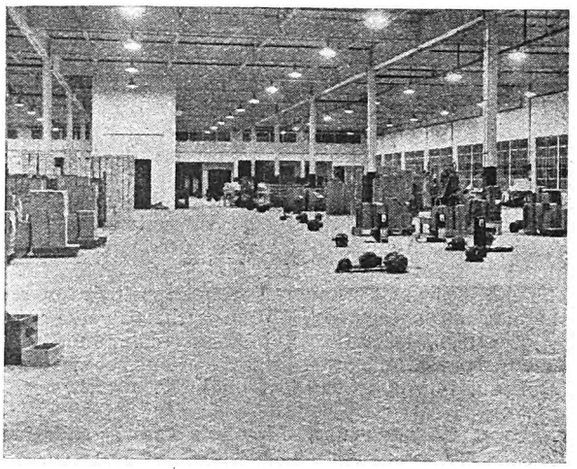
SOUTHEND CORPORATION, March 3rd.—Twelve months' supply of stores, including meters and instruments, electrical fittings, cables and steel conduits, joint boxes, earthenware conduits, etc. Specification, etc., from the Borough Electrical Engineer and Manager, Electricity Works, London Road, Southend-on-Sea.

STIRLING CORPORATION, March 3rd.—Electrical work in connection with erection of 32 houses at Raploch, Stirling. Specifications, etc., from Mr. Andrew H. Goudie, burgh engineer, Stirling; deposit £1.

WESTHOUGHTON URBAN DISTRICT COUNCIL, March 3rd.—One year's supply of stores, including metallic filament lamps, Forms of tender, etc., from the Surveyor, Town Hall, Westhoughton. Stamped, addressed envelope to be sent.

CAMBRIDGE CORPORATION, March 4th.—Twelve months' supply of stores, including electric lamps (schedule 16). Forms of tender, etc., from the Borough Engineer, Guildhall, Cambridge.

MANCHESTER GUARDIANS, March 4th.—Supply of electric equipment required at Styal Cottage Homes, Styal, near Manchester. Particulars from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints', Manchester.



THE new works of J. S. Fry and Sons, at Somerdale, illuminated by 20 in. "Benjamin R.L.H." reflectors, in conjunction with 500 W Siemens "Silvalux" opal lamps. After the installation was completed, tests showed a mean intensity of 12·4 ft. c., on the floor level, and, as will be seen from the photograph reproduced, which was taken by the unaided artificial lighting, there is an almost entire absence of shadows, with practically uniform illumination over the whole area.

ROTHERHAM GUARDIANS, March 4th.—Supply of electrical sundries. Tender forms from the clerk, Mr. W. C. Harrison, 26, Moorgate Street, Rotherham.

GLASGOW CORPORATION, March 5th.—Electrical installations in houses at fire stations. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow, C.2.

ALLOA CORPORATION, March 6th.—Electrical installation in connection with erection of 63 houses at Broad Street, Alloa. Schedules from Messrs. J. Melvin and Son, architects, Mar Street, Alloa.

WALSALL AND WEST BROMWICH UNIONS JOINT COMMITTEE, March 6th.—Supply of electric fittings. Particulars from the clerk, Mr. A. H. Ward, 22, Lombard Street, West Bromwich.

ERITH URBAN DISTRICT COUNCIL, March 7th.—Twelve months' supply of h.t. and l.t. underground cable, joint boxes and other accessories. Forms of tender, etc., from the Electrical Engineer, Walnut Tree Road, Erith.

KETTERING URBAN DISTRICT COUNCIL, March 7th.—Supply of certain transformers. Specifications from Mr. W. A. Walker, Electricity Offices, Rockingham Road, Kettering; deposit £1.

LEICESTER CORPORATION, March 7th.—Installation of electric light wiring and fittings at Belgrave pumping station. Specifications, etc., from the City Surveyor, Town Hall, Leicester; deposit £1.

EDINBURGH CORPORATION, March 8th.—Supply and maintenance of telephones, in Edinburgh, Leith and Portobello districts. Forms of tender, etc., from the City Architect, City Chambers, Edinburgh.

BEDFORD CORPORATION, March 10th.—Supply during one year of e.h.t., h.t. and l.t. underground cables; and incandescent lamps. Specifications from the Borough Electrical Engineer, Prebend Street, Bedford. Tenders from British manufacturers in the United Kingdom only are invited.

BLACKBURN CORPORATION, March 10th—Manufacture and supply of electrical requirements for 12 months, including

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paper insulated, lead sheathed cable, rubber insulated wire, consumers' meters and gasfilled and vacuum incandescent lamps. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall, Blackburn ; deposit 10s.

CHEDDLESTON (LEEK) MENTAL HOSPITAL, March 10th.—Supply of electric lamps for six months. Tender forms from the clerk and steward, Mr. F. G. Eve.

PRESTWICH URBAN DISTRICT COUNCIL, March 10th.—Twelve months' supply of lamp standards, electric lamps, etc., Forms of tender, etc., from Mr. H. T. Ainsworth, surveyor, Town Hall, Prestwich, Lancs.

TORQUAY CORPORATION, March 10th.—Supply and erection of 7 500 kW m.c.r. turbo-alternator and condensing plant. Specifications, etc., from Mr. G. J. Hollyer, Electricity Offices, Torquay ; deposit £3 3s.

WARRINGTON CORPORATION, March 10th.—Supply of (1) motors, and (2) transformers. Specifications from Mr. F. V. L. Mathias, Electricity Works, Warrington ; deposit £1 1s. for each.

LIVERPOOL CORPORATION, March 12th.—Supply of 5 000 kVA, 12 500 kVA and 33 000 V step-down transformers and 6 000 V and 33 000 V metal-clad switchgear for sub-stations. Specification, etc., from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

STOKE-ON-TRENT CORPORATION, March 12th.—Twelve months' supply of (1) e.h.t. truck type switchgear (contract No. 3004) ; and (2) a.c. and d.c. meters (contract No. 3005). Specifications from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent ; deposit £2 for each.

HARROGATE CORPORATION, March 15th.—Twelve months' supply of cables, joint boxes, joint-box compound, service meters and service cut-outs. Specifications, etc., from Mr. Neil McLean, borough electrical engineer, 33, Swan Road, Harrogate.

LIVERPOOL CORPORATION, March 18th.—Installation of electric lifts, etc., at new abattoir, Stanley, Liverpool. Specification, etc., from the Land Steward and Surveyor, Municipal Buildings, Liverpool ; deposit £3 3s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, March 19th.—Coal-handling plant at Ironbridge generating station. Specification (No. 8), etc., from Mr. E. F. Hetherington, Phœnix Buildings, Dudley Road, Wolverhampton.

CARDIFF CORPORATION, March 20th.—Supply of e.h.t. and l.t. paper insulated cable during 12 months. Specifications, etc., from the City Electrical Engineer, The Hayes, Cardiff. Only manufacturers on the King's National Roll are invited to tender.

CENTRAL ELECTRICITY BOARD, March 24th.—Supply and erection of 33 kV and lower voltage transformers, in connection with the North West England and North Wales Electricity Scheme. Specification (N.W.E.-S.T.4). from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2 ; deposit £2 2s.

EDINBURGH CORPORATION, March 24th.—Twelve months' supply of materials, including underground insulated cables, conduits, house service fuse boxes and fuse boards, electrical material for interior wiring, electricity meters, etc. Specifications, etc., from the Engineer and Manager, Electricity Department, Dewar Place, Edinburgh.

RHONDDA URBAN DISTRICT COUNCIL, March 29th.—One year's supply of ordinary and prepayment a.c. meters, cable, joint boxes, compound cut-outs, etc. Specifications and forms of tender from Mr. J. M. Bowman, Electricity Works, Porth, Glam.

CENTRAL ELECTRICITY BOARD, March 31st.—Supply and erection of metering equipment required in the area of the North West England and North Wales Electricity Scheme. Specification (N.W.E.-G.M.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2 ; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

GOTHENBURG HARBOUR AUTHORITY, March 3rd.—Supply of ten electrically operated 2½-ton portal cranes. (Reference A.X. 9 089.)

VICTORIAN ELECTRICITY COMMISSION, March 3rd.—Supply of 44 000 V tensioning and pin type supporting insulators (specification No. 30/16). (Reference B.X. 6 177.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 4th.—Supply of automatic exchange power boards (schedule C. 562). (Reference B.X. 6 072.)

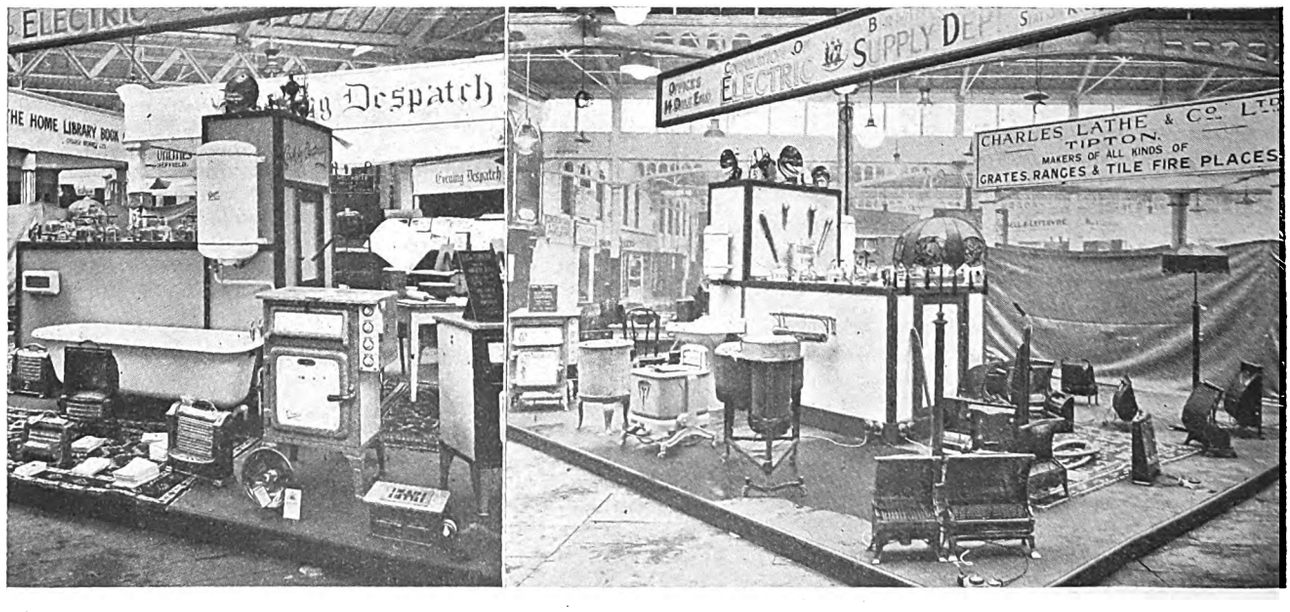
INDIAN STORES DEPARTMENT, March 5th.—Supply of battery charging motor generator set, for Wireless Section (schedule No. 880 R/1). (Reference B.X. 6 146.)

NEW ZEALAND POSTS AND TELEGRAPHS, March 5th.—Supply of v.i.r. wire (specification No. P. and T. 151/2 096). (Reference B.X. 6 089.)

VICTORIAN ELECTRICITY COMMISSION, March 10th (extension of time).—Two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

MOROCCO POSTS AND TELEPHONES (FRENCH ZONE), March 11th.—Supply of glass insulators, bronze and copper wire and galvanised ironwork. (Reference B.X. 6 410.)

NEW ZEALAND POSTS AND TELEGRAPHS, March 11th.—Supply of three-conductor cords (P. and T. No. 151/2 145). (Reference B.X. 6 173.)



TWO views of the stand of the Birmingham Electric Supply Department at the recent "Brighter Homes" Exhibition which was held in Birmingham.

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th. Supply of 66 kV switchgear and protective system for Lyttleton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

POSTMASTER-GENERAL'S DEPARTMENT, March 24th.—Supply of dial parts (schedule C. 555). (Reference B.X. 6 047.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE March 25th.—Supply of cordless telephone switchboards (schedule C. 566). (Reference B.X. 6 071.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays, for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

VICTORIAN ELECTRICITY COMMISSION, April 14th.—Supply of 22 000 V switchgear and accessories, for sub-station "C" at Brunswick (specification No. 30/17). (Reference B.X. 6 182.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, April 30th.—Supply and erection of h.t. overhead transmission lines in isolated basins of Upper Egypt. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1; £10 5s., not returnable.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

Tenders Accepted.

GENERAL POST OFFICE.—Johnson and Phillips, Ltd., trunk telephone cables between Birmingham-Wolverhampton and Oxford-Banbury.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Johnson and Phillips, Ltd., 11 000 V overhead power lines for rural development of Kent.

LOWESTOFT CORPORATION.—Callender's Cable and Construction Co., Ltd., supply and erecting of h.t. cables, transmission lines, etc., £9 399.

ADMIRALTY.—Siemens Electric Lamps and Supplies, Ltd., supply of large quantity of Siemens vacuum and gasfilled pearl lamps and clear gasfilled lamps.

HARTLEY MAIN COLLIERY CO., LTD.—Johnson and Phillips, Ltd., underground cables, power station and sub-station switchgear and transformers for new colliery power scheme, £40 000 (approximate).

DEPTFORD (LONDON) BOROUGH COUNCIL.—Works in connection with electric light installation at Town Hall: General Electric Co., Ltd., supply of fittings, £381; Stinton Jones, rewiring, £246. (Both recommended.)

EDINBURGH CORPORATION.—Bruce Peebles and Co., Ltd., equipment, comprising 1 500 kW Peebles-Brown Boveri mercury arc rectifier, designed for 3-phase 50-cycles 6 500/6 800 V on a.c. side and 550/600 V on d.c. side. The rectifier will operate on a traction load.

CROYDON CORPORATION.—British Electric Transformer Co., Ltd., supply of transformers: two 400 kVA, £420 each; five 400 kVA, £292 each; one 1 000 kVA, £558, and one 500 kVA, £310, A. Reyrolle and Co., Ltd., supply of switchgear, £7 879 11s. 6d. (Both recommended.)

MANCHESTER CORPORATION.—D.P. Battery Co., Ltd., and Chloride Electrical Storage Co., Ltd., supply of electric vehicle batteries; English Electric Co., Ltd., supply of sub-station kiosk and switchgear at Sharston Green; James Russell and Sons, Ltd., six months' supply of steam tubes and fittings.

CENTRAL ELECTRICITY BOARD.—Johnson and Phillips, Ltd., 33 kV transmission lines; and English Electric Co., Ltd., 132 kV transformers, in connection with Mid-East England Electricity Scheme. Approximate value of contracts, £230 000. Contract for transformers is additional to those recently announced.

GLASGOW CORPORATION.—Metropolitan-Vickers Electrica Co., Ltd., turbo-alternator and spares, for Pinkston power station, £41 867, subject to deduction in respect of spares for condensing plant; G. and J. Weir, Ltd., condenser and spares, £9 448 15s. Malcolm and Allan, Ltd., electrical work at Belvidere Hospital, £889 12s 8d (All recommended.)

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Enfield Cable Works, Ltd., supply of 2 500 yds. of 0·2 sq. in. three-core, lead-covered, 11 000 V Bowden-Thompson type cable, and 1 720 yds. of 0·2 sq. in. three-core, steel armoured, 11 000 V Bowden-Thompson type cable, £4 722 16s. 9d.; Doulton and Co., Ltd., supply of 1 250 yds. of 4 in. two-way conduit, with Stanford self-centring joints, £302 6s. 11d.

GENERAL POST OFFICE.—Cable—supply, manufacture drawing-in and jointing—Birmingham-Wolverhampton, Johnson and Phillips, Ltd.; Exeter-Honiton, W. T. Henley's Telegraph Works Co., Ltd.; Portsmouth-Petersfield, Callender's Cable and Construction Co., Ltd.; Hanley-Uttoxeter W. T. Glover and Co., Ltd. Electric lift—Lewes station sorting office, W. Wadsworth and Sons, Ltd. telephone exchange equipment—Watford (Herts), Kings Langley (Watford multi-area) and Radlett (Watford multi-area), General Electric Co., Ltd.; Folkestone, Hythe (Folkestone multi-area), Sandgate, ditto, Cheriton, ditto, and Lyminge, ditto, Ericsson Telephones, Ltd.

"S O S."

Bouverie Players Give Good Account of Themselves at the Scala Theatre.

THE Bouverie Players (Benn Brothers' Dramatic Society) have given this week three successful evening performances of Mr. Walter Ellis's play "S.O.S.," for the benefit of the John Benn Hostel and other charitable institutions. The players collectively gave a good account of themselves. Mr. Gordon Grieve as Sir Julian Weir and Mr. Guy Catchpool as Owen Herriot are worthy of mention for their masterly delineations of the characters of bereaved husbands, who, in the end, discover the guilt and the innocence, respectively, of their deceased wives. Miss Phyllis Trimby, who has so charmingly represented heroines in the Society's previous plays, showed her versatility by giving an excellent representation of the wicked wife. Allan Herriot (Mr. Wm. McNaught) and Judy Weir (Miss Muriel Johns) displayed the necessary naïveté as youthful lovers, Mr. Bert Bryant, as Martin, had a dialect which convinced one immediately of the rural atmosphere of the setting, and Miss Muriel Smith as an unsophisticated barmaid gave a delightful character sketch. Mr. Harry Duck, as Freddie Cobb, a pious licensed victualler, Mr. Reg Cawte as Brent, a butler, Mr. James Mactavish, as a police inspector, and Mr. Charles Payne, as a footman, were also at home in their parts, and contributed their full share towards the success of the production. Mr. A. R. Heaton, the producer, and "The Times" Orchestra also deserve credit for their assistance.

INDUSTRIAL WELFARE.

Some 400 industrialists were present at the Industrial Welfare Society's banquet at the Hotel Victoria, London, on Wednesday, when the speakers included the Duke of York, Mr. Frank Hodges and the Archbishop of Canterbury. The banquet marked the completion of 11 years' work by the Society, of which the Duke of York is president. It was pointed out during the course of the evening that the necessity of looking after the health of employees was indicated by the fact that the time lost to industry in a single year through sickness was equal to twelve months' work for nearly 590 000 persons, one well-known company, during a period of twelve months, having paid in salaries during sickness a sum of no less than £199 000.

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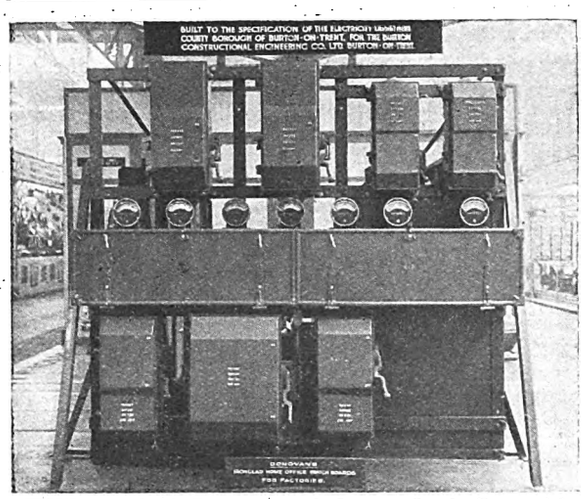
ELECTRICITY SUPPLY.

Harnessing the Nygaards Falls—Hydro-Electric Developments in Canada—Current Consumption increases in Minehead—Portsmouth and the S.W. England Scheme.

EAST Grinstead U.D.C. has decided to instal at the electricity works an additional generating set at an estimated cost of £9 240.

Winchester Corporation has received sanction to a loan of £3 780 for a new feeder main from the power station to the Guildhall.



THE stand of Donovan and Co., at Castle Bromwich, includes this attractive panel built for the Burton-on-Trent Constructional Engineering Co. to the specification of Burton-on-Trent Electricity Department.

Croydon electricity department is to extend mains, at a cost of £687, and to lay a loop feeder from London Road to meet the increased demand at the poor law hospital.

Dronfield Council has entered into an agreement with Sheffield Corporation for a supply of electricity to Dronfield. The Council decided not to entertain an offer by Dronfield and District Electric Service, Ltd.

The Norwegian Government has sanctioned the town of Narvik's plan to harness the Nygaards Falls, with a view to supplying electric power for railway purposes. The town has made arrangements to borrow Kr. 6 700 000 at 5% per annum for ten years.

Oswestry T.C. has decided to apply to the Electricity Commissioners for sanction to borrow £6 500 for meeting the demands on the undertaking during next winter and to cover the cost of the first stage of the change over of the supply from d.c. to a.c.

The Irish Free State Electricity Supply Board, in acknowledging the receipt of a cheque for £30 from Newbridge Town Commissioners on account of the public lighting of the township, pointed out that a considerable sum remained due. The Chairman said, at a recent Council meeting, that the delay in carrying out extensions was very disappointing and they were putting the lights at the wrong places.

Mr. C. H. Yeaman, city electrical engineer, has reported to Stoke-on-Trent Electricity Committee applications for supply to the works of Messrs. Pyrosil, Ltd., and for an additional supply to the Washington works of Messrs. Macintyre and Co., Ltd. The necessary extensions of the mains are to be carried out at a cost of £740. The Electricity Committee is also to lay a main to the premises of Messrs. Dalehall Mills, Ltd., at a cost of £600.

The Dominion Water Power and Reclamation Service of the Department of the Interior of Canada has issued its annual review of hydro-electric and water power developments in Canada during 1929. New installations brought into operation during 1929 amounted to 378 400 H.P., bringing the total capacity of installations in the whole Dominion to 5 727 600 H.P. Undertakings now under construction will add more than 1 600 000 H.P. during the next three years.

The chairman of Minehead U.D.C., Mr. J. A. C. Kennard, on February 19th, started up at the Minehead electricity station a new 500 H.P. engine which is part of the plant necessitated by the increased demand for electricity and the change over from d.c. to a.c. Mr. Selwyn Grant, general manager of Whitehall Securities, Ltd., and chairman of the Minehead Electricity Co., said the consumption per head in that area had increased during the last five years by 76%.

Residents in the village of Freshford, near Bradford-on-Avon, object to the erection of overhead lines in the village by the West Wilts Electric Light and Power Co. Mr. Gordon Tucker, for the Ministry of Transport, recently held an inquiry into the matter, and concessions were made both by the company and the R.D.C. The company undertook to lay one section, from St. Peter's Church, High Street, etc., underground, and to exclude the road to the Tynings from the present scheme.

In his presidential address to the Society of Engineers, last week, Mr. W. M. Beckett referred to the paper he read before the Society in 1926 outlining a scheme for a Severn barrage to cost about £12 000 000. He said so far no report on the subject had been made public or presented to Parliament as the result of the Government Committee's investigations, and it would appear to be a matter of urgent public interest that definite information on the subject should be furnished without further delay.

The supply of electricity to Berkswell, is the subject of an agreement between the Coventry and Birmingham Corporations. Coventry electricity department has received applications for supply, but the Corporation's mains cannot at present be economically extended to Berkswell, and Birmingham Corporation, whose mains are more conveniently situated, will furnish the supply, Coventry to bear the cost of connection and distribution, laying services, etc., and to pay Birmingham 60% of the receipts.

Douglas (Isle of Man) Electricity Committee has received a letter from the Government secretary, stating that a draft Bill for supplying electricity outside the area of the Corporation supply is under consideration. The Bill provides that the Corporation shall be the generators, and supply current in bulk to the company referred to in the Bill.—The Committee has given instructions to the Borough Electrical Engineer with respect to provision in the forthcoming estimates for additional public and decorative lighting.

The Borough Electrical Engineer of Hornsey reports that the convertor at the Highgate sub-station should be completed for remote control during this year. To prepare for this remote control and the further remote control plant in the Highgate and Muswell Hill sub-station, the necessary pilot control cables will have to be pulled into the existing ducts. It is estimated that the cost of putting in a 25-core cable between the generating station and the Highgate sub-station will be £1 380. The Electricity Committee recommends that the work be carried out.

After considering arguments suggested by Mr. B. Handley, borough electrical engineer, in favour of such procedure, Portsmouth Electricity Committee recommends that, having regard to the provisions contained in the South West England electricity scheme, the Town Clerk be authorised to make representations to the Central Electricity Board with a view to the "selection" of the Portsmouth generating station, and, as to the financial matters involved in the scheme, that the Committee be empowered to take any further action which may be considered necessary.

Salcombe Gas and Electricity Co. having applied to the Minister of Transport for his consent to the erection of overhead lines in the urban district of Kingsbridge, Mr. F. Gordon Tucker, on behalf of the Minister of Transport, held an inquiry recently into the matter. For the company it was stated that they were anxious to arrive at some mutually satisfactory scheme and had met the objections of the Kingsbridge Council by offering to lay underground cable in Fore Street as far as the Grammar School. The Chairman of the Council said they could not consent to the erection of poles similar to those in the Salcombe streets. The width of the streets in Kingsbridge was in many cases very narrow. The inspector stated that up to 1919 local authorities had the right to veto. In 1919 Parliament decided that the Minister of Transport should have power to override local authorities if he considered it desirable, but the Minister was anxious that such matters should be settled by agreement. It was stated subsequently that the Council was agreeable to steel poles in certain thoroughfares.

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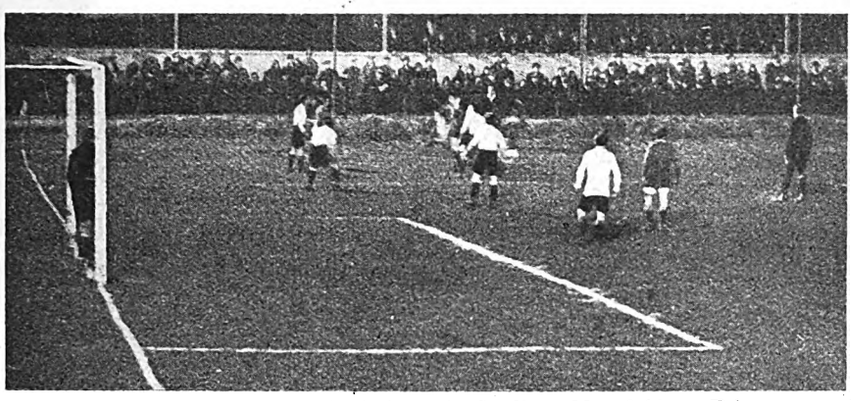
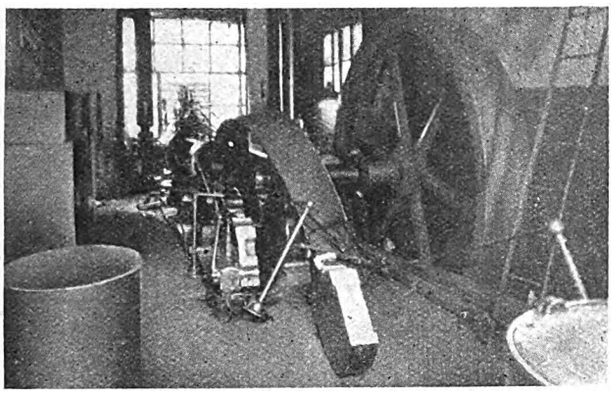
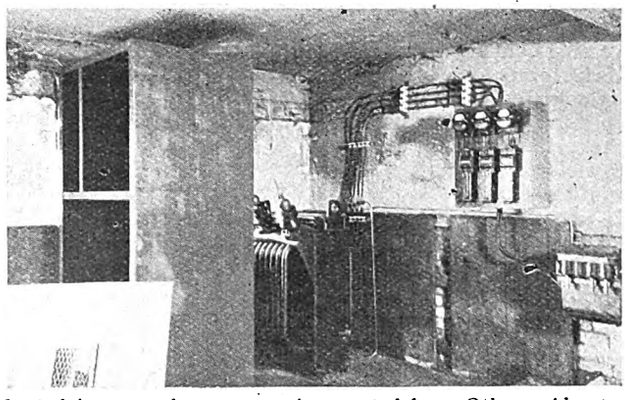
ELECTRICAL NEWS IN PICTURES.



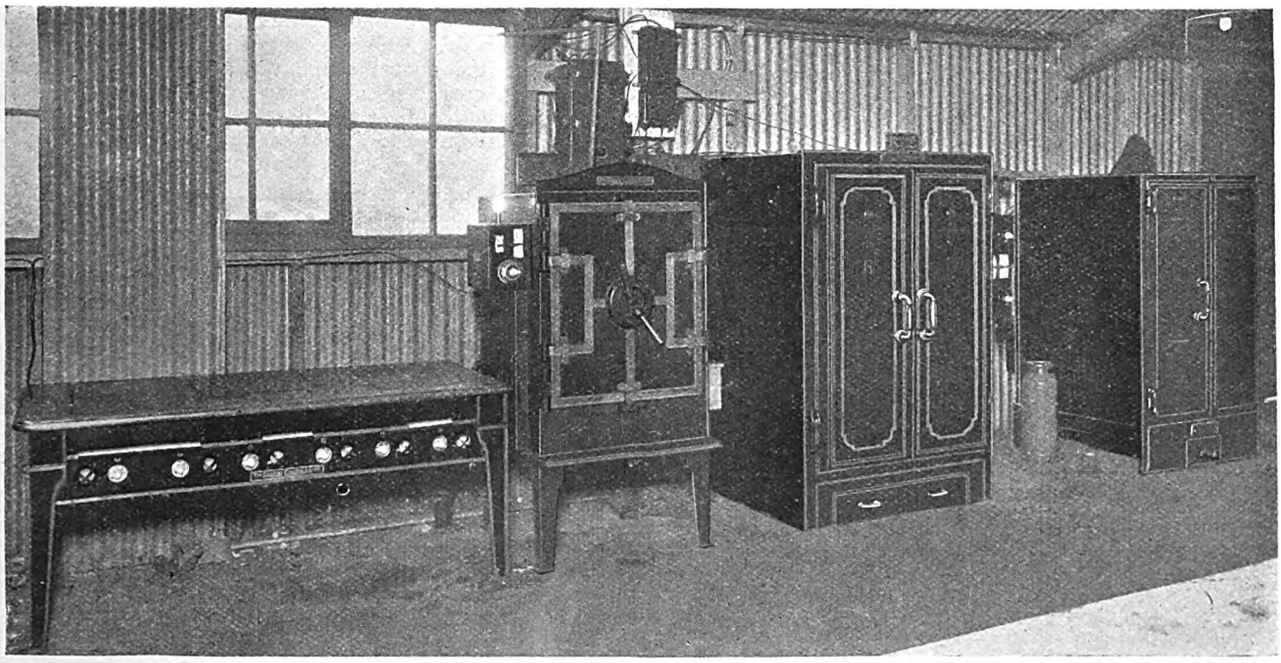
Ollerton Forest played Welbeck Athletic at the Stadium, Mansfield, on February 22nd by aid of electric light, and this picture is reproduced from a photograph taken during the match. The lighting arrangements were in the hands of Philips Lamps, Ltd., over 1 000 000 C.P. being used.

Mr. J. J. Murphy, who has resigned the chairmanship of the Irish Free State Electricity Supply Board. It is reported that Mr. R. F. Browne has been appointed his successor. See page 278.





Another example of the facility with which electric drive can be adopted in case of emergency is reported from Otley. About mid-day on February 14th, the 150 H.P. steam engine at the works of a printing machinery manufacturers suffered damage beyond repair due to the breaking of the crank disc. The Yorkshire Electric Power Co. at once approached the firm and terms of supply were quickly agreed. An extension of 11 000 V mains was necessary, and collaboration with Mr. Robinson, a local electrical contractor, who installed the wiring and necessary electric motors, resulted in the works being ready for running at 5.40 p.m. on Sunday. The picture on the left is of the engine after breakdown and the temporary sub-station before erection of screens is seen on the right.



A feature of the British Industries Fair at Birmingham which so far seems to have escaped attention by most visitors, because it is out of sight and is not scheduled as an exhibit, is the electric cooking installation in the restaurant. Ovens and transformer equipment were provided by The General Electric Co., Ltd., roasters by the Jackson Electric Stove Co., Ltd., hot cupboards by the British Electric Transformer Co., Ltd., the range by Berry's Electric (1928), Ltd., and switches by A. Reyrolle and Co., Ltd.

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BUSINESS AT THE FAIR.

Reports from Birmingham Show that Many Orders have been Secured.

INQUIRIES amongst standholders at the end of the first week of the Fair—which closes to-day—revealed a state of affairs in the Electrical Section which amply justifies the policy embarked on a year or so ago of making the section bigger and as fully representative as possible of the many sides of the electrical industry, a policy which, incidentally, has resulted in the Section having become one of the biggest portions of the Fair. It is too early at the time of writing, to give an accurate estimation of the number of inquiries received and the business done, but there is sufficient evidence to indicate that in both directions the results this year will exceed appreciably those of any previous year, and it is not surprising to hear the opinion expressed amongst some of the standholders that additional space may be taken for next year. The attitude of exhibitors towards the worth-whileness of the Fair varies greatly, of course. There are those who consider participation justified if they take orders enough to cover the total costs of exhibiting, others who are content if their products have been the subject of good inquiries, and a third class who look to the Fair as the means of bringing immediately an amount of business far exceeding the costs of exhibiting.

A number of exhibitors report good orders and inquiries from abroad, and one cannot fail to be impressed by the increasing evidence of the success with which British electrical manufacturers are tackling the overseas markets, though this is principally confined at present to the Dominions and Colonies. The Revo Electric Co., Ltd., Tipton, at the time of the writer's call, had just booked an order for 100 cookers, and their representative mentioned that 500 of these well-known cookers had been supplied to China last year. There had been a number of good inquiries from India, Australia, and other Dominions. Another firm able to report good business with overseas visitors is the B.K.B. Electric Motors, Ltd., 220, High Holborn, London, whose single phase repulsion induction motors are said to be establishing a place in the market hitherto held with little rivalry by American manufacturers. There was a good deal of interest and also many inquiries at the stand of Birmingham Electric Furnaces, Ltd., Parade, Birmingham, who have supplied what is believed to be the largest electric carburising furnace in this country to David Brown and Sons, Ltd., Huddersfield. Another noteworthy feature amongst the industrial exhibits in the Section is the range of new switchgear by Donovan and Co., Stechford, Birmingham, which is shown for the first time. Buyers were also interested in Donovan's new switchgear for 3-phase 4-wire systems, in which the neutral is made to make first and break last. Interest in domestic electric appliances is one of the outstanding features of the Fair, and is undoubtedly much higher than last year. Kettles and irons are the foremost subjects of inquiry, and one is very favourably impressed by the high standard of workmanship and electrical efficiency revealed in many of these products. The same remark applies almost with equal truth to fires and lighting fittings, while cookers and water heaters are again indicative of much progress and have attracted more attention amongst buyers and visitors generally than has been the case hitherto. The display of cookers by Credenda Conduits Co., Ltd., Oldbury, and the Revo Electric Co., brought both these firms good business with home buyers, while the new chromium plating in fires, irons, kettles, lighting fittings, etc., is also responsible for many inquiries. The range of new glassware and lighting fittings and "Magicoal" fires by Berry's Electric Ltd., is a noteworthy success, while the Alpha Electric Apparatus Co., Greet, Birmingham, reports having had better business with a new type of iron produced for the Fair than with any previous type, inquiries having been good from buyers from Australia, New Zealand, and South Africa. A popular feature at the stand of Bulpitt's and Son, Ltd., Birmingham, is their new combined kettle and saucepan fitted with two heating elements. Another firm which is doing good business in kettles and irons is Chesterton Jones and Co., Ltd., Tyseley, Birmingham.

The foregoing indications are necessarily sketchy, but they will suffice to show in a broad and general way the success of the Electrical Section. They were gathered during a tour of the stands when the business of the Fair was in full swing, and an impression which demands to be recorded is that the Section is the best lit, the best planned, and the most attractively displayed section in the whole of the Fair. And not the least welcome feature is the conveniently placed reception and inquiry bureau under the auspices of the Electrical Development Association.

CHLORIDE WORKS COMMITTEE.

The 1929 report of the Works Committee of the Chloride Electrical Storage Company's works at Clifton Junction, near Manchester, contains evidence of the good work done by the Committee and of the happy and sympathetic relations prevailing between the company and its employees. At the outset, the report refers to the great loss sustained by all the employees through the death of Mr. Wm. Bannister, the late chairman of the company, and quotes a letter dated February, 1929, in which Mr. Bannister expressed the appreciation by the board of the committee's assistance in maintaining cordial relations between the management and employees and his own approval of the thrift scheme mentioned in last year's report. The 1929 report states that the shareholders of the company allotted a further £10 000 to the pensions fund, which now amounts to £89 000, and records that "Haig" poppies sold on November 11th realised £9 13s. 3d., and that the Bannister trust fund afforded six grants to alleviate distress during the year. The employees' fund has provided the means for 53 persons to visit convalescent homes. The Committee also refer with satisfaction to the work of the medical officers in counteracting the risk of lead poisoning, no cases of plumbism having occurred in the works during the year. Amongst other beneficial institutions mentioned are the dental clinic, thrift scheme, marriage gifts, evening lectures, long-service awards, sick club, free hospital treatment and canteen and library. The benefits paid by the sick club amounted to £2 021 5s. 6d., and grants made out of the works' employees subscription account to £605 12s. 8d.

TWO views of the stand of the British Thomson-Houston Co., Ltd., in the Electrical Section of the Fair at Birmingham. See page 268.

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COMPANY NEWS.

Cables and Wireless Stocks Still Sagging—Increase of A.E.G. Capital—English Electric Co.'s Capital Reorganisation—Directors' Reports—New Companies.

BUSINESS in electrical shares has eased off during the past week and charges in price quotations are relatively few. Cables and Wireless continue to sag, and the "A" stock is in the neighbourhood of 60. American Telephone and Telegraph convertible bonds have been marked down 7½ points. Metropolitan Electricity Supply shares are up to £2 and Enfield Cable Works are not very far off £5.

Metropolitan Railway stock is somewhat slow to reflect appreciation of the company's better results and increased dividend. Lord Aberconway, presiding at the meeting on February 20th, said their traffic receipts for the past year increased by £17 746, and expenditure decreased by £44 000. The interests of the coal trade and the railway companies were so closely allied that he thought there was nothing to be feared from the legislative proposals now before the country. The widening of the line between Wembley Park and Harrow and lengthening platforms at a number of stations were about to be commenced. Rumours were about of Parliament initiating some scheme for the amalgamation of the various transport agencies in the Metropolis. Any definite proposals of this character that were brought forward would naturally receive the careful consideration of the directors. At the same time, it must not be overlooked that the Metropolitan was only partially a London transport company. It was really a trunk line in miniature. They did practically everything that was done by one of the large grouped lines, in that they carried, in addition to passengers, goods and merchandise of all descriptions, had their own collection and delivery organisations, and were parties to the railway clearing system. The report and accounts were adopted, and the dividends, including full dividends on 3½% preference, 3½% "A" preference, 3½% convertible preference and 5% preference stocks and £2 15s.% on the consolidated ordinary stock, making £4% for the year, were approved. At a subsequent Wharncliffe meeting, a resolution approving the promotion of a Bill to authorise the Wembley-Little Stanmore line was carried.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	" " "C" Cum. Pref. ..	21/–	21/–	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	61/3	61/3	78/–	29/9
6	" " " 6% Cm. Pf.	22/–	22/–	24/–	21/–
(*d*)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/–	32/6
5	" " 5% Cum. Pref.	20/–	20/–	23/3	19/10
4	Central Electricity Board 4%Stock	80	80	81	77½
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/–	26/–	51/–	24/3
4½	" " " 4½% C.P. (£1)	17/–	17/–	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/–	25/–	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/–
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	35/7½	36/3	44/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/–
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/–
10	County Lon. Elec. Sup. Ord. ..	44/4½	45/–	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/–	21/3
7	Edmundson's Elec. Corp.7% Pref.	24/–	24/–	27/–	21/6
(*g*)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	21/6	23/–	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/–	35/–	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	13/9	14/1½	23/6	10/–
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/–
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " " 4½% 1st Mt.Deb.Stk.	87	87	92	80½
—	Hydro Electric Securities.. ..	42⅜	43⅜	87	20
—	International Holdings	5	5	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/–	27/–	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/–	27/–	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9½	Lou. Elec. Sup. Ord. (£1).. ..	26/6	26/6	37/6	23/–
5	London Power Co. 5% Deb. Stk.	99	99	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
1/9½	Metro. Elec. Sup. Ord.	40/–	38/9	53/–	24/9
4½	" " " 4½% C.P. ..	17/–	17/–	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/6	28/–	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	32/6	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-TyneElec.Sup.Ord..	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	£58/3	31/–
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	£11½	9⅜
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
8	Scottish Power Ord.	29/–	29/–	35/9	22/–
6	Shrops. Worcs. & Staffs. Power Pref.	22/–	22/–	24/–	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/–	25/–	26/–	21/9
8½	S. London E.S. Ord.	26/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/–*	25/7½	27/–	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/–	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94½	94½	98⅜	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/–
5	Victoria Falls Power Ord. ..	58/9	58/9	69/–	46/3
	Railways and Tramways.				
4½	BirminghamDist.Inv.Trust1stDeb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	90½	90½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	" " " 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	13/1½	14/4½	24/–	14/–
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/–
4	Cent. Lon. Ry. Ord. Stk. (asstd.)..	73*	73	74½	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. .	69	69	65½	52
4	" " 4% Perp. Deb. ..	76½	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	79	42½
4	" " " " 4% Pf. Stk.	72	72	77	68
4	" " " " 4% Deb. ..	76½	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " " 5% Deb. ..	70½	70½	72½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	64½	63½	81	54½
3½	" " " 3½% Pf. Stk. ..	62	62	76	60½
3½	" " " 3½% Deb. ..	67½	67½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	74½	74½	81½	52½
4½	" " " 4½% 1st Pref. ..	80½	80½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt.Bds.	86½	86½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	71	64½
9	Torquay Trams Ord.	25/–	25/–	30/3	20/3
7	Underground Electric Rlys. Ord.	23/–	23/–	28/6	11/–
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	26/6	26/6	58/6	26/3
8	" " " 8% C.P.	51/10½	51/10½	56/9	49/6
4	" " " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/–	10/–	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	99/4½	56/–
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	75/–	75/–	91/3	63/9
6½	" " " 6½% C.P. ..	23/9	23/9	25/9	22/–
7½	" " " 7½% B. Pref. ..	27/6	27/6	28/3	25/–
17½	Consolidated Signal Ord.	37/6	37/6	52/–	6/6
5	" " " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/–	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	" " 7% C.P. ..	20/–	20/–	22/9	20/–
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord.	97/6	96/3	112/6	60/–
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/–
—	" " 6% C.P.	7/6	7/6	18/9	5/–
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb... ..	65½	65½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	17/3	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/6	28/6	34/2	23/9
6	Ferranti 6% Pref...	18/–	18/–	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	47/6	81/3	26/6
6½	" " "A" C.P.	24/–	24/–	26/–	22/–
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	121/3	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/–
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/–) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/–	25/–	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	26½	27	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	240	240	314½	144½
4½	" " " Conv. Gd. Bds.	102½	110	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk.	102½	102½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	21/10½	21/3	26/–	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk... ...	60	64½	90½	73½
—	"B" Ord. Stk.	30½	30½	104	33
—	5½% Cum. Pref. Stk. ..	96	96	99	90
3½	Eastern 3½% Pref. Stk.	63½	63½	70½	58½
4	" 4% Deb.	77	77	81½	73
4	Eastern Extension 4% Deb. Stk.	76	76	80½	73
22	Great Northern Telegraph (£10)	30½	30½	43½	26
—	International Teleph. & Teleg. ..	$72½	$72½	161½	48½
15	Marconi Int. Mar.	42/6	43/9	90/–	16/6
4½	New York Telep. 4½% Mt. Bds.	97½	97½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/–	41/–
—	Radio Corporation of America ..	46	46	115⅜	18½
4½	United R. Plate Teleph. 4½% Deb.	87½	87½	95/–	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(*a*) 19½d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7.181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2½d. per share
*Ex dividend.

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Directors' Reports, etc.

NORWICH ELECTRIC TRAMWAYS CO.—Intm. div. of 2½% (same as last year) is announced.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Intm. div. on 6% pref. shs. will be payable on March 1st.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Half-year's div. on 8% 1st pref. shs. will be payable on March 1st.

LIVERPOOL OVERHEAD RAILWAY CO.—Div. for year ended Dec. 31 last at rate of 5% p.a., less tax, on pref. shs. is announced.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD.—Div. of 4% on ord. shs. for year to Dec. 31 last is declared. To gen. res. and depreciatn. £30 000.

MATHER AND PLATT, LTD.—Fin. div. of 5%, with bonus of 5%, makg. 15% for year (same as previous year), is recommended. Fwd. £109 855, agst £108 006.

CHISWICK ELECTRICITY SUPPLY CORPORATION, LTD.—Fin. div. of 8½%, makg. 16% for 1929 (same as last year); to depreciatn. res. £16 000; fwd. £3 828.

METROPOLITAN ELECTRIC CABLE AND CONSTRUCTION CO., LTD.—Net pft. for 1929, £15 921; to res. for taxatn., £5 000; div. 10%, tax free; to gen. res., £5 000; fwd. £897.

KIDDERMINSTER AND DISTRICT ELECTRIC LIGHTING AND TRACTION CO., LTD.—Net receipts for 1929, £7 624, agst. £9 764; net pft., £3 806, agst. £6 871; fwd. £576.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Directors recommend blce. div. on £1 ord. shs. of 10·181 d. p. sh., makg., with intm. div., standard div. for the year 1929.

CABLES AND WIRELESS, LTD.—Transfer books of 5½% cum. pref. stk. will be closed from March 1 to 8, inclusive, for preparatn. of warrts. for dividend for half-year ended Dec. 31, 1929, payable March 31.

SMITHFIELD MARKETS ELECTRIC SUPPLY CO., LTD.—Net pft. for 1929, £8 072, agst £10 778. Fin. div. 5%, makg. 8% for year (same as previous year); to res., £3 000, agst. £6 000; fwd. £2 781, agst. £2 508.

CONSOLIDATED SIGNAL CO., LTD.—Credit blce. for year to Sept. 30, 1929, £25 800, agst. £32 481, includg. div. of 8% received from Westinghouse Brake and Saxby Signal Co. Ord. div. 12%, agst. 17½%; fwd. £840.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—Fin. div. of 7%, makg. 10% for year 1929, agst. 9%, is announced. This div. does not apply to recent issue of 500 000 new £1 ord. shs., on wh. int. to Dec. 31, 1929, has already been paid.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—The pref. sh. transfer books are closed until to-day (Feb, 28), inclusive, preparatory to paymt. of final divs. on 7% cum. 1st pref. and 6% cum. second pref. shs. for the year 1929.

UTILITIES AND GENERAL TRUST.—Net revs. for 1929, after charging int., management exes., income tax, etc., £25 448, agst. £22 125. Pref. div. absorbed £10 000; to res., £3 500; fin. div. on ord. 3% less tax, makg. 6% (same). Fwd. £3 118, agst. £3 170.

CLARKE, CHAPMAN AND CO., LTD.—Gross pft. for 1929, £93 907, agst. £82 519; net pft. £77 185, after allowing £14 515 for depreciatn. and £2 206 for directors' fees. Fin. div. 8%, makg. 11% for year, agst. 10%. To res., £15 000; fwd. £23 961, agst. £16 548.

MIDLAND ELECTRIC MANUFACTURING CO., LTD.—Net pft. for 1929, £45 182, agst. £43 402. Div. 10%, plus bonus of 12½% on enlarged ord. cap., agst. div. 10%, plus bonus 25%; to reductn. of goodwill £8 984, agst. nil; to res. £10 000, agst. £24 274; fwd. £14 640, agst. £13 193.

METROPOLITAN ELECTRIC TRAMWAYS, LTD.—Traffic receipts for 1929, £709 923, increase £30 554; net receipts £16 244, increase £1 729; other income £138 546, makg. net income £154 790, decrease £9 998. After deductg. fixed charges, blce., £6 934, is applied to reduction of deficit brt. fwd. to £73 893.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Gross rev. for 1929, $22 286 284 agst. $21 235 991. Operatg. exes. $7 099 642, taxes $1 416 966, depreciatn. $2 228 628, fixed charges $2 803 408. Net income, $8 737 638 agst. $7 866 462. Divs. paid amt. to $4 890 470. For insurance, contingt. and pensn. funds $520 000. Blce. $3 327 168 agst. $3 028 814. Earnings equal to $4·28 per share, agst. $3·85, of common stk.

TYNESIDE TRAMWAYS AND TRAMROADS CO.—Exes. for half-year to Dec. 31, 1929, exceed receipts by £208, and, adding int. on mtges, etc., less int. received, etc., makes total deficit £1 783. Amt. of £1 800 has been transferred from res., and after bringing in £68 from previous half-year £85 is carried fwd. Hldrs. of mtges. and shs. have passed resolutns. that prior mtges. not exceedg. £26 370 be created, and £18 000 of these will be issued in first instance.

ELECTRIC SHAREHOLDINGS CORPORATION.—First rpt. covering period March 8 to Dec. 31, 1929, shows net income $4 116 764, including pft. on sale of securities and stock divs. valued at market prices. Net assets $48 329 417, represented by 195 500 shs. of $6 pref. and 1 483 024 shs. of common stk. Value of assets behind each share of $6 pref., increased from $193.94, based on total cap. paid in for stk. to $247.21 on Dec. 31. Income after all deductns. equal to $2.80 a sh. on average amt. of common stk. outstandg.

MIDLAND COUNTIES ELECTRIC SUPPLY CO., LTD.—Trading pfts. of undertakgs. owned and operated by company for 1929, £349 209; to depreciatn. and reserves £105 500; brt. in £5 676; loan and deb. int., £18 306, to res. accts. £23 766; intm. div. on 6% cum. pref. shs. for half-year to June 30, 1929, £42 000. It is proposed to pay div. on 6% cum. pref. shs. for half-year to Dec. 31, 1929, and div. of 7%, less tax, for year on ord. shs. Fwd. £4 578. It is proposed to increase cap. by creatn. of an additional 500 000 shs. of £1 each.

LANCASHIRE UNITED TRANSPORT AND POWER CO., LTD.—Traffic receipts of operatg. companies comprised in company's system for 1929, £359 329; energy sold and miscellaneous receipts £29 732; total £389 061, workg. exes. £300 276; gross pft. £88 785. Int. 5% on 2nd mtge. deb. stk. for 1929 is to be paid, and blce., £19 307 carried fwd. Depreciatn. and renewal accts. and amts. carried fwd. in combined companies amts. to £201 833. Act of Parliament has bn. obtained authorising statutory compy. to change name to South Lancashire Transport Co.

LONDON AND SUBURBAN TRACTION CO., LTD.—Divs. and sundry pft. for 1929 amtd. to £56 498 agst. £55 381. Expenditure, £46 018 agst. £45 240, leavg. £10 480. Adding blce. from last year £36 137, makes £46 617, carried fwd. Combined results of Metropolitan Electric Tramways, London United Tramways, South Metropolitan Electric Tramways and Lighting Co. and Tramways (M.E.T.) Omnibus Co. for 1929 were: Passengers carried 332 025 650, increase 8 975,202, gross receipts £2 439 380, increase £34 442; expenditure, £2 037 604; int., rentals and other fixed charges, £235 912; reserves for renewals and contingencies, £105 000, surplus £60 864, decrease £34 696.

CHARING CROSS ELECTRICITY SUPPLY CO., LTD.—Pft. of West End undertakgs. for 1929, £134 547 agst. £145 920, plus £79 706 brt. in and £55 470 int. and divs., makg. £269 723. Deb. int. and sinkg. funds £56 474, leavg. £213 249. Final div. 10 1-16d., makg., with intm., 9½d., standard div.; shhldrs'. proportn. of consumers' benefit and appropriatn. to co-partners £23 151; fwd. £87 584. Pft. of City undertakg. £124 891, agst. £137 287, plus £18 226 brt. in and rent in respect of Bow generatg. statn., etc., £60 943, makg. £103 580. Provisn. for deb. int., loans, and sinkg. fund £100 481; div. 10% on £350 000 and 7% on £200 000 ord. cap. (same) £67 000; to shhldrs. proportn. of consumers' benefit £31 931; appropriation to co-partners £4 649.

RADIOVISOR FOREIGN AND COLONIAL, LTD.—First report covering period from Dec. 5, 1928, to Dec. 31, 1929, states that board recently made agreemt. with Siemens and Halske, of Berlin, giving latter exclusive rights of mfre. and sale of apparatus involving use of selenium bridges in certain countries of Europe and for non-exclusive similar rights in other European countries. Basis of agreemt. is that Siemens and Halske buy from company bridges at fixed price, and in addition pay royalty based on percentage of cost of apparatus in which bridges are used. Negotiatns. for sale of rights in U.S.A. and Canada are proceeding satisfactorily. Company, in partnership with Radiovisor Parent, has equipped buildg. at Letchworth for mfre. of all types of Radiovisor light-sensitive bridges. Accts. show deficit on profit and loss of £5 232.

Company Meetings.

ALLGEMEINE ELEKTRICITÄTS GESELLSCHAFT, BERLIN.—Dr. Buecher, presiding at the meeting last Saturday, said the influx of new orders, which at the beginning of 1930 stood at about 30 000 000 marks below the figures for the beginning of 1929, was now going on unabated, but it was difficult to make a forecast of the future. Proposals to distribute a dividend of 9% and to increase the company's capital to 200 000 000 marks by the issue of 4 000 000 marks of new shares were approved. Reserves amount to 70 000 000 marks.

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FIFE TRAMWAY, LIGHT AND POWER CO., LTD.—Mr. Wm. Low, presiding at the twenty-first annual general meeting on February 17th, said the company's assets had risen from the figure of £303 000, which appeared in their first balance sheet, to nearly £1 600 000. He also referred to the sale during the past year of their power and lighting business to the Scottish Power Co. The report and accounts were adopted and a dividend on the ordinary shares at the rate of 4% per annum, less tax, was approved.

ST. JAMES' AND PALL MALL ELECTRIC LIGHT CO., LTD.—Mr. Gerald W. Balfour, presiding at the meeting on Tuesday, said capital expenditure during the past year was just over £80 000. Negotiations for further sites for transformer stations had been successful. By the end of 1929 they had made connections to their a.c. system of 7 304 kW, equivalent to 20% of the total connections. They were faced this year with a programme of capital expenditure estimated at £124 000. They had purchased nearly 6 000 000 additional units, and the cost per unit of electricity purchased from the London Power Co. fell from 0·794d. to 0·776d. Receipts for electricity decreased by £3 778 although units sold increased by nearly 5 250 000. Charges for all classes of supply were now considerably below pre-war basis. The average return from sales was 2·054d. per unit compared with 2·414d. in the previous year. The net profit was £75 339, against £103 851, the result of the board's deliberate policy in fulfilment of their obligations under the 1925 Act. The report and accounts were adopted.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—At the meeting on Tuesday, Lord Ashfield (chairman and managing director) said, adding the cost of the new Brimsdown power station, the total capital involved in their undertaking was £5 592 220. Balance from working was £398 537, or £25 000 in excess of the previous year, to which interes and amount brought forward were added, making the total £428 427. The directors recommended a dividend on the ordinary shares of 10%. Since 1924 expenditure on extensions and improvements had totalled £3 296 000, units sold had increased from 96 500 000 to 199 700 000, and the average price received had decreased from 1·53d. to 1·19d. Last year they sold to 6 000 consumers on the contract rate (the domestic two-part tariff) an average of 1 897 kWh, compared with an average of 328 kWh to consumers on the lighting and heating rates. Reductions in the existing rates would take effect about the end of the present quarter. The report and accounts were adopted, and at a subsequent extraordinary meeting proposals to issue 250 000 6% £1 preference shares and a further £750 000 of 5½% debenture stock were approved.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—Lord Wargrave, presiding at the meeting on Tuesday, said the capital expenditure amounted to £239 726, a part of which represented the reinvestment of sinking funds in the company's undertaking. The item "cost of replacing consumers' d.c. apparatus on change of system" had increased during the past year by £35 405 and the expenditure under this heading was being written off out of revenue. During the year they sold 11½ million more units than in 1928. Revenue from sale of current was up by 11½%. Another contribution to the arrears of the pension fund was made this year, and so it was brought a step nearer being self-supporting. Revenue derived from consumers during the year was £175 000 below what would have been received if they had charged the standard price. The amount available for the shareholders under the sliding scale arrangement was £29 166, and it was proposed that this amount be transferred to the special reserve fund. The report and accounts were unanimously adopted and the final dividend on the ordinary shares of 13·12d. per share, making the standard dividend of 1s. 9·12d. per share for the year, was declared.

ENGLISH ELECTRIC CO., LTD.

Financial Reorganisation Scheme Approved—Mr. W. L. Hichens on the Outlook—Four Ways of Securing Improvement—Debenture Holders' Security.

MEETINGS of the holders of debentures, debenture stock and shares in the English Electric Co., Ltd., and also an extraordinary general meeting of the company, were held on Tuesday, February 25th, at Kingsway Hall, London, E.C., to consider a financial reorganisation scheme.

Mr. W. L. HICHENS (Chairman) said that it had been apparent since the heavy losses which were disclosed in the balance sheet for 1927 that the financial reorganisation of the company must be undertaken at the appropriate moment. The most urgent need at that time, however, was to reduce the fixed charges of the company, and as a result of the economies that had been made the losses which in 1926 and 1927 were £123 000 and £134 000, respectively, were reduced to £33 000 in 1928.

There were four ways in particular in which further improved results could be obtained: (1) the reduction of fixed charges by a financial reconstruction, (2) the installation of improved machinery; (3) the expansion of the company's turnover; (4) a greater concentration upon research. The proposed scheme would enable important advances to be made in each of the four directions indicated. It was clear that the company was over-capitalised, and the result of the scheme was to write down the existing capital of the company by £1 755 000.

The present scheme would result in a reduction in charges for interest and sinking fund from £182 000 per annum to £72 000 per annum. As regards the provision of new machinery the new capital of £750,000 which Messrs. Lazard Bros. would provide was sufficient not merely to liquidate the indebtedness of the company to its bankers, thereby relieving fixed charges, but also to enable important improvements to be carried out, which would have a material effect in reducing costs.

Another necessity for the success of the company was that it should have a bigger turnover of business. To secure this it required strong allies and unquestioned financial stability. The present scheme fulfilled both these requirements, and this was one of its most important features. As regards research, the company had suffered in the past because, though much had been done, it had not, either through alliance or its own efforts, been able to establish sufficiently close contact with the experimental side of the industry. It would be possible in the future to remedy this defect, which was largely due to lack of money.

Dealing with the financial aspect of the scheme as it affected the preference shareholders, Mr. Hichens pointed out that the market value of the preference shares at the beginning of December, before the present scheme was made public, was 7s. 6d., whereas the new par value would be 12s. 6d. In view of the fact that the new preference shares would be buttressed by the £750 000 of new ordinary shares which Messrs. Lazard Bros. would subscribe, and assuming, as presumably Messrs. Lazard Bros. anticipated, that the new ordinary shares might reasonably be expected to yield in course of time a satisfactory return, it was a fair inference that the new preference shares would in time have a market value at least equal to their nominal value.

Addressing the meeting of the 6% convertible debenture stock holders, Mr. Hichens said that the scheme did not propose an alteration in the par values which existing debenture holders would receive, for the par value in both cases would be £100. But it did propose an alteration in the form of security. It was important in the first instance to remember that the debenture holders would be protected by the addition of £750 000 of new money in the form of ordinary shares. If the ordinary shares became stabilised and yielded a satisfactory return, obviously the preference shares would at least reach the level of par. It followed, therefore, that, if the scheme was as successful as the experts believed, the market value of the new securities would rise to par or above.

The problem was best solved if some independent authority with expert knowledge made an apportionment, after studying the situation in all its bearings and discussing it with those best qualified to express a judgment, and that procedure had been followed in this case.

The resolutions were carried without dissent by the requisite majority at all shareholders' meetings. The meeting of the holders of the 5½% sinking fund first mortgage debentures was adjourned for three weeks in the absence of a quorum. At the meeting of the holders of the 6% convertible debenture stock, the resolutions were approved on a show of hands by the necessary majority, but to comply with the requirements of the Court a poll was taken, the result of which will be announced later.

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NEW COMPANIES.

G. AND A. STONE, LTD.—Cap., £2 200. Electrical engineers, etc. Reg. Office: 536, London Road, Westcliff-on-Sea.

T. HALL AND CO., LTD.—Cap., £1 000. Electricians, wireless engineers, etc. Reg. Office: 44, Malden Road, Cheam, Surrey.

DORMOR AND CO., LTD.—Cap., £4 000. Electrical and wireless engineers and factors, 217c, Old Christchurch Road, Bournemouth.

LOUIS G. FORD, LTD.—Cap., £25 000. Ironmongers and electrical engineering materials factors. Reg. Office: 12, Station Parade, Eastbourne.

E. SLIGHT AND SON, LTD.—Cap., £500. Ironmongers, dealers in wireless and electrical apparatus, etc. Reg. Office: 229, Cowbridge Road, Cardiff.

JAMES DAVIS, LTD.—Cap., £2 000. Motor, electrical and general engineers, dealers in wireless accessories, etc. Reg. Office: 3A, Pole Street, Preston.

THOMSON AND BRADLEY, LTD.—Cap., £100. Sheet metal workers, general and electrical engineers, etc. Reg. Office: Vickers Street, Miles Platting, Manchester.

ROBERT LEES, LTD.—Cap., £50. Engineers, manufacturers of, and dealers in, electrical and scientific appartaus, etc. Reg. Office: 59, Fleet Street, Liverpool.

V.G. ENGINEERING, LTD.—Cap., £100. Mechanical, electrical, and consulting engineers, etc. Reg. Office: 202, Abbey House, Westminster, London, S.W.

ATLAS SALES SERVICE, LTD.—Cap., £500. Manufacturers of and agents for electrical, wireless, television apparatus, etc. Reg. Office: 8, Mount Vernon, Liverpool.

SMALL AND MACDONALD, LTD.—Cap., £1 500. Electrical and mechanical engineers, dealers in electrical machinery, etc. Reg. Office: 177, West Regent Street, Glasgow, C.2.

WARWICKSHIRE IGNITION SERVICES, LTD.—Cap., £1 000. Electricians, suppliers of electricity, automobile electrical engineers, etc. Reg. Office: 25, Bennetts Hill, Birmingham.

D. LLOYD LEWIS, LTD.—Cap., £1 000. Electricians, suppliers of electricity, manufacturers of, and dealers in, electrical apparatus, lighting sets, etc. Reg. Office: 76, Duke Street, Liverpool.

SHAW, FLETCHER AND CO., LTD.—Cap., £100. To acquire business of electrical engineer heretofore carried on by T. R. Shaw, trading as Shaw, Fletcher and Co., at King Street, Wrexham, Denbigh.

LONDON NIGERIAN POWER CO., LTD.—Cap., £100 000. To produce, generate, store and distribute electrical energy or power, etc. Reg. Office: 31 and 33, Bishopsgate, London, E.C.2. (Public company.)

A. S. HOWARTH, LTD.—Cap., £2 000. Electricians, engineers, manufacturers of, and dealers in, electrical and other instruments in connection with wireless telegraphy, etc. Reg. Office: 41, Toad Lane, Rochdale.

CEREAL MILLERS, LTD.—Cap., £100. To take over all rights of Bandon Milling and Electric Lighting Co., Ltd., and of J. Murphy, of Mill Place, Bandon, electrical engineer. A director: J. Murphy, Mill Place, Bandon.

SCAIFE AND RUDD, LTD.—Cap., £850. Manufacturers and importers of, and dealers in, lamp shades in silk or other materials for electrical fittings, etc. Reg. Office: 1A, Greenleaf Road, Walthamstow, London, E.17.

LANCASHIRE FOUNDRY COKE CO., LTD.—Cap., £350 000. Manufacturers and sellers of coke and by-products; generators and storers of electricity, electrical engineers, etc. Reg. Office: Moorfield, Altham, near Accrington.

S. GORDON AND CO. (MANCHESTER), LTD.—Cap., £1 000. To carry on business of electrical, wireless and mechanical engineers, dealers in electric fittings, machinery and lamps, etc. Reg. Office: 12, Cannon Street, Manchester.

RADIO BY-WIRE, LTD.—Cap., £3 000. To construct and maintain wireless signal and receiving stations, and to carry on business of electricians, wireless and radio engineers, etc. Reg. Office: Exchange Court, Bowlalley Lane, Hull.

RADIO FINANCE CO., LTD.—Cap., £1 000. Financiers, concessionaires, and agents for, and manufacturers of, and dealers in, radio, electrical, scientific and mechanical apparatus and appliances, etc. Reg. Office: 5, Priory Place, Doncaster.

RUCEL, LTD.—Cap., £60 000. To adopt agreement with Rucel, Ltd. (vendor company) for purposes of reconstruction and to carry on business of manufacturers and preparers of and dealers in Rucel, natural and artificial rubber, electrical and general engineers, etc. Reg. Office: 9, Gresham House, Old Broad Street, London, E.C.2. (Public Co.)

DUALITE, LTD.—Cap., £21 000. To acquire goodwill and undertaking of Dualite, Ltd. (in voluntary liquidation), and to carry on business of manufacturers, importers and exporters of, and dealers in, appliances used in connection with electric lighting, electrical and wireless plant, etc. Reg. Office: 52 and 53, Fetter Lane, London, E.C.4.

WILLIAM MILLWARD, LTD.—Cap., £8 500. To acquire the business of a plater and gilder now carried on by G. M. Marriott as "William Millward" in Birmingham, and to carry on business of depositors on any metal, by electrical or other process, of gold, silver, copper or any other metal, etc. Col. E. T. Rich, C.I.E., Wyddrington, Church Road, Edgbaston, Birmingham (chairman and managing director).

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.

CRESCENT.—504 088. Class 18. Electric heating stoves. Albert Phillips, Ltd. Excelsior Works, Eyre Street, Spring Hill, Birmingham; manufacturers. July 1st, 1929. (By consent.)

LIVER.—508 133. Class 18. Engineering, architectural and building contrivances for electric purposes. The Liverpool Electric Cable Co., Ltd, Linacre Lane, Bootle Liverpool; manufacturers. November 23rd, 1929. To be associated with No. 508 182 (2 704) and others.

VIKING. 505 742. Class 6. Domestic vacuum cleaning machines, domestic washing machines, electric fans for domestic use and electrically driven sewing machines for domestic use. Leonard Samuel Marchant, 54, Aston Avenue, Fallowfield, Manchester; merchant, September 3rd, 1929. (By consent.)

INFINITY. 508 295. Class 8. Electric cables. Sloan Electrical Co., Ltd., 8, 10 and 12, Golden Lane, London, E.C.1; merchants. November 29th, 1929. To be associated with No. 508 296 (2 705) xl.

RADIO SERVICE (sign). 507 205. Class 8. Electric accumulators (not for medical purposes). Radio Service (London), Ltd., 105, Torriano Avenue, Camden Town, London, N.W.5; accumulator hirers. October 25th, 1929.

GOLIATH. 508 657. Class 8. Loud speakers and sound amplifying apparatus. The British Blue Spot Co., Ltd., 204 and 206, Great Portland Street, London, W.1; manufacturers. December 10th, 1929.

CYNTHIA. 508 696. Class 8. Gramophones, gramophones in connection with radio receiving sets, and wireless telephonic apparatus. J. W. Dugmore, Ltd., 42, Waterloo Road, Smethwick, near Birmingham; dealers in musical instruments. December 12th, 1929.

NOVOTEXT. 496 225. Class 50. Electrical insulating materials. Allgemeine Elektricitäts-Gesellschaft, 2-4, Friedrich Karl-Ufer, Berlin, N.W.40; manufacturers. October 22nd, 1928.

CROMMOID. 506 491. Class 50. Synthetic resin sold in the form of powder, blocks, rods, sheets, tubes and the like for industrial purposes; casein, celluloid and cellulose sold in the form of blocks, rods, sheets, tubes and the like for industrial purposes; and articles (not included in other classes) made from synthetic resin, casein, celluloid or cellulose, namely:—electrical insulating materials, lamp shades, lamp bowls, candlesticks; mouth-pieces for telephones; bases for electrical apparatus, switch covers and pushes. Cromwells, Ltd., Tipton Road, Dudley Port, Staffordshire; manufacturers. September 30th, 1929. To be associated with No. 506 490 (2 705) xiii.

L.E.C. (sign). 505 077. Class 50. Electric lighting, heating, telephonic, telegraphic, and wireless telephonic, telegraphic and television fittings, all being goods made of material covered by class 50 and not included in other classes, but not including wire covered with asbestos, electric junction boxes or casing for surface wiring. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool, manufacturers. August 6th, 1929. To be associated with No. 472 197 (2 536) and another. Registration of this trade mark shall give no right to the exclusive use of the letters "L.E.C."

HELIA.—506 049. Class 13. Electric suspension switches (ordinary). Frederick Charles Bint, trading as Bint and Co., 5, Dowgate Hill, Cannon Street, London, E.C.4.; steel merchant. September 13th, 1929. Concurrent user claimed from the year 1922. Sect. 21.

CRAYONNE.—508 954.—Class 50. Covers and bases for electric switches and bells, electric light fittings and plugs made from compositions in which cellulose predominates. Arthur Willy Kanis, 66, Aldersgate Street, London, E.C.1; manufacturer. December 19th, 1929. To be associated with No. 478 403 (2 558) and others.

BIFLECA.—496 775. Class 8. Gramophone horns and loud speakers for use in wireless telephony. Frederick Albert Boyd, 142, Gray's Inn Road, London, W.C.1; gramophone dealer. November 7th, 1928.

TRI-SPOT (sign).—501 514-6 736 S. Class 8. Wireless telephonic apparatus and parts thereof and gramophones and parts thereof, all being goods made wholly or partly of metal. H. C. Rawson (Sheffield and London), Ltd., 100, London Road, Sheffield; manufacturers and merchants. April 4th, 1929. The Trade Mark is limited as regards the circular devices to the colours red, white and blue, exactly as shown on the representation on the form of application. Registration of this trade mark shall give no right to the exclusive use of the word "Tri-Spot."

METAL AND CHEMICAL PRICES.

TUESDAY, February 25th.

	Price.	Inc.	Dec.
Copper —			
Best Selected	per ton	£77 5 0	5s. 0d.	—
Electro Wirebars	„	£84 5 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	„	11⅜d.	¼d.	—
Phosphor Bronze —				
Wire (Telephone), basis	per lb.	1s. 2½d.	—	—
Brass (60/40) —				
Rod, basis	per lb.	9d.	—	—
Sheet „	„	10¼d.	—	—
Wire „	„	10¼d.	—	—
Pig Iron —				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig —				
English	per ton	£22 10 0	—	10s. 0d.
Foreign or Colonial	„	£21 2 6	—	10s. 0d.
Tin —				
Ingot	per ton	£172 2 6	—	£2 5 0
Wire, basis	per lb.	2s. 4d.	—	¼d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£19 0 0	—	7s. 6d.
Mercury	per bottle	£23 0 0	—	5s. 0d.

Sulphur—Flowers, Ton £12 0 0 ; Roll, „ £10 10 0 — ***Copper Sulphate*** .. Ton £25 to £25 10s ; ***Boric Acid*** (Crystals) „ £32 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 — ***Sodium Chlorate***—Per lb., 2½d

Sodium Bichromate—Per lb., 3½d.

Rubber—Para fine, 8⅝d.; plantation, 1st latex, 8½d.

∴ **The metal prices are supplied by British Insulated Cables Ltd.**, and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

According to James Forster & Co. the lead market opened last week in a stagnant state, but on Wednesday values broke sharply on heavy selling of forward lead, early lead falling 8s. 9d., and forward 10s. A further drop took place on Thursday of 11s. 3d. and 10s. per ton respectively to £20 13s. 9d. for February, and £20 11s. 3d. for May.

Closing prices on February 21st were £21 3s. 9d. for February, £21 1s. 3d. for March and April, and £21 for May, 10s. to 11s. 3d. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BANCE, Mr. F. W., 90A, Bartholomew Street, Newbury, wireless dealer. £18 5s., January 13th; and £15 7s. 7d., December 2nd.

BURGOYNE WIRELESS, LTD., 36A, York Road, King's Cross, wireless dealers. £14 5s. 3d. January 20th.

DANKS, H., 24, New Street, Dudley, wireless dealer. £14 2s. 4d. January 9th.

GARRATT, E. C., AND CO., Cannock Road, Chadsmoor, electrical engineers. £19 10s. 1d. January 15th.

GRAINGE, Mr. R. W., Grainges Wireless Depot, 20, Nile Street, North Shields, wireless dealer. £10 4s. December 2nd.

LONDON RADIO STORE, 107A, High Street, Uckfield, wireless dealers. £11 4s. 11d. December 6th.

SCHOFIELD, Herbert, The Arcade, Waterfoot, wireless dealer £16 13s. 8d. December 2nd.

SHACKLETON, Mr. S. M., 5, Main Avenue, Heworth, Yorks, wireless dealer. £30 19s. 5d. January 10th.

SOUTHEND AND DISTRICT LIGHT SUPPLY CO., LTD., 52A, High Street, Southend, electricians. £55 18s. November 14th.

Receiverships.

ACME ELECTRIC WIRE AND CABLE CO., LTD. S. I. Wallis, Incorporated Accountant, of 3, King Johns Chambers, Bridlesmith Gate, Nottingham, was appointed receiver and manager on February 8th, 1930, under powers contained in debenture dated April 11th, 1929.

CENTRAL POWER ENGINEERING CO., LTD. T. J. McManis, certified accountant, of 2A, Foster Lane, E.C., was appointed receiver and manager on February 3rd, 1930, under powers contained in debenture dated October 2nd, 1927.

INSTRUMENT WIRES AND CABLES, LTD. F. W. Paterson, of 35, Great Tower Street, E.C.3, was appointed receiver on February 10th, 1930, under powers contained in debentures dated September 26th, 1928.

"PHANTESTRA" (RENN'S GRAMOPHONE AND WIRELESS), LTD., A. E. Middleton, of 18, Essex Street, Strand, W.C.2, was appointed receiver on February 8th, 1930, under powers contained in first mortgage debentures created March 14th, 1919.

YELDON (G.), LTD. E. H. Hawkins, of 4, Charterhouse Square, E.C.1, was appointed receiver on January 28th, 1930, under powers contained in a first mortgage debenture dated January 5th, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

SULLIVAN (H. W.), LTD., London, S.E., electrical engineers. Registered February 3rd, debenture, to Bank; general charge. *Nil. July 4th, 1929.

Satisfactions.

GRAY (J. W.) AND SON, LTD., London, W.C., electrical engineers.—Satisfaction registered February 7th, £1 500, registered January 2nd, 1929.

MEAD AND JEFFERY, LTD., London, W., electrical engineers.—Satisfaction registered January 31st, £500, registered August 8th 1919.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HALCYON WIRELESS CO., LTD., 313, Regent Street, London, W., radio manufacturers. A largely attended meeting of the creditors in this matter was held at 313, Regent Street, W., on February 20th, when the chair was taken by Mr. Gisburne, solicitor, representing the Six Sixty Radio Company, the largest trade creditors. The notice convening the meeting had been sent out over the signatures of four of the principal creditors, who had been appointed a provisional committee for the purpose of examining the affairs of the company, and in the circular calling this meeting it was stated that the four signatories referred to were convinced that as a result of certain proposals there was every hope that some scheme could be formulated which would result in a substantial payment being made to the creditors. The Chairman mentioned that a petition for the compulsory winding up of the company had been presented by Bullmores, Ltd., creditors for £141. He suggested that there should be an informal committee appointed to watch the interests of the creditors and of the company alike, and to keep in touch with the outgoings and commitments generally, this overlooking to go on for three or four weeks, and in the meantime that the creditors should support the application for the adjournment of the petition for one month so that definite proposals might be laid before the creditors.

A representative of Ogle, Newman, Ashworth and Bevan, accountants, stated that the assets at January 31st totalled roundly £25 000, subject to a debenture held by the bank and covered an overdraft for £5 000. The claims of sundry creditors were £28 211, and there had been a loss on trading to date of £10 588. The assets included sundry debtors £10 531, and stock £9 596, the latter consisting largely of made up sets or sets that were practically in a state of completion, a director of the company stating that the stock was all in a very saleable condition. In reply to a question, Mr. Emby, a director, said it had been intended to float a public company in the early part of the present year. He added that one of the difficulties in the wireless trade was that so many people came into it who had little or no experience in the trade, and this did irreparable damage. After the matter had been discussed, a resolution was proposed, seconded and carried that the time asked for be granted the company, and the committee authorised to support the adjournment of the petition when it came on for hearing.

London Gazette, etc.

Winding-up Petitions.

MAYFAIR ELECTRIC GRAMOPHONES, LTD. A petition for the winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, on March 3rd.

WYNSOR ELECTRIC RANGE CO., LTD. A petition for winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, on March 3rd.

Companies Winding-up Voluntarily.

FREEZONE, LTD. By reason of its liabilities, February 14th. H. M. Barton, Alderman's House, Alderman's Walk, Bishogsgate, London, E.C.2, chartered accountant, appointed as liquidator.

GRAVESEND AND NORTHFLEET ELECTRIC TRAMWAYS, LTD. By special resolution, February 18th. T. Bower and T. H. Underhill appointed as liquidators.

NORTH SURREY ELECTRICAL FACTORS, LTD. Statutory meeting of creditors, February 26th.

Bankruptcy Information.

CANE, John Alwyn, CANE, Thomas Phillips, CANE, Douglas Raymond, consulting and electrical engineers, trading as CANE BROTHERS, at Sturry, Kent. First meeting, March 6th, 3.30 p.m., Room 53, Bankruptcy Buildings, Carey Street, London, W.C.2. Public examination, March 25, 10.15 a.m., Guildhall, Canterbury.

GODDARD, Arthur Percy, 25, Silver Street, Doncaster, electrician. Receiving order, February 18th. Debtor's petition. First meeting, March 6th, 12.30 p.m., Official Receiver's Offices, Figtree Lane, Sheffield. Public examination, March 20th, 2 p.m., County Court Hall, Bank Street, Sheffield.

JACKSON, John Harold, Dock House, Winsford, Chester, electrical engineer. First meeting, February 28th, 2.30 p.m., Official Receiver's Office, 12, Lonsdale Street, Stoke-upon-Trent. Public examination, March 20th, 11 a.m., Petty Sessional Court House, Edleston Road, Crewe.

Notices of Dividends.

MILLWARD, Eric Rodney, trading as WEST OF ENGLAND RADIO, 67, High Street, Barnstaple, wireless engineer. First and final dividend, 2s. 3d. per £, payable, February 21st, Official Receiver's Offices, Exeter Bank Chambers, Broadgate, Exeter.

WARNES, Elizabeth Ann (Widow), 10, Crescent Gate, Wilmslow Road, Rusholme, Manchester, electrical and radio engineer, formerly trading as VICTORIA RADIO CO., but now as E. A. WARNES AND CO. First and final dividend, 1s. 6d. per £, payable February 24th, Offices of the Trustee, Arthur Tyldesley Eaves, 47, Mosley Street, Manchester.

Order Made on Application for Discharge.

WORSNIP, William, 30, Market Hall, Walham Green, London, wireless dealer. Discharge suspended for one year until January 28th, 1931.

Partnerships Dissolved.

D.C. ELECTRIC CO. (James DOOTSON and William Frank COBB), electrical and radio engineers and allied trades, Higher Cheap Street, Sherborne, Dorset, and at Bridport, Dorset, by mutual consent as from January 21st, 1930. Debts received and paid by J. Dootson, of Higher Cheap Street, Sherborne.

ELECTRICAL SUPPLIES CO. (Wilfred Enoch ASPREY, William Donald ARNOT, and Roland Whelan CHAPMAN), motor trade electrical factors, by mutual consent as from February 15th, 1930. Debts received and paid by W. E. Asprey.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

295 724 British Thomson-Houston Co., Ltd. Insulated cable joints. (18/8/27).
321 256 C. Chaffer and J. H. Dand. Magnetic compasses. (23/8/28.)
321 259 L. E. Fillmore and L. W. Fillmore (trading as Jackson Bros.). Slow-motion mechanism or fine-adjustment device for electrical tuning-apparatus. (28/8/28.)
296 353 P. Conrady. Refrigerating-machines for domestic and like refrigerators. (29/8/27.)
321 264 W. R. Millar. Portable electric lampholders. (1/9/28.)
296 673 Compagnie Generale D'Electro-Ceramique. Suspension insulators and strain insulators for electric conductors. (3/9/27.)
321 265 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Connecting-devices for use in electric circuits. (3/9/28.)
321 266 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Connecting-devices for use in electric circuits. (3/9/28.)
321 267 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Fuse-boxes for use in electric circuits. (3/9/28.)
321 271 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric lamps. (5/9/28.)
307 734 Newcombe-Hawley, Inc. Electrostatic acoustic device. (12/3/28.)
315 294 Newcombe-Hawley, Inc. Electrostatic sound-reproducers. (11/7/28.)
321 278 I. T. Stokes and A. G. Ionides. Electric heating and cooking apparatus. (18/9/28.)
321 279 Quasi-Arc Co., Ltd., and R. J. Musto. Apparatus for use in electric arc welding. (20/9/28.)
297 833 General Electric Co., Ltd. Electrical cut-outs. (30/9/27.)
321 280 G. B. M. Kelp and M. H. Jessen. Devices for the automatic control and regulation of temperature in electric heating and cooking apparatus. (24/9/28.)
297 846 British Thomson-Houston Co., Ltd. Electric switches. (29/9/27.)
298 567 British Thomson-Houston Co., Ltd. Induction motors. (11/10/27.)
321 300 E. M. Johnson and Associated Electrical Industries, Ltd. Electrical control systems. (13/10/28.)
321 303 Relay Automatic Telephone Co., Ltd., and T. M. Inman. Fire-alarm systems in conjunctions with telephone-exchange systems. (16/10/28.)
321 318 C. Hall. Automatic electric switches. (27/10/28.)
321 327 Wireless Music, Ltd., and M. Trouton. Electromagnetic vibratory devices for acoustical instruments. (8/11/28.)
321 335 Gramophone Co., Ltd., C. O. Browne, and W. F. Tedham. Electrical conductors. (17/11/28.)
303 010 International General Electric Co., Inc. Explosion-pots for oil switches. (21/12/27.)
321 357 F. W. Golby (Red Spot Electric Co., Inc.). Electric fluid-heaters (7/1/29.)
321 360 M. Leef. Electric incandescent lamps. (18/1/29.)
321 363 S. Z. de Ferranti and Ferranti, Ltd. Meter indicator mechanism. (23/1/29.)
306 894 R. Bosch Akt.-Ges. Means for leading-in electric conductors through metal walls. (27/2/28.)
321 368 A. Schuhmann. Electrically-operated toy railways and the like. (1/2/29.)
306 895 Accumulatoren-Fabrik Akt.-Ges. Electric accumulator battery. (27/2/28.)
305 952 Electric Furnace Co., Ltd. Electric melting-furnace. (11/2/28.)
307 020 Benjamin Electric, Ltd. Means for securing a glass or other cover to a reflector, shade, or the like. (1/3/28.)
319 315 C. Cremer. Electric cables. (20/9/28.)
307 309 Telefunken Ges. fur Drahtlose Telegraphie. Picture and the like radio-transmission systems. (3/3/28.)
308 262 J. C. Pole. Metallic-vapour lamps. (20/3/28.)
321 385 W. E. Williams. Directional aerials for the transmission and/or reception of electromagnetic waves. (9/11/28.)
321 405 L. A. Levy and Almeida Accumulators, Ltd. Secondary cells. (3/5/28.)
291 089 Askania-Werke Akt.-Ges. Vorm. Centralwerkstatt Dessau und C. Bamberg-Friedenau. Process of and apparatus for regulation of power-generating installations, more particularly electric power stations. (28/5/27.)
321 389 J. L. Baird and Television, Ltd. Television apparatus and the like. (5/6/28.)

Applications for Patents.

October 30th.

32 900 Associated Electrical Industries, Ltd. Suspension devices for electrica apparatus. (30/10/28, U.S.)
32 993 Associated Electrical Industries, Ltd. Control systems for electrical apparatus. (30/10/28, U.S.)
33 011 Associated Telephone and Telegraph Co. Electric remote-control systems. (1/11/28, U.S.)
33 012 Automatic Telephone Manufacturing Co. and R. Taylor. Electrical indicating devices.
33 033 E. Belin. Picture, etc., receiving apparatus.
32 998 British Automatic Totalisator, Ltd. Luminous indicators.
33 001 British Electrical and Allied Industries Research Association and E. B. Wedmore. Circuit breakers.
32 935 R. A. Catlin and Electro-Mechanical Brake Co., Ltd. Trucks for tramway vehicles, etc.
32 984 W. R. Edwards and R. Edwards and Co., Ltd. Accumulators.
32 922 Electric Central Heating and Ventilating Co., Ltd. Heating and ventilating apparatus.
32 955 Elliott Bros. (London), Ltd., and G. F. Shotter. Transformers and measuring instruments.
32 950, 32 952 Ericsson Telephones, Ltd., and T. Lyden. Totalisators.
32 951 Ericsson Telephones, Ltd., and F. Limb. Totalisators.
32 981 Federal Telegraph Co. Oscillation generators. (30/10/28, U.S.)
32 911 E. Gallizia and General Electric Co., Ltd. Mercury vapour rectifiers.
33 017 P. H. Greeley. Low frequency electric amplifiers.
32 945 Grierson, Ltd., and R. Grierson. Electric heating systems.
32 903 I. Hortick and C. D. Rowley. Duplex telegraph systems, etc.
32 989 T. H. Jones, C. R. Riber, and Siemens Bros. and Co., Ltd. Selecting switches for automatic telephone systems.
32 894 F. W. Lanchester. Wireless receiving apparatus.
33 024 C. Lorenz Akt. Ges. Electric generators for transmission of signals on locomotives. (1/11/28, Germany.)
32 936 M. L. Magneto Syndicate, Ltd. Magnetos.
32 987 A. Mozer. Method of electrolytically separating gold and silver. (11/12/28, Germany.)
33 002 M. J. E. Morgan. Electric water heaters.
33 009 N. V. Philips' Gloeilampenfabrieken. Frequency transformation of electrical oscillations. (2/11/28, Holland.)
33 021 N. V. W. Smit and Co.'s Transformatorenfabriek. Coated electrodes for welding. (7/10/29, Holland.)
32 948 A. F. and D. A. Pollock. Condenser microphones.
32 966 Standard Telephones and Cables, Ltd. High frequency signalling systems. (21/12/28, U.S.)
32 967 Standard Telephones and Cables, Ltd. Damping arrangements for acoustic devices.
32 968 Standard Telephones and Cables, Ltd., and A. T. Starr. Electrical networks.
33 895 G. Wilkinson. Electrical distribution systems.

October 31st.

33 098 British Thomson-Houston Co., Ltd. Vapour electric discharge devices. (31/10/28, U.S.)
33 172 S. G. Brown. Electrical apparatus.
33 174 Burgess Battery Co. Drip for dry cell cores. (2/11/28, U.S.)
33 176 A. H. Cooper, Gramophone Co., Ltd., and A. G. D. West. Variable electrical components.
33 179, 33 180, 33 181 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
33 076 Dunlop Rubber Co., Ltd., P. E. Lavell and J. R. Ward. Cover for live rails.
33 151 A. J. H. Crane-Jacobs. Electrical gramophone pick-up attachment.
33 173 Koch and Sterzel Akt. Ges. High potential circuit breakers. (7/11/28, Germany.)
33 130 G. W. Le Baigue. Holders for electric lamp shades.
33 109 G. C. and P. A. Lundberg, A. P. Lundberg and Sons, Ltd., and G. Pegg. Electric switches.
33 184 Marconi's Wireless Telegraph Co., Ltd. Picture telegraph, etc., apparatus. (31/10/28, U.S.)
33 060 Rogers-Jenkins and Co. Pty., Ltd. (P. G. T. de Villiers). Automatic telephone call-boxes.
33 123 Siemens-Schuckertwerke Akt. Ges. Short circuit armatures for electric motors. (13/12/28, Germany.)
33 073 F. Smith. Suspender hooks for overhead cables.
33 139 Western Union Telegraph Co., Ltd. Repeater for telegraph systems. (30/8/29, U.S.)

COMING EVENTS.

Friday, February 28th (To-day).

Institution of Electrical Engineers (West Wales-Swansea Sub-Centre).—Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch."
Electrical Association for Women.—Club Room, Kensington Court, London. Lecture by Mr. L. L. Robinson on "Tariffs." 3 *p.m.*
Imperial College of Science.—Imperial Institute Road, South Kensington. Paper by Mr. R. O. Cherry on "Field Intensity Measurements Around Some Australian Broadcasting Stations." 5 *p.m.*

Saturday, March 1st.

Institution of Electrical Engineers (North Midland Students' Section).—Visit to the works of Messrs. John Fowler and Co., Ltd., Hunslet, Leeds. 2.15 *p.m.*
Association of Mining Electrical Engineers (South Wales Branch).—Visit to the Oakdale Collieries. 2.30 *p.m.*

Monday, March 3rd.

Royal Institution of Great Britain.—21, Albemarle Street, London. General meeting. 5 *p.m.*
Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Push-Button Control. Opened by Mr. J. J. Fisher. 7 *p.m.*
Institution of Electrical Engineers (South Midland Centre).—University, Edmund Street, Birmingham. Papers by Lt.-Col. S. E. Monkhouse, and Mr. L. C. Grant on "The Heating of Buildings Electrically by means of Thermal Storage"; and Mr. T. G. N. Haldane on "The Heat Pump—An Economical Method of Producing Low-Grade Heat from Electricity." 7 *p.m.*
Institution of the Rubber Industry.—Engineers' Club, Coventry Street, Piccadilly, London. Paper by Dr. H. A. Daynes on "A Method of Making Electrical Contact with Ebonite and Soft Rubber for Insulation Tests." 7.30 *p.m.*

Tuesday, March 4th.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.
Institution of Electrical Engineers (East Midland Sub-Centre).—Loughborough. Paper by Mr. J. J. Denton on "Television—Progress and Applications."
Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, 17, Albert Square, Manchester. Discussion on "Low-Temperature Carbonisation of Fuel, with special reference to its combination with the production of Electricity." Introductory paper by Messrs. E. H. Smythe and E. G. Weeks. 7 *p.m.*
Electrical Association for Women (Bristol and District Branch).—Electricity Offices, Colston Avenue. Lecture by Mr. A. M. Willis on "Electricity in the Service of Women." 3 *p.m.*
Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir William Bragg on "X-Ray Determination of the Structure of Cellulose." 5.15 *p.m.*
Electrical Society of Glasgow.—30, Gordon Street. Annual general meeting. 7.30 *p.m.*

Wednesday, March 5th.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting.
Electrical Contractors' Association (Dublin Branch).—Ordinary meeting.
Institution of Electrical Engineers (Wireless Section).—Savoy Place, Victoria Embankment, London. Papers by Mr. H. J. Lucas on "Some Developments of the Piezo-Electric Crystal as a Frequency Standard," and Mr. J. E. P. Vigoreux on "The Valve-Maintained Quartz Oscillator." 6 *p.m.*
Institution of Heating and Ventilating Engineers.—Swedenborg Hall 20, Hart Street, London. Discussion on "The Space Required for Central, Station Equipment." 7 *p.m.*
Electrical Association for Women.—46, Kensington Court, London. Social Sub-Committee "At Home." 3 *p.m.*
Institution of Electrical Engineers (Tees-Side Sub-Centre).—Cleveland Technical Institute, Middlesbrough. Address by Mr. B. A. Robinson. 7.15 *p.m.*

Thursday, March 6th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting.
Electrical Contractors' Association (Bristol Branch).—Ordinary meeting.
Batti-Wallahs' Society.—Hotel Cecil, Strand, London. Luncheon. 12.30 for 1 *p.m.*

Friday, March 7th.

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London. Paper by Messrs. A. E. Moore and W. T. Slater on "An Investigation of the Frequency Variations in Induction Watt-hour Meters." 7 *p.m.*
North-East Coast Institution of Engineers and Shipbuilders.—Institution Rooms, Bolbec Hall, Newcastle-upon-Tyne. Informal meeting. Discussion on "The Effect of the Use of Electricity in Workshops on Efficiency and Costs." 7.15 *p.m.*
Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Armstrong College, Newcastle-upon-Tyne. Paper by Mr. W. A. Cook on "Insulation Testing." 7.15 *p.m.*

Saturday, March 8th.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*
Electrical Power Engineers' Association.—Café Royal, Regent Street, London. Annual dinner and dance. 6.45 for 7 *p.m.*

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THE ELECTRICIAN

Vol. CIV.—No. 2701. Friday, March 7, 1930. [Registered at the General Post Office.] Sixpence

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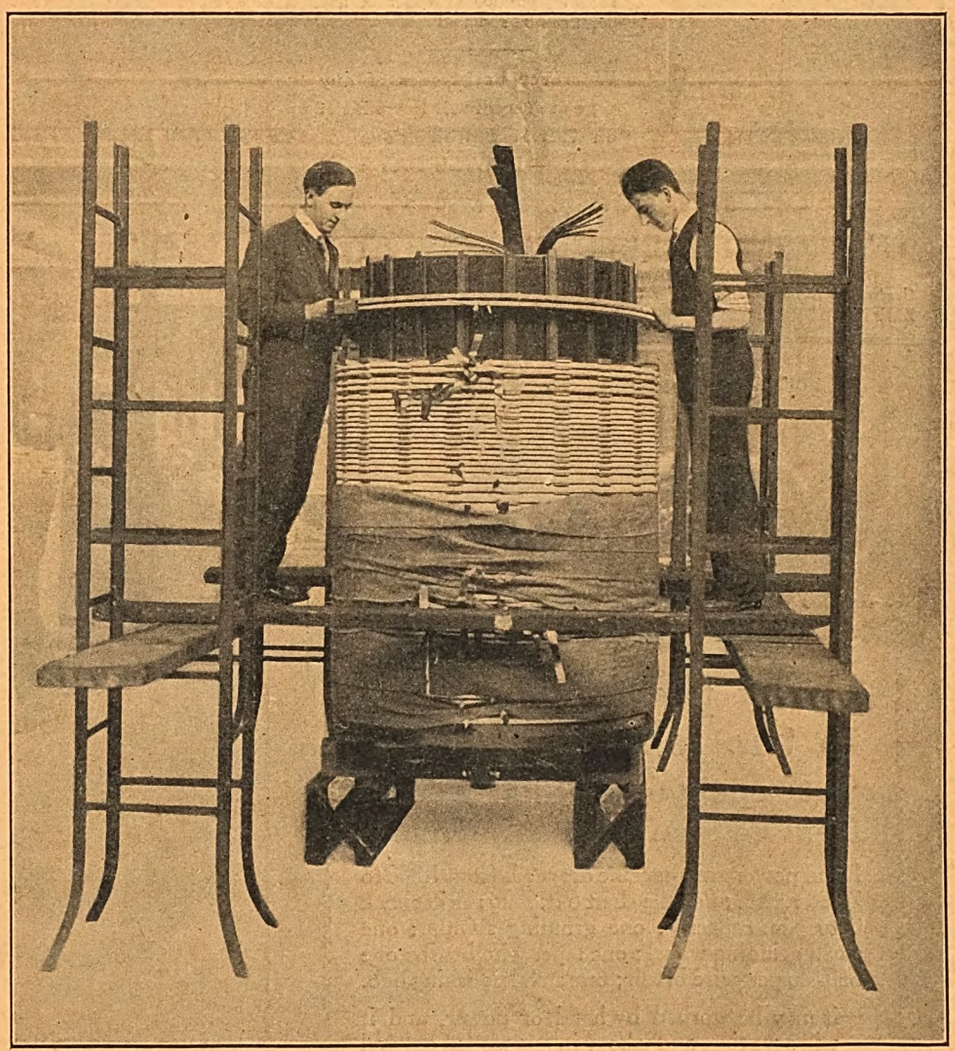

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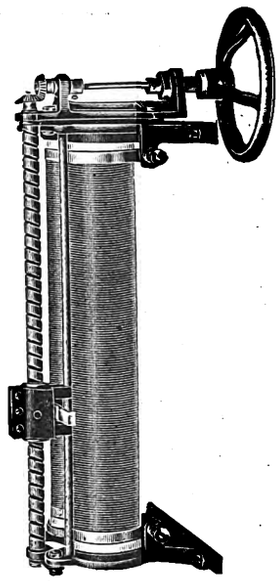

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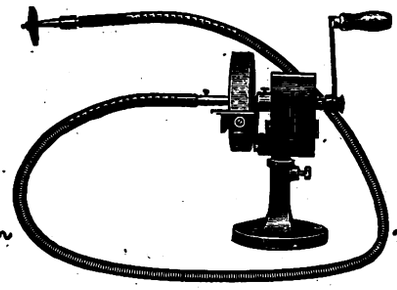

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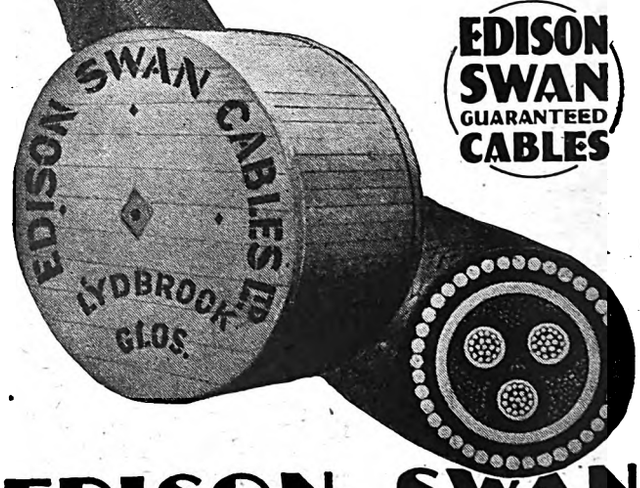

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The Beam Decision.

LENGTHY statements issued by the Postmaster-General and by the General Manager and Secretary of Imperial and International Communications, Limited, in regard to the decision of the Government not to make use of the company's Beam stations for long distance radio telephone services, raise a number of important issues. Leaving aside for the moment the purely technical aspect of the matter, the chief point in dispute concerns the exact value of the recommendations of the Imperial Wireless and Cable Conference of 1928 upon which the I. and I.C. Company was brought into being. It is easy to follow the company's argument that the development of a Post Office system of long distance radio telephony may well be prejudicial to the cable and wireless telegraph traffic upon which the company's income depends. The company is under an obligation to pay £250 000 a year to the Post Office for the privilege of exploiting the system of Beam telegraphy which the Marconi Company invented and installed, as well as 12 per cent. on any increase above a standard revenue on its communication profits from April 1st, 1931, and a lump sum of £60 000. These payments are in respect of the transfer of services operated by the Beam stations for which the total capital payment made by the Post Office to the company was £161 744. In these circumstances the Government's decision to establish what, from the traffic standpoint, can only be regarded as a competitive service, may be legitimately challenged on grounds of equity.

On the technical side there is also controversy as to the ability of the Post Office to establish reliable long distance radio telephonic services. The Transatlantic service works well over what is only a medium distance in these days. The Australian experiments, so far as they have gone, are said to have been quite satisfactory. It is claimed by the Marconi Company's technical experts that there is a great advantage in the use of large aerials for long distance work. It would not be possible to form an accurate opinion as to the relative merits of the Post Office and Marconi Beam systems without a prolonged series of comparative tests designed to show the degree of continuity and the average quality of speech attainable with each. Dr. F. E. SMITH and Prof. G. W. O. HOWE reported that apart from future developments both systems were *probably* equally capable of providing satisfactory telephonic communication between two points for a given number of hours a day. The use of the word "probably" suggests that there was some uncertainty in their minds due to lack of sufficient data to justify a definite assertion. Without that assurance any financial arguments have little value.

It was in the nature of things that a Labour Government should, all things being equal, decide a matter of this kind in favour of the Post Office, whereas the previous Government clearly leaned towards the entrustment of long distance communications to the I. and I.C. Company, which was formed with that special object as the result of the Conference of 1928. But the country is entitled to demand full proof that all things are equal, and even then probably a majority of the electorate will view with regret any extension of the field in which the commercial management of the Post Office is allowed to operate. There is sufficient doubt as to some of the essential facts to indicate the need for a complete and impartial investigation by a competent commission. Otherwise the country will be committed by a minority government to a course which will be costly and difficult to retrace should it prove later to have been unwisely chosen. It must not be overlooked that the decision of the British Government will strongly influence the attitude of the Oversea Governments of the Empire. This has already been demonstrated in the case of South Africa, which has followed Great Britain's lead although the motive appears to be mainly dissatisfaction with the position of the existing beam station near Cape Town, it being considered that a more central site at Johannesburg is required.

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Current Topics.

1 000 000 V Sparks.

ELECTRICAL engineers are accustomed to regard sparks with suspicion, as indications of trouble or inefficiency. A fortunate few had a very interesting experience last Friday when, at the invitation of Sir PHILIP NASH and the Metropolitan-Vickers Electrical Company, they were able to watch a display of artificial lighting which was both impressive and awe inspiring. There was almost an unholy joy, mixed with envy, on the faces of some of the physicists present, and Sir ERNEST RUTHERFORD dwelt lovingly on the prospect of 10 000 000 V on tap in an ordinary sized research laboratory We have still some way to go to attain that goal, though it may be reached well within the fifty years mentioned by Sir ERNEST RUTHERFORD. At any rate last Friday's wonderful demonstration should do something to dissipate the prevalent impression that in matters of research British manufacturers are considerably behind their American and Continental competitors. All who were privileged to be present will, we are sure, join us in thanking the company for a most interesting and well staged display.

Service Deficiencies.

WE have received from a firm of electrical contractors a strong complaint regarding the service arrangements of one of the electric cooker manufacturing concerns. Our correspondent points out that after a hot plate element had been on order for three weeks a griller element was sent, with the result that the customer installed a gas stove. He points out that delay and carelessness of this kind may mean that the householder is unable to cook a proper meal for a considerable time, and rightly emphasises the check to the spread of electrification exerted by such occurrences. We are afraid that this is by no means an isolated case. It is a matter to which manufacturers will do well to give their most careful attention, for much expenditure on publicity can be neutralised by experiences of this kind.

Profitable Railway Electrification.

IN 1926, immediately before electrification, the gross profit on the Chicago suburban lines of the Illinois Central was $3 450 000, of which all but $103 000 went to pay taxes. In 1929, the gross revenue exceeded $5 000 000, of which the surplus after paying taxes was $1 560 000. An increase of $1 550 000 in three years—nearly 45 per cent.—is a remarkable example of the advantage reaped by electrification of suburban systems where a sufficient density of traffic exists. Doubtless this result will stimulate other railways which enter Chicago to convert their local lines to electric working. Is it too much to hope that it may also assist in the more difficult task of inducing the Board of the L.N.E.R. to take the plunge in the case of the lines entering Liverpool Street and King's Cross ?

Southern Railway's Example.

THERE is, however, an example much nearer home. At the Southern Railway Company's annual meeting last week the chairman, The Hon. EVERARD BARING, was able to tell the shareholders that the increase in traffic in the electrified area was progressing at a pace which had considerably exceeded all expectations. He mentioned that in order to cover the cost of the additional train mileage to be worked when the electric services to Brighton and Worthing come into operation in 1932, and provide for depreciation and interest on the additional capital, an increase in traffic receipts of 6 per cent. on the electrified sections will be required. The company expects to achieve this increase during the first year of electric working. Multiple unit trains are to be used on the Brighton and Worthing services, and we think it is a wise decision to treat these lines as extensions of the London suburban services. Mr. Baring emphasised the value of the colour light signalling system installed in the London area. Electric traction can only yield its full advantages when the signalling system is also of a luminous electric type and preferably automatic—if the number of junctions on the railway network does not prevent the effective use of the automatic method.

Spreading the Light.

IN the course of the discussion which followed Mr. C. H. FLOWER's paper on " The Electrical Industry and the Architect " at the February E.D.A. Conference, Lt.-Col. VIGNOLES gave a tip which should be noted by all who send publicity literature to architects, who probably receive more of such matter than any other professional men. He said that one architect had told him that it was his practice to consign anything of the kind to the waste paper basket unless it had stiff covers—if it had such covers it was kept on his shelves. Just what degree of stiffness was judged to be sufficient to ensure eligibility for the shelf, Col. VIGNOLES did not disclose, but it is very probable that this criterion is fairly widely applied. Obviously every circular or pamphlet is not worth the cost of dressing in starched skirts and some are only intended to be ephemeral bulletins. But in the case of more lasting and carefully prepared printed matter, the extra expense would almost certainly justify itself.

American Power Output in 1929.

PRELIMINARY figures show a total increase in the production of electricity in the United States in 1929 by all agencies which contribute to the public supply (plus imports from Canada) of 10·4 per cent., compared with an increase of 9·3 per cent. in 1928 over 1927. In 1929, the output of hydro-electric energy was 34 609 666 000 kWh (or 35·6 per cent. of the total) as compared with 34 695 591 000 kWh (or 39·5 per cent. of the total) in 1928. This is the first time since 1921 that the production of electricity by water power has fallen below that of the previous year. On the other hand, the total output of fuel-generated electricity rose from 53 153 988 000 kWh in 1928 to 62 684 017 000 kWh in 1929—an increase of 18 per cent. This estimate of production (97 000 000 000 kWh), includes all the energy generated by the central stations and by tramways, railways and manufacturing plants which contribute to the public supply, but it is stated that the total amount generated at switchboards from all sources was 125 000 000 000 kWh. The Statistical Research Department of the National Electric Light Association reports that 91 000 000 000 kWh, in round figures, were generated and made available for distribution by central generating and distributing stations of the light and power industry itself. Only 76 000 000 000 of the 91 000 000 000 kWh generated by the industry reached the customers' meters. There is a certain amount of wastage in transit which must be taken into account in the rate to the ultimate consumer.

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HIGH VOLTAGE RESEARCH.

Metropolitan-Vickers Laboratory at Trafford Park—Opening by Sir Ernest Rutherford—His Hopes for 10 000 000 V Spark—Fascinating Demonstrations—Equipment of the Laboratory Described.

SIR ERNEST RUTHERFORD, F.R.S., opened the Metropolitan-Vickers Electrical Co.'s high voltage research laboratory at Trafford Park, Manchester, last Friday, in the presence of a distinguished company, which included :—Mr. F. W. Aston, F.R.S., Prof. W. L. Bragg, F.R.S., Mr. S. Donkin; Dr. Lunt, Capt. P. Dunsheath, O.B.E., Prof. C. L. Fortescue, O.B.E., Sir Richard A. Gregory, Prof. D. R. Hartree, Dr. P. Kapitze, Prof. E. H. Marchant, Prof. S. R. Milner, Dr. V. E. Pullin, Dr. E. H. Rayner, Dr. F. E. Smith, C.B.,O.B.E., F.R.S., Department of Scientific and Industrial Research, London, Prof. Miles Walker, Prof. R. H. Fowler, O.B.E., F.R.S., Mr. O. W. Marshall, Mr. E. B. Wedmore, Prof. E. N. Da Costa Andrade, Mr. L. St. L. Pendred, Mr. C. T. R. Wilson, F.R.S., Sir Richard Glazebrook, K.C.B., F.R.S., Father O'Connor, S.J., Lord Verulam, Mr. J. H. Rider, and Mr. H. Warren.

Sir Philip Nash, chairman of the Metropolitan-Vickers Electrical Co., said that the whole of the electrical industry had grown out of scientific research. The company had always endeavoured to keep the science and engineering sides actively co-operating with one another. It had built the high voltage laboratory within the last few years in order to keep pace with developments that were going on in this country and elsewhere. It had been engaged for some fifteen years in high tension work, and had always possessed facilities which enabled it to keep pace with commercial requirements. Every bit of apparatus in the laboratory was built in the company's own factory.

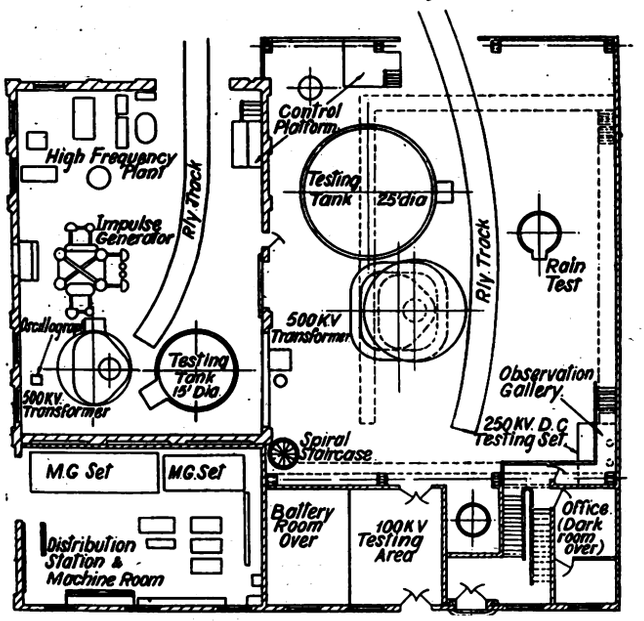

Fig. 1.—Plan of H.V. laboratory.

Sir Ernest Rutherford said that with the growth and increase of the voltage of transmission of power at great distances, the need had grown for a high-tension installation to test in the laboratory the effects of the insulation and other properties of these transmission lines, the effect of meteorological conditions and particularly the effect of surges in the wire produced either by the machines themselves or possibly due to the extraneous effects of lightning discharges. He would like to draw attention to the importance of an installation of this kind in conducting fundamental research. For the last fifty years we had been busy examining the discharge of electricity through a vacuum tube, and although we had made much progress we were quite sure that there were many problems that we did not understand. Even to-day we were in a position of doubting whether the explanations already given were more than a small part of the truth. We were still ignorant of the relative role that was played by electrons or by positive ions in initiating a discharge and maintaining it, and in general there were many unsolved problems in this field. What we required was a combination of laboratory experiments on a small scale to settle the relative importance of the various factors involved together with experiments on a large scale such as could be made with installations of the kind in front of them. Of the effect of conductors and dielectrics on voltages applied slowly or gradually, we knew that very little had been carried out in this field. We were ignorant of what was the effect of high pressure of oil or of air in preventing those local discharges or streamers that were suddenly observed. There was a multitude of effects and he was sure that workers in this installation felt that at present we had no proper understanding. We could see therefore that an installation of this kind, apart from its direct utility provided an opportunity of research on many problems.

Importance of Laboratory Tests.

There is one direction in which he must say a word, namely, the great importance of this problem of high voltages from the point of view of experiments in the laboratory itself. What we required badly was a high potential so as to produce in a vacuum tube high velocity protons and high velocity electrons. In this respect nature quite outstripped the puny experiments we had so far made on this scale. A piece of radium emitted α particles which would require at least 5 000 000 V in order to produce them artificially in a vacuum tube, and a piece of radium would require 3 000 000 V to produce electrons; the penetrating radiation from the atmosphere would require at least 1 000 000 000 V for their production. He had always had the hope that before he left this earthly scene he would be able to see in the laboratory an α particle accelerated by an additional potential of 10 000 000 V. In a laboratory like that of Cambridge with its exiguous finance he could not hope to see a cathedral-like structure such as this in order to house a high potential installation. What they wanted was a simple apparatus that could produce about 10 000 000 V in the laboratory to be contained possibly in oil or air under pressure, and a discharge tube to which they could apply this voltage. That was a simple and interesting technical problem he set before his engineering friends. It had to be confined in a room twice the size of an ordinary office structure. He was perfectly sure if he came back in fifty years he should see this as a standard equipment in laboratories. Even university laboratories with their exiguous finance would have a laboratory with an apparatus of 10 000 000 V in a quite relatively small space, and it could be accomplished. We could congratulate the Metropolitan-Vickers Co. on its progressive and far-sighted policy in encouraging research in this important direction. It would lead to a wide expansion of our knowledge in many directions and would prove invaluable to electrical science.

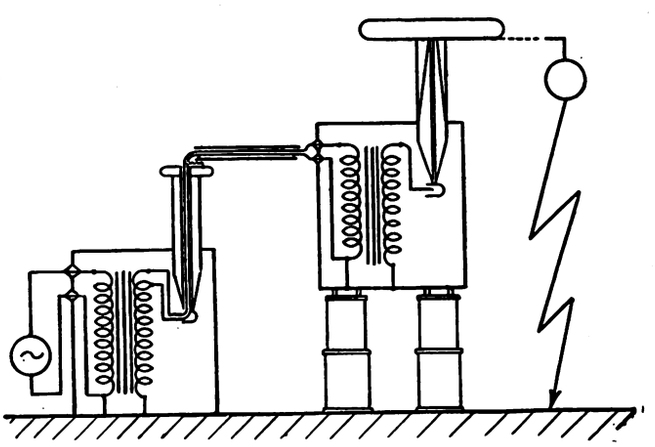

Fig. 2.—Connections of a 1 000 000 V Dessauer circuit.

An impressive series of demonstrations was then given to the visitors. First came the great 1 000 000 V flash over from the Dessauer circuit. The lights were extinguished, and with a crackling hum that conveyed the sensation of immense power a pale violet luminiscence surrounded the large copper

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ball suspended 12 ft. above the floor. Slowly a glowing tongue crept downwards across the gap until the artificial lightning struck with a loud report and the luminous discharge vanished.

Then followed an equally interesting performance by the 1 500 000 V impulse generator in the surge laboratory. A 750 000 V, 100 000 cycle spark spread earthwards like a fiery serpent reaching sideways as it descended. Then came spark-overs on chains of insulators such as are used on the 132 000 V transmission lines of the grid. Single flashes accompanied by reports like pistol shots imitated the possible effects of a severe thunderstorm and, as an indication of the hidden force involved a wooden lath inserted between the ring and the horns of the insulator chain was shattered. An electric wind generated by an apparatus resembling an inverted sprinkler from which sparks emerged in place of water, raised obvious waves on the surface of a large tank of heavy oil. Subsequently the party inspected the other laboratories in which work is in progress on acoustics, eddy current steel furnaces, the behaviour of carbon steels under superheater temperatures, fatigue in turbine blades and a number of other subjects.

The Dessauer Circuit.

The high voltage laboratory consists of two semi-independent main buildings (47 by 67 ft. and 67 by 86 ft.) and an annexe containing the materials laboratory, physical laboratories, machine room and offices, the general layout being shown in Fig. 1. The main laboratory contains one of the two 500 000 V, 500 kVA, 50 cycle transformers used in the Dessauer 1 000 000 V circuit. These transformers are of the oil immersed type and are contained in a stout steel tank specially reinforced to allow of vacuum drying on site. The high voltage connections are taken through the tanks by means of 500 kV condenser type bushing insulators believed to be the highest voltage bushings yet constructed in this country. The power supply is obtained from two motor generator sets housed in the machine room, the two transformers being independent of each other except when coupled in cascade in the Dessauer circuit. The generators were specially designed to maintain a pure semisoidal voltage wave under the most adverse conditions.

The primary winding of the first transformer has one terminal grounded and is supplied from the generator as indicated in Fig. 2. One terminal of the secondary winding is also grounded, the other terminal consequently having a voltage of 500 kV to ground. Situated at the high tension end of the secondary is a tertiary winding having a one to one ratio with the primary, but insulated from it for 500 000 V. The secondary and tertiary connections are brought out through a common bushing insulator, one end of the tertiary being connected to the secondary. The second transformer of the group is a precise duplicate of the first except that its tank is insulated from ground by means of pedestal insulators capable of withstanding 500 kV between their ends. The tank of this second transformer is connected to the secondary terminal of the first unit and is accordingly at 500 kV to ground. The primary of the second unit is fed from the tertiery of the first in such a manner that the secondary voltages of the two units are additive. The total voltage of 1 000 kV then appears between the terminal of the second unit and ground. Structurally the transformers are of the core type, with both limbs wound. The primary winding is a single layer spiral adjacent to the core. The secondary consists of a number of single layer cylindrical coils arranged concentrically on the core, the length of which is the smaller the greater their diameter. One end of the secondary coil adjacent to the primary winding is connected to the tank; the other end is connected to the end of the corresponding coil on the other limb, the free end of which is in turn connected back to the second coil on the first limb and so on. In this way the diameter of the coil increases and its length decreases as the high voltage end of the winding is approached; the general construction is thus similar in principle to that of the well-known condenser bushing and possesses the same advantages.

The M.V. impulse generator was designed to produce impulsive voltages up to at least 1 000 000 V, and it was considered undesirable to tie up the 1 000 000 V power frequency plant every time an impulse test was required. The use of a multiplying circuit was, therefore, decided on, and the decision to use d.c. for charging followed naturally from consideration of the restrictions which would be imposed on the design were this not the case. The number of stages in the multiplying circuit was a matter carefully considered, and it was finally decided that 250 kV per stage, giving four stages for 1 000 000 V, would give the best results. The way in which the design was realised in practice will be apparent from the photograph on the opposite page. The main structure consists of a four post vertical frame divided into four sections or storeys corresponding to the four stages of the circuit. The main condensers are cylindrical in form and are mounted horizontally at the upper end of each frame section. The trigger gaps and isolating resistances connecting the adjacent sections are mounted diagonally on the main frame. At the instant of discharge the voltage rises uniformly up the frame the junction of the respective sections being at 250, 500, 750 and 1 000 kV to ground. A number of stress distributors are provided in order to suppress all discharges. Voltages up to 1 500 000 V to ground have been produced by means of this apparatus.

Damped Oscillations.

For producing damped oscillations of high voltage a Tesla transformer is installed. Its rating is 750 000 V, 100 000 cycles with coupling coefficients of either 35% or 8%. At this voltage it is capable of dealing with loads of a capacity up to about 600 m.m.f., equivalent to a large oil switch with several bushing insulators.

Other apparatus includes two rectifier sets (one mechanical and the other equipped with thermionic rectifiers) for producing high continuous voltage; two tanks for making electrical tests in hot or cold oil, apparatus for making porosity and temperature cycle tests on porcelain insulators, and for carrying out drying and adhesion tests on varnishes, arc and ignition tests on fire resisting materials and a great deal of other apparatus developed and designed by the Company for special purposes.

In the 100 kV laboratory the electrical equipment consists of a 50 cycle 30 kVA transformer for 100 900 V supplied from a motor generator set and controlled in the usual manner. A cylindrical air condenser is employed as the standard of comparison in a Schering bridge used for the measurement of dielectric losses.

A cathode ray oscillograph of the type used by Professors Ragowski and Norinder has been constructed by the Research Department and is now installed in the surge laboratory of the Company.

Spark-over tests with artificial rain can be made in both the main and surge laboratories, and a special mixing tank is provided to permit the control of the resistivity of the water used—an important matter in tests of this kind.

PERSONAL SALESMANSHIP.

Fourth of the Manchester E.D.A. Conferences Devoted to Salesmanship.

THE fourth of the present series of E.D.A. Sales Conferences was held in Manchester on February 19th, with Mr. H. C. Lamb in the chair. The speaker was Miss Gladys Burlton, who gave a very interesting lecture entitled "Personal Salesmanship in the Electrical Industry." In opening, Miss Burlton said that she proposed to deal with the problems of electrical salesmanship and certain faults which might easily be made if care were not taken. She had sold many types of articles, and although the electrical industry had certain particular difficulties of its own, there were general selling points which might be applied thereto. There was, however, no scientific rule to successful selling. In general, the three most important things, and she proposed to emphasise these to-night, were a natural liking for other people, an intimate knowledge of the commodity, and skill in talking. In the electrical industry it was important to make the commodity appreciated, and the salesman should be a guide, philosopher and friend to the customer. Moreover, he had to deal with all types of disposition, and the method of approach must therefore not be allowed to become stereotyped. The speaker then went into the many ways in which salesmanship could be improved, such as by being cheerful at the right moment, developing an attractive personality and other apparently minor matters which, however, made the difference between a good salesman and a mediocre one. A most important point which the speaker emphasised during the course of the lecture was the danger of boring the customer with technicalities which they did not understand. Technical facts should be presented in a non-technical manner, emphasis being made with regard to practical results. Electrical salesmen were too apt to talk about "volts," "juice," etc.

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MODERN BOILER HOUSE PRACTICE—I*.

Standard Types of Stoker Fired Water Tube Boilers for Average Pressures of 250 lb.—Essential Features of High Steaming Capacity Types.

By F. JOHNSTON TAYLOR.

WITH the advent of the super power station, boiler house practice has undergone radical changes of recent years. Steam generated in a more or less saturated condition at about 150 lb. by relatively small water tube boilers having such standard equipment as mechanical stokers economisers and perhaps some system of mechanical draught has given way to high pressure superheated steam produced by large units

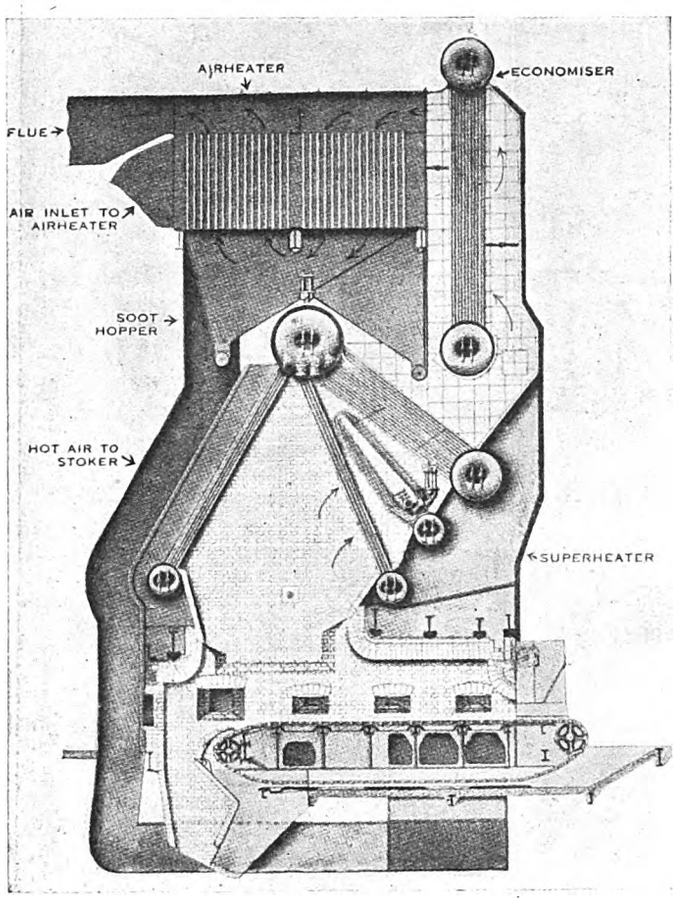

Fig. 1.—Yarrow boiler.

equipped with every conceivable device to ensure economical steam generation, amongst which may be mentioned pulverised fuel, automatic coal and ash handling, forced or induced draught, dust collectors, feed heaters, air pre-heaters, special types of stack and a more or less elaborate array of instruments to guide the boiler house attendant on the comparatively easy road to abstracting the maximum amount of heat at the greatest possible rate from the minimum amount of coal.

Yet the combustion engineer has a comparatively hard road to travel. The imprisoned heat in a lump of coal is like fortune, still a very elusive quantity, of which only but a small percentage can even under modern conditions be accounted for in the shape of kW sold. Turbines, of course, are not yet 100 per cent. efficient, and condensers perforce carry away a large amount of heat, but progress continues. From the steam generation standpoint it is largely a matter of huge boilers and high pressures. The modern boiler unit is in many instances, a complete plant in itself from bunkers to stack. So far as pressures are concerned, just what high pressure is to-day is rather difficult to define. A few years ago 300 lb. fell into this category. To-day, though not to any material extent in this country, 1 000 lb. and over has ceased to be a freak idea, but it calls for methods of steam generation such as the Benson, Lœffler Atmos and other systems which are foreign to orthodox practice, while between 1 000 lb. on the one hand and 200 lb. on the other there lies a pressure range of around 500 lb. This is now generally regarded as good average central station practice, it is high enough to realise the definite advantages of high pressure while it is low enough to enable standard types of boiler to be constructed for it at reasonable cost.

As the tendency at the present day is to adhere to more or less standard types of boiler which have been modified to suit the conditions of the times as regards size, pressure, duty and methods of firing, it will be well to review the subject in these notes from that standpoint, and to regard super pressures of 1 000 lb. or so as still to be justified.

Power station engineers learnt something from marine practice when they adopted the Yarrow boiler, and a design of Babcock boiler now in extensive use in power stations is the C.T. Marine type. It has an integral superheater, a chain grate stoker and superposed economiser, the whole being steel cased forming a compact self-contained unit in accordance with modern ideas.

The principal features of the Yarrow boiler are indicated in Fig. 1, from which it will be seen that it incorporates an air preheater and an economiser. So far as the orthodox type of economiser is concerned, it is to be quite frank, unsuited to high pressures, and such economisers as are now used with these modern boilers are as a rule of relatively small capacity and of special type, as for instance, in the diagram of the Yarrow boiler. The air pre-heater accounts for a large percentage of the waste heat in the flue gases and being delivered to the furnace this heated air greatly improves combustion

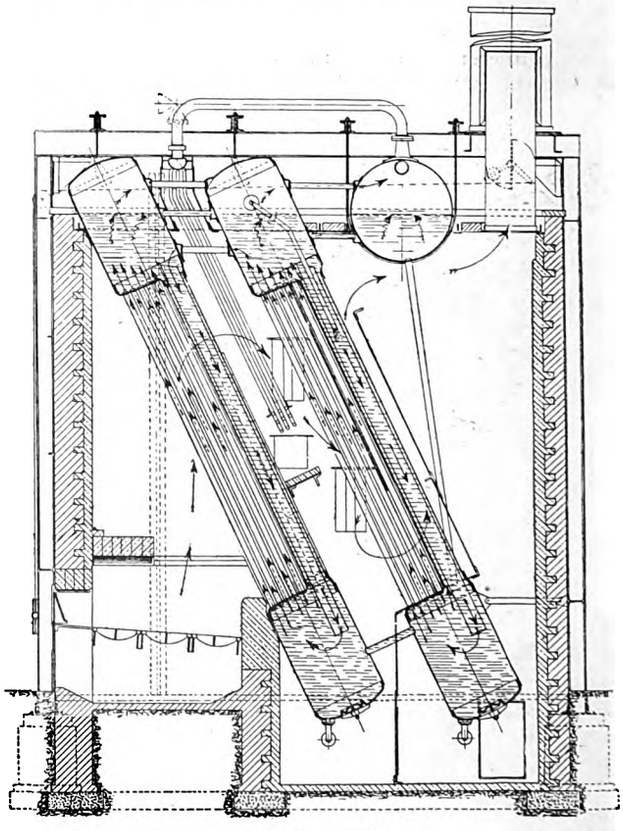

Fig. 2.—Danks boiler.

while it is an essential part of any pulverised fuel system. Moreover, an air preheater, whether of the tubular type shown or any other such as the Usco or Lungstrom is quite a simple adjunct which performs its duty well with the minimum of

* In a series of six articles, the writer discusses the principal features of modern boiler plants as associated with present-day power station practice. The second article will deal with boilers constructed on more or less standard lines for pressures of about 500 lb., while the third will deal with the salient features of pulverised fuel and of boilers constructed for this method of firing. In article IV, stacks, draught systems and dust catchers are dealt with, article V deals with air pre-heaters, economisers and superheaters, while the sixth and last of the series will discuss coal and ash handling systems as applicable to modern power station practice.

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trouble. The Yarrow boiler shown is designed for the high pressure of 600 lb., though it does not differ materially from those built for 300 lb. or so. The stoker is an "Underfeed" L type, the superheater is of the self draining variety and the efficiency of these boilers which are designed for a normal duty of 61 000 lb. and a maximum duty of 75 000 lb. at 600 lb. and 780 degs. F. is stated to be 86 per cent.

While the Yarrow boiler is in a distinct class by itself, and is principally notable for its high steaming capacity in respect of its size, it will be noted that straight small bore tubes are used as opposed to the relatively large tubes of the standard Babcock types of boiler and others falling into the same category. Modern boiler construction tends largely to the use of vertical tubes or certainly to tubes inclined nearer to the vertical than to the horizontal and several advantages are claimed for them. There are for instance, no rigid connections, and the steam and water spaces are large. There are no tube caps and the tubes being inserted directly into the upper and lower drums are quite accessible and the insertion and removal of tubes is a simple matter. The upright arrangement ensures their contact with the hot gases throughout their whole length which gives a large effective heating surface, and as the banks of tubes are in suspension they are free to expand.

So far as circulation is concerned, there is some difference of opinion as to the relative merits of vertical and inclined tubes, but the vertical tube does undoubtedly ensure a brisk circulation which prevents the dangerous overheating of the tubes while their disposition is distinctly favourable to the easy removal of soot. It is now generally recognised that upright or nearly upright tubes present the most favourable surface for the impingement of the hot furnace gases. The course of the steam in these tubes being direct, a rapid circulation is induced in the front of the boiler whilst the water flows downwards through the back tubes which being only subjected to the heat of the cooler gases act as economiser, feed heater and purifier. The feed is led into the rear headers of the boiler where it is evenly distributed, it passes down the tubes and is heated sufficiently to deposit any scale forming matter, which, in the form of mud falls to the bottom drums. Such boilers by their simple design and rapid and easy circulation are eminently well suited to pressures in the neighbourhood of 500 lb. Typical of this type of boiler is the range made by Messrs. John Thompson of Wolverhampton.

Built on a different system is the Nesdrum boiler which has vertical drums; another is a new design of Messrs. Danks,

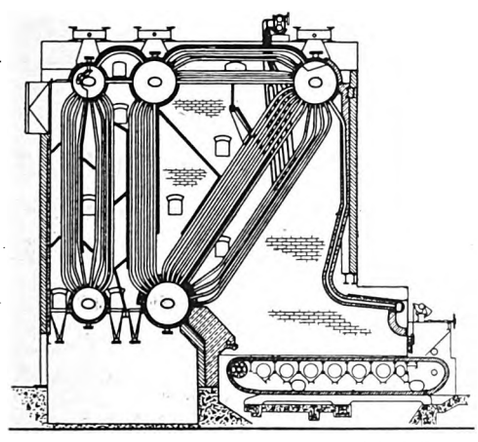

Fig. 3.—Typical American vertical water-tube boiler.

which is shown in Fig. 2. Although the Nesdrum boiler is constructed on similar lines to the Danks, the latter, which is quite a recent introduction, incorporates as will be seen, the small bore tubes as associated with vertical water tube boilers, but, in addition, there is a large one. This large tube which is permanently rivetted into the flanges in the headers is the return tube. The water has a double pass in every section with a consequent high velocity through the tubes which allows the best heat transfer to the water while the comparatively cold feed is heated as it moves towards the hot furnace gases. The feed is admitted into the header of the rear section, and is guided for a suitable distance into the isolation tube and passes down this tube which is situated in the aforementioned large return tube.

The curved tube type of boiler as shown diagramatically in Fig. 3 is rather a feature of American practice, this being a design of the Erie City Ironworks, and it partakes of some of the features of the Vickers Spearing boiler.

The Woodeson boiler, built by Clarke Chapmans with six large drums and three banks of vertical tubes, is specially noticeable for accessibility, and is referred to again under the heading of Pulverised Fuel in the third article of this series.

The best Continental practice is undoubtedly represented by the Sulzer boiler of which the essential features are shown

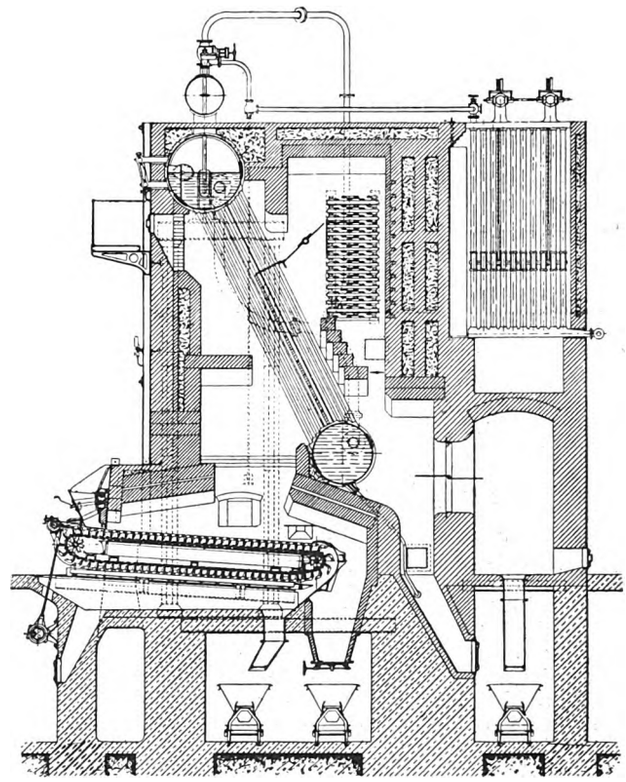

Fig. 4.—Sulzer boiler.

in Fig. 4. From this it will be seen that the nest of tubes is divided by a brick baffle into two unequal parts. The front section which comes into direct contact with the fire carries a somewhat larger number of tubes than the back part in order to create the necessary draught section. The hot gases pass upwards along the tubes and they can be diverted by means of a damper through the superheater, afterwards passing down along the back section of the tubes and then to the stack by way of the economiser if one be fitted. These boilers are built with both double and single banks, though from the economy standpoint the latter is to be preferred and the superheater is placed between the banks and may be cut out of service by means of a damper when required.

It is hardly necessary to point out that boilers of the class described are almost invariably equipped with mechanical stokers combined as a general rule with mechanical coal and ash handling gear. While there are several different designs of mechanical stoker in common use, the majority are of either the chain grate type or the underfeed type each of which has its own special merits. Then there are various different types to suit natural, induced or forced draught either one or the other or a combination of both in the form of balanced draught. Space does not admit of lengthy description of the several good designs of mechanical stoker now associated with modern boiler practice. That shown in Fig. 5 is one of Bennis' standard designs arranged to work in conjunction with a submerged ash conveyor and needs no further description, such modifications as are introduced in the general design being dictated by special conditions pertaining to the type of boiler it is intended to work with. The Babcock and Willcox (McCulloch) type stoker as arranged for balanced draft is used extensively with boilers of the C. T. Marine class. It is of the zoning or compartment type designed to give sectional control of the air passing up through the fuel bed. Inequalities in the thickness of the fuel bed frequently require varying degrees of underfire air pressure at different stages of the fuel's combustion and in order that this may be accomplished locally a series of cast iron compartments is built into the space between the upper and lower chains of the grate into which the air is led from ducts set in the boiler side walls.

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Thereby the fireman can adjust the underfire pressure by suitably arranged dampers. In addition, in order to deal with the troublesome fine ash which finds its way into the air compartments, there are riddling valves under each which extend the entire width of the grate. These valves are automatically opened at regular intervals so as to discharge the ash into the pit but without loss of air pressure. The air which is forced through narrow slots at high velocity ensures

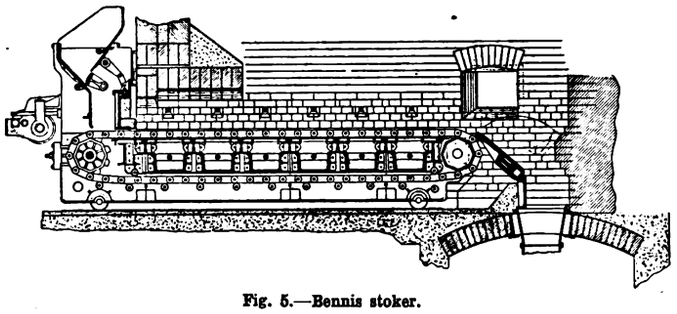

Fig. 5.—Bennis stoker.

efficient combustion of the lowest grades of fuel, including coke breeze.

A multiple retort stoker of the Underfeed Co.'s design is shown in Fig. 6. The action of this type of stoker is to force the coal and clinker downwards and rearwards throughout the length of the retort. The principal parts are the ram *a*, which propels the raw coal from the base of the bunker *b*, *c c* being non-clinkering furnace blocks ; *d* are the air supply grate blocks, *e* a reciprocating lower ram extending the full length of the retort, *f*, active overfeed grate surface in the lower part of the retort, *g* the air gate operating rod, *h* the inspection door, and *j* the speed shaft with the necessary shearing pin for safety. At *k* are the active fuel burning dumping grates which provide for a gradually increasing amount of ash and clinker and automatic control of the necessary air for the complete combustion of the combustible in the ash so as to prevent formation of clinker along the bridge wall.

Despite the progress being made with pulverised fuel for the operation of large boilers, stoker fired units of large output will no doubt figure in central station practice for many years to come and for those with a relatively high rating there is a good deal to be said for the arrangement shown in Fig. 7 of water cooling for the back of the furnace. At this point there is a tendency for clinker formations to arch over the stoker dump plates and to fuse the firebrick in the bridge wall. This can be largely eliminated by a water cooled back because it removes the cause of avalanching and in addition it reduces the percentage of combustible lost in the ash and it effectively cools such clinker as may be formed.

While there are different arrangements which effect the same end, that is the replacing of perishable brickwork by more permanent construction, that shown which is known as the Foster " Composite " water back is simple and practical. The elements consist of seamless steel tube bent as required

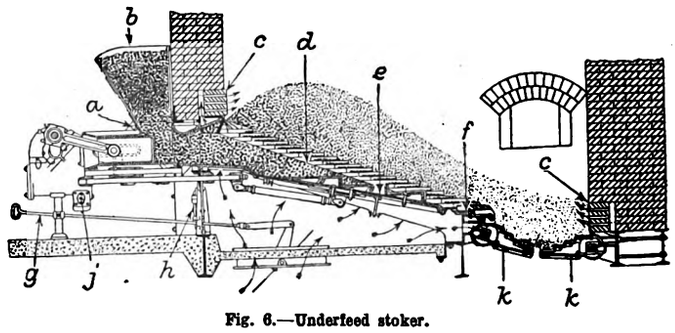

Fig. 6.—Underfeed stoker.

for extension to the inlet and outlet connecting headers. These tubes it will be seen are covered by cast iron blocks which are tightly fitted round them so as to virtually form a single piece of metal. The surfaces of these blocks which face the stoker are flat and present to the fire a smooth front just as brickwork would do. They are, in effect, water cooled cast iron bricks. The headers into which the tubes are expanded are supported on structural members.

The composite arrangement is excellent from many standpoints. The cast iron blocks expose to the fire a metal which when properly cooled is well suited to withstand the erosive and abrasive action of the furnace gases, clinkers and firing tools. The surface is smooth and the construction is rugged, while the area presented to the furnace is greater than the projected area of the tubes themselves and the general lay-out is conducive to good heat distribution. In respect of support the angle supporting the top block and the freedom of movement of the bottom leg in the box will be noted, while steel bars pass through holes in the steel fins which are welded to the top bend which incidentally is of large radius for cleaning purposes. These steel bars support the refractory material upon which the upper brickwork rests. The idea as

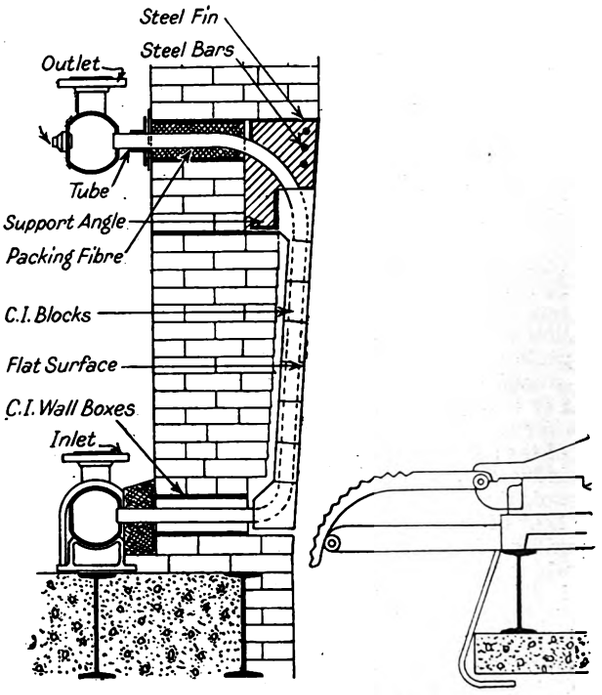

Fig. 7.—Water cooling at back of furnace.

stated is thoroughly practical and can well improve the efficiency of a boiler to the extent of 4% or 5% by the added heat it gives to the water and the reduced amount of combustible lost in the ash. It is equally well applicable in a modified form to steel cased boilers.

OVERHEAD LINES ASSOCIATION.

Conversazione and Supper Dance—Some Interesting Exhibits.

THE Overhead Lines Association held a convivial gathering at Harrods Restaurant on February 26th from 8 to 12 p.m. A feature of the function was the way in which some of the pre-war veterans of electricity showed some of the younger generation how barn dances and other Victorian " capers " used to be " cut " ; dance music worthy of the name was played by Harrods' ladies' orchestra.

There were on view a number of exhibits relating to overhead line work, and it was remarked that they formed a good demonstration of the progress that is taking place.

The exhibits on view showed plainly that engineers and manufacturers had taken up seriously the question of the design and supply of reliable simple apparatus for overhead lines, at a capital cost such lines can stand. It was encouraging to note the number of items designed for 11 000 V, a pressure which for normal conditions has common sense behind it ; anything which makes for standardisation of voltage encourages cheap production and brings " the juice " nearer to the farmers' door, which end was one of the objects of the formation of the Overhead Lines Association.

The evening social function was looked upon as being a great success, thanks to the efforts of the social committee, consisting of the President (Mr. Theodore Stevens), Mr. Fenwick, and Messrs. Borlase Matthews, G. W. Molle, J. H. C. Brooking, with Mr. W. F. Andrews as Social Hon. Secretary.

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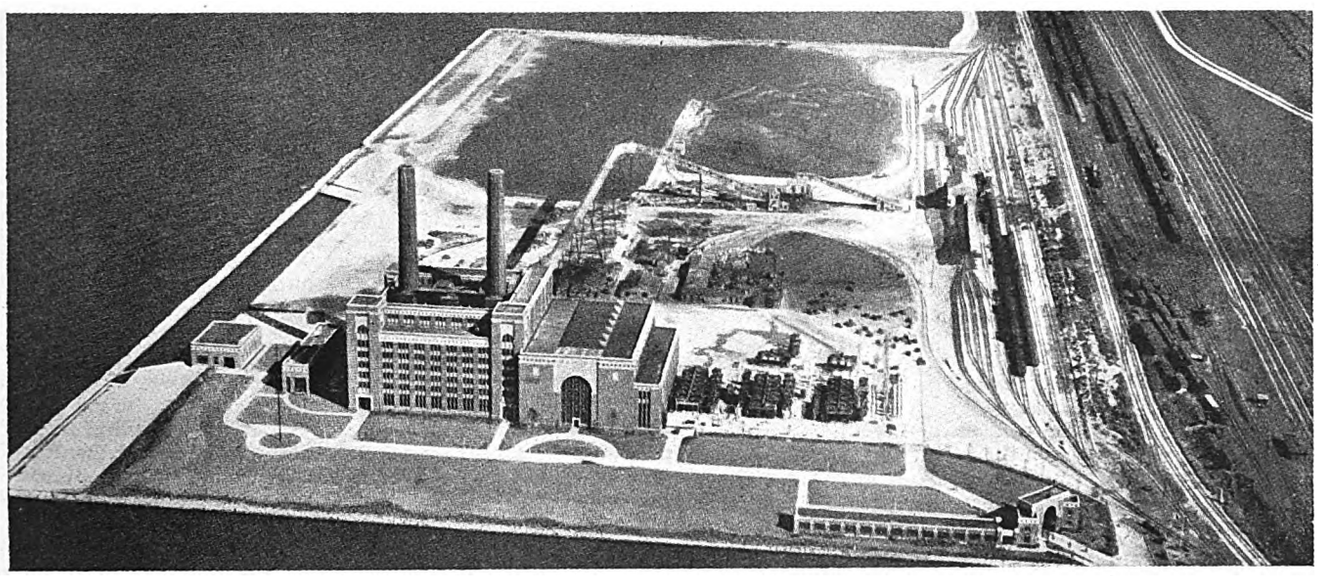
THE STATE LINE POWER STATION—CHICAGO.

Largest Turbine Unit in the World—An Impressive Spectacle—Characteristics of the 208 000 kW Group-unit—Steam at 650 lb. from Six Boiler Units—Outdoor Switchyard with no Live Parts Exposed.

By Dr. E. F. ARMSTRONG, F.R.S.

IT was my good fortune during a recent visit to the United States to make the acquaintance of Mr. Wm. S. Monroe, one of the foremost electrical engineers in that country, and to discuss with him problems arising on the fuel side of electrical generation. In consequence, I was enabled to visit the great generating stations in Chicago under the inspired guidance of Mr. H. C. Heaton. Our visit was made at night, which I now believe to be the most impressive time to inspect a power station; as we drew near an architectural building, which might well have been a modern cathedral, lay before our astonished eyes, illuminated from outside by a flood of ruby red light. Seldom have I seen anything more impressive connected with industry, and first impressions were confirmed by the detailed tour of the station which I have endeavoured to describe briefly in the restrained language of the technician in the following pages.



Aerial view of the State Line generating station, Chicago. The outdoor switchyard is seen to the right of the power plant.

Far rather would I regard the achievement in more riotous phrasing. In the bottom of our hearts all of us have a liking for the marvellous; we love it though we know it does not exist, for if it did it would no longer be marvellous. Anatole France tells us that the marvellous is a falsehood, that we know it and that we want to have lies told to us. I should like to have had Anatole France with me in that power station and to have aided Mr. Heaton, if indeed he needed any aid, in making clear to that delightful writer all that it implied in progress. How slavery and physical hardship have been taken from the shoulders of man and delegated to the willing and reliable activities of the engine and the electric motor. How, in consequence, time has been set free for the personal use of the average human—time for improvement of the home, time for study and education, time for cultivation of the sciences or of the finer arts, time for all those things that to the wise make life worth while.

Greater ambitions, finer ideals of conduct, such were the thoughts that came to us that night—for the first time, with quite astonishing vehemence, we were able to repudiate the slander, alas! so often true, contained in the line "where only man is vile." Here the engineer and the architect and those who had given them a free hand to create, had risen beyond the ordinary. For themselves they were justly proud, but largely preoccupied with the next step forward.

In Chicago and adjacent territory in north-eastern Illinois and north-western Indiana there is one of the great interconnected electric power systems of the world. All the electric generating stations in what is known as the Chicago Metropolitan District are interconnected in one system. They have a total capacity of 1 517 700 kW or 2 034 450 h.p. The various companies in this district serve nearly 1 300 000 customers. In the midst of this great power system stands the new generating station of the State Line Generating Company, operating a turbine unit of 208 000 kW or 278 820 H.P.—the largest generating unit ever built.

This station, which begins operation only fifty years after the invention of the incandescent electric lamp by Thomas A. Edison, is a dramatic example of the tremendous progress made by the electric light and power industry in a half century. It is built on the shore of Lake Michigan, on the Indiana side of the Indiana-Illinois state line. This location was selected for the reason that it was conveniently situated in the heart of the territory served by the electricity supply companies, and also because no other site suitable for so great an undertaking, with the abundant water supply required by a large station, was available in or near Chicago.

Unit No. 1 has a rating of 208 000 kW or 278 820 H.P. This turbo-generator group unit is the largest electrical production unit now in operation anywhere in the world.

The station is planned for five units with a total ultimate capacity of at least 1 000 000 kW. The present station, therefore, is about one-fifth of its eventual size.

Plans for this development indicate the manner in which the electric light and power companies must anticipate growth and future demands for power. Less than six years ago, the largest generating unit in this section of the country was of 37 500 kW. Advancement has been rapid, however, during the past five years and within that period generating units ranging from 50 000 to 100 000 kW capacity have been placed in operation in the Chicago district.

The present turbo-generator group-unit consists of one high-pressure steam turbine and two low-pressure turbines. The high-pressure turbine operates at 650 lb. steam pressure and exhausts through live steam re-heaters into the two low-pressure turbines at 110 lb. Each of the three turbines is coupled to an electric generator. At 85 per cent. power factor, the generator on the high-pressure turbine has a rating of 76 000 kW and those on the two low-pressure machines are of 62 000 kW each. Electrical energy is generated at 22 000 V.

All the elements of the generating unit operate at 1 800 r.p.m. and each of the low-pressure turbines, in addition to its main generator, drives a 4 000 kW direct-connected auxiliary generator. The high-pressure element is supplied with steam at a total temperature of 730 deg. F. Between the high-pressure and low-pressure elements exhaust steam from the high-pressure turbine is re-heated from 400 deg. F. at 110 lb. absolute pressure to 500 deg. F. at 110 lb. absolute pressure with live steam from the high-pressure header and supplied to the low-pressure turbines. For the first time in commercial

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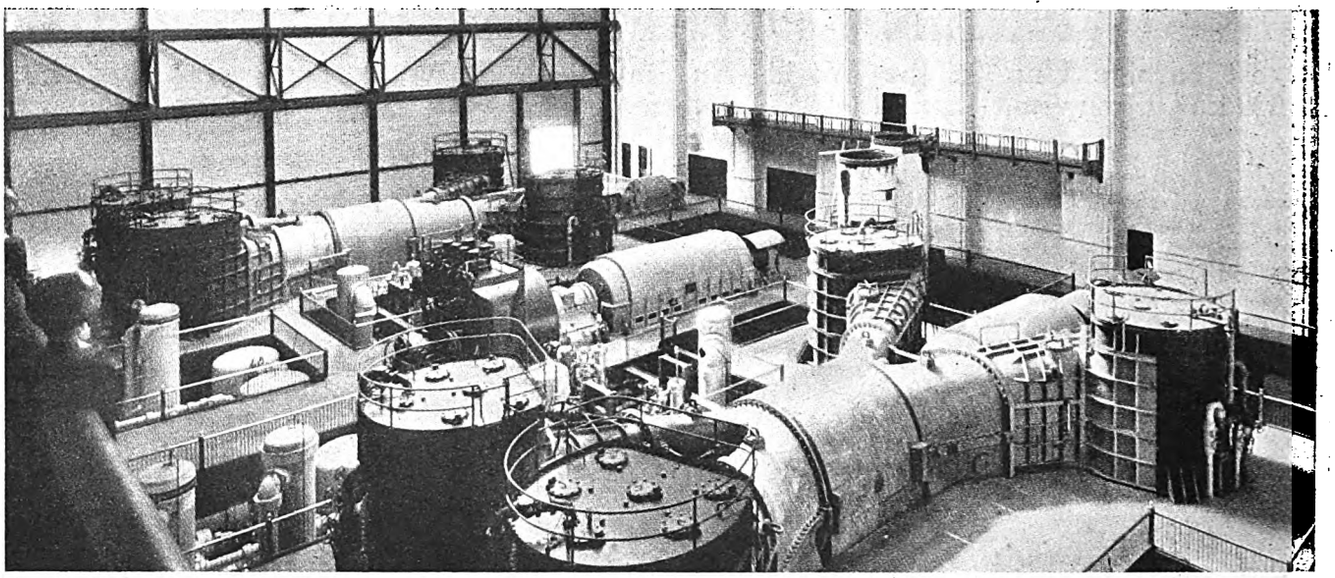

Turbine room of the State Line power station.

service five stages of feed-water heating, ranging from a maximum of 380 lb. absolute to a minimum of 9·4 lb. absolute, are used.

Each of the low-pressure turbines is double-flow, arranged so that each set of low-pressure wheels is served by two surface condensers, making four condensers for each low-pressure turbine, or a total of eight condensers for the unit. These condensers have a total of 176 000 sq. ft. of cooling surface and are designed to condense 1 600 000 lb. of steam per hour when supplied with 380 000 gallons of circulating water per minute. The circulating water, supplied by four vertical circulating pumps placed in the crib-house outside of the generating station, enters the condenser through the lower water box, flows upward through the tubes, and is discharged downward through overflow pipes in the condenser shell. This arrangement eliminates the external piping usual with the standard arrangement. Concrete tunnels connect the crib-house with the condensers in the turbine room.

Means are provided by which any one of the three turbo-generators comprising the group-unit may be taken out of service and the other two continued in operation. This meets the objection, from an operating point of view, that it is unwise to concentrate so great a capacity in one unit. Further, the object of this arrangement, rather than, say, two sets, in the group-unit, is to obtain a certain flexibility which permits of greater efficiency at varying conditions of load.

To obtain a better conception of the size of this unit, one needs only to realise that it will furnish sufficient power to light three and one-half millions of the standard 60-watt lamps as used in our homes. This number of lamps spaced 50 ft. apart would girdle the globe with enough left over to reach fron New York to San Francisco.

Steam is supplied by six boiler units with steel drums 52 in. in diameter built for 800 lb. working pressure and operating 650 lb. This is the first time such high steam pressure has been used in electric generating stations in the Chicago District. Each boiler unit, operating with superheaters, economisers, air heaters and water wells, has a guaranteed output of 450 000 lb. of steam per hour.

Advantage of Large Boiler Units.

One thing to be remembered, is that with the development of larger steam turbine units it is very desirable to develop large boiler units also, because there is as much or more to be accomplished in the way of cost reduction by increasing the size of the boiler units as by increasing the size of the turbine units.

While the furnaces are relatively large in comparison with boilers and economisers, the total amount of building space occupied by the boiler units amounts to only 985 cu. ft. per 1 000 lb. of steam capacity. The reserve boiler capacity of the station is such that the plant can be operated with five of the six boiler units, and in an emergency it is believed that four of the six would serve.

A modern feed-water cycle for large steam turbine units calls for large air heaters, which mean high temperatures for the air going to the furnaces. Air going through the furnace is pre-heated and forced draught is used. Dust and soot eliminators are being installed on all boilers.

Pulverised coal is used in the steam-raising equipment. More than two tons of coal are consumed each minute for steam generation when the station is in full operation.

The electrical installation in this plant is also rather unusual in that, by an original design, the generator bus is completely out-of-doors and entirely enclosed by metal, so that no physical contact can be made with any live parts. A double ring bus is divided into three sections, one generator supplying each section, with suitable reactors and oil circuit breakers between sections. It is so laid out that, as future generators are added, one additional bus section will be placed in the ring for each additional generator. The electromotive force on this bus is 22 000 V. The entire output is transmitted in large quantities either at 33 000, 66 000 or 132 000 V., by the companies purchasing the electrical energy. The large transformers by which the generator potential of 22 000 V is raised to the higher outgoing voltages are so installed as to be integral with each individual transmission line.

Thus the conventional generator-station switch-house or switching-room, with its multiplicity of concrete compartments and cells, does not exist at this station. Instead, by the new method of installation the main electrical switching equipment, the main 22 000-V. bus bars, the 22 000-V. oil circuit breakers and their interconnections are supported on a series of open steel frameworks located out-of-doors.

BOOK REVIEWS.

Principles of Radio. By KEITH HENNEY. (London: Chapman and Hall.) Pp. 477+iv. 17s. 6d. net.

Mr. Henney, who is the director of the American Radio Broadcast Laboratory, has written this book with an eye to the man who studies without the help of a teacher as well as for those attending courses. It is a comprehensive textbook, not overburdened with mathematics but well illustrated with problems and examples of a practical nature. Valves are, of course, referred to as vacuum tubes, and the front end paper tables refer to American models.

Energiewirtschaft. By MICHAEL SEIDNER. (Berlin: Julius Springer.) Pp. vi+133. Paper covers. 9 marks.

This book represents an attempt to provide a scientific basis for the estimation of the economics of electric power generation. The elements of cost for thermal and hydraulic stations are worked out and some space is devoted to combinations of thermal with hydraulic sources of energy. A problem that has been exercising Central Europe recently is that of equipment for the provision of peak loads, and the author has much to say on the subject. This is a book for the specialist. There is also much in Dr. Seidner's book which will be serviceable to those interested in the economics of power transmission, bulk supply and such like questions.

S. PARKER SMITH.

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MARINE ELECTRICITY.

Eight Electric Ships Now Building in this Country—Modern Electric Ship Types—Details of the New Fruit Carriers—Increasing Use and Appreciation of Storage Batteries.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types," etc.)

THEORIES and suggestions which American marine electricity has from time to time put forward are now being expounded wholeheartedly in this country, and—to quote only one instance—the electric passenger liner of large size and reasonably high power, which at one time may have been regarded very definitely in the light of an experiment in the eyes of British marine engineers, has now entirely proved its ability for certain duties. A year's successful operation of the P. & O. Company's "Viceroy of India" has now been followed by the ordering of two further rather larger vessels for the company's Australian service; two large vessels insulated for the carriage of fruit, and with first class passenger accommodation, are building for service between this country and the Caribbean Sea; a fruit carrier which has already been in service for a few years with one type of electric propulsion (and which was built originally in this country) is now being converted to another type of electric propulsion and modernised in every respect. Two large size tankers with electric propelling equipment are completing on the Clyde. A Canadian Great Lakes bulk cement carrier with electric propulsive equipment has recently been laid down at Middlesbrough, and a number of ships are now scheduled for conversion or rather part-conversion from direct steam reciprocating drive to the electric supercharge which has been discussed previously in some detail in these notes. This makes a total of eight electrically propelled ships in process of construction. Several more are in process of conversion to auxiliary turbo-electric drive or electric supercharge, and a large turbo-electric liner for the Furness Company to run between New York and Bermuda will, it is currently rumoured on very good authority, be laid down very shortly.

It does at least show an interesting range of ship types which may now be considered as suitable for the use of electricity for propulsion. So much so is this the case that one is tempted sometimes to abandon one's preconceived ideas that while electric ships will increase numerically, they will be limited in scope as far as type is concerned. Passenger liner, fruit and passenger, fruit carrier, tanker, tug, dredger and ice breaker . . . these represent surely a diverse group of tonnage with a very attractive range for the enterprising electrical manufacturer. Even to-day there is a novel trawler with a Diesel engine for main propulsion which claims to come within the electric shipping category by virtue of the fact that her engine drives off a forward extension of the crankshaft an 80 kW generator set, which supplies current at 115 V for driving the main trawl winch. The propelling engine is thus a dual purpose unit, for when full power is needed for the trawl winch the propeller thrust shaft can be disconnected from the engine by means of a magnetic clutch. This arrangement is decidedly novel and presents one solution to the problem of supplying the power needed to drive the winch. It contrasts with a new motor trawler recently completed at Falmouth in which the necessary electric power for the trawl winch and for other auxiliary purposes on the ship is supplied by two entirely separate 74 kW Diesel engine driven generating sets arranged in the forward wings of the engine room on either side of the main engine. There is also a 15 kW standby generating set—presumably for port use for lighting—a function which incidentally might easily be carried out by storage batteries charged from a shaft driven generator set.

Spread of Auxiliary Electricity.

Be that as it may, this ship besides being one of the largest power driven trawlers is a very plain indication of the way in which auxiliary electricity is spreading to ships which hitherto were regarded as coming almost entirely within the realms of steam for main as well as for auxiliary powering. It would, of course, be idle to deny that much of this progress is directly attributable to the corresponding development of the Diesel engine. The two are in fact complimentary.

As examples of up-to-date turbo-electric practice the two new Elders and Fyffe's ships to which attention has been called already, are interesting. The one building at the Workman Clark yard at Belfast is to be called "Musa" and will have a deadweight tonnage of about 5 500 tons on a draft of 25 ft. 6 in. Her fruit capacity is about 185 000 cu. ft. and the dimensions of the vessel are 415 ft. by 56 ft. by 34 ft. She is to have a speed, laden with fruit, of 16 knots and, therefore, it will be seen is quite a fast vessel. She is of the structural type known as 3-island and is constructed to obtain the highest classification of the British Corporation. She has three 'tween decks forward and aft, and the forward holds are all completely insulated and cooled by refrigerated air circulation for the carriage of fruit on Transatlantic service. Accommodation for officers and engineers and a number of passengers is provided in rooms situated amidships, while seamen, oilers, etc., are berthed under the poop, as is customary with this company's ships.

Equipment of the "Musa."

As would be expected on such a ship, electricity is used extensively for auxiliary purposes and is used to operate winches, windlass, steering gear, refrigerating plant, etc. To supply current for all these auxiliary purposes there are in all three turbo-generator sets of geared type. Two of these are 500 kW units generating current at 220 V d.c. and operating at 670 revs. The third is a 175 kW generator set generating current at the same power at 800 revs. of the main generator. The "Musa" is propelled by a single screw, and the single unit motor which operates this screw is rated 6 750 to 7 000 horse-power at 120 revs. It is a 2 600 V three-phase type motor and takes its current from a single turbo-alternator set which is rated 5 500 kW, 2 600 V, three-phase at 3 000 revs. The steam pressure at the turbines is 250 lb. per sq. in. gauge with 200 deg. F. superheat and 28 in. vacuum. For supplying steam for the main and auxiliary turbo-generators there are five boilers built by the shipbuilders, in each case generating steam at 275 lb. per sq. in. It is believed, although this information should not be taken as final, that these boilers are of ordinary Scotch type and they may be, therefore, contrasted with "La Marea," the vessel mentioned in my article last month, on which conversion work is now proceeding. This vessel has recently been lengthened from 325 ft. to 352 ft. 6 in. and the whole of her original Diesel electric machinery has been removed and turbo-electric machinery substituted. The shaft horse-power of the main propelling motor has been increased from 2 500 to 3 300, and the propeller speed has been increased correspondingly from 95 to 125 revs. Two Babcock and Wilcox water tube marine boilers with superheaters and air preheaters have been installed to supply steam to the new turbo-alternator which has now taken the place of the Diesel generators originally fitted when the ship was new. These boilers are designed to raise steam at 370 lb. per sq. in. gauge pressure and with 264 deg. F. superheat (700 deg. F. total temperature).

It will be seen that turbo-electricity is being responsible for adding to the world's mercantile fleets three remarkably efficient vessels. It is of particular interest to note that vessels such as these with high auxiliary loads, owing to the refrigerated spaces—no details of these loads unfortunately are at the moment available—should be fitted with turbo-generators. Protagonists of Diesel-electric drive have always maintained that where high auxiliary loads are concerned Diesel electricity is particularly useful because the main generators are also the auxiliary generators. So far, as far as fruit ships are concerned, this has only been put into practice on two vessels and, judging by the fact that no repeat orders have been given, it would seem that the owners have scarcely been completely satisfied with their original choice. This does not mean, however, that there is no field for Diesel electricity in this type of ship, and it does not mean that the next few years will not see an increase in the use of Diesel engines for fruit carrying in conjunction with d.c. generator sets. So far, owners of fruit vessels have maintained a somewhat conservative attitude towards electric propulsion.

The United Fruit Co. has been an outstanding exception which has shown the way, and it is very interesting now to record that Elder and Fyffes, which is an English associated company of the United Fruit Co., has decided to follow the example of the people on the other side of the Atlantic. The appearance of these vessels will be watched with considerable interest in this country by all shipowners, and even those who are not directly interested in fruit carrying will unquestionably want to see something of their performance.

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SHIP-AND-SHORE RADIO TELEPHONY.

Details of the "Majestic's" Installation.

A FURTHER great step in the development of electrical communication is now a commercial possibility, following the complete success of an experimental public service of radio telephony inaugurated by the White Star liner "Majestic" on her last outward and homeward voyages. As mentioned in our last week's issue, the transmitting and receiving equipment has been made by Standard Telephones and Cables, Ltd., to the order of the International Marine Radio Co., Ltd. and the British Post Office.

The wavelength used depends on the distance to be covered and the hour, shorter waves being used for the longer distances and during daylight. The wavelengths actually employed on the "Majestic" installation are 33, 26 and 17 metres, the latter being found most satisfactory for daylight working over long distances.

In the "Majestic's" transmitter the high frequency carrier wave is generated by a crystal-controlled master oscillator operated on a quarter of the radiated frequency in order that a comparatively thick crystal may be used. The output from this master oscillator is passed through a balanced amplifying stage, which entirely prevents the frequency from being affected by subsequent operations in the transmitter. The frequency is then quadrupled by two harmonic generators connected in cascade, and the carrier amplified to its final power by two stages of h.f. amplification, each comprising two thermionic valves connected in "push-pull." Modulation is effected on the first of these amplifiers, a modification of the "Heising" or choke control method being adopted, which enables the carrier to be completely modulated.

The final power amplifier valves are of the water-cooled type, and have an output of 2 kW each. Together with their associated tuning circuits and the rubber hose coils used to lead the cooling water to and from their anodes, they are contained in a separate unit approximately 4 ft. square by 7 ft. high.

The remainder of the apparatus mentioned above, together with the modulating equipment, is all contained in another unit of the same size. The energy required to work the transmitter is obtained from motor generator sets run from the ship's mains. An interesting feature is the special spring floor which has been provided to isolate the delicate apparatus contained in the transmitter from the vibration of the ship.

The receiver works on the superheterodyne principle. It comprises two stages of high frequency amplification, employing screened grid valves, followed by a first detector, beating oscillator, five stages of intermediate frequency amplification, second detector and one stage of audio-frequency amplification. The intermediate frequency amplifier is made with the high degree of selectivity required for successful duplex working

Method of Overcoming Fading.

In order to overcome fading, that is periodic variation of the strength of the received signal, an automatic volume control is used. This consists of a special detector valve connected in parallel with the second detector, and so arranged that the strength of the received signals varies the grid bias on the first detector. A strong signal increases the bias on the first detector and so reduces the amplification of the receiver. This is accomplished by using a separate high tension battery for this valve and connecting a resistance between this battery and earth. The potential across this resistance is applied to the first detector.

The receiver is arranged in the form of a number of units assembled on Duralumin trays, with front panels carrying the meters and controls. The whole is assembled in a teak cabinet approximately 3 ft. long, 2 ft. high, and 10 in. deep. As a protection against vibration rubber cushions are provided on the base, together with shock absorbing springs for wall mounting.

The transmitter is located in a position beside the after funnel, the aerials used for transmission being rigged between the funnel and the mainmast. The horizontal half-wave type of aerial is employed, consisting of a horizontal wire slightly less than half the wavelength long, broken in the middle by a tuning coil, across which is connected the high frequency transmission line used to excite it. This consists of a pair of wires, spaced about 6 in. apart, leading down to the transmitter. Separate aerials are used for each transmission wavelength. The receiver is located just above the bridge and the receiving aerials are rigged between No. 1 funnel and the foremast. The operator in the receiving room has a variable amplifier and a visual volume indicator which enables him to adjust the level of the speech and send it over the line to the transmitter. He can also adjust the volume of the received speech. The arrangements at the shore end of the circuit are similar to those employed on the short wave transatlantic circuit between this country and New York.

The transmitter employed at Hillmorton (Rugby) is a "Standard" Type III equipment, differing only from that used on the "Majestic" in that a further stage of h.f. power amplification is added, using two 15 kW water-cooled valves in "push-pull" operating with an anode potential of 10 000 V obtained from a rectifier system. This is mounted in a separate unit similar to that housing the final stage of the ship set. The receiver at Baldock is a large equipment designed primarily for use on shore at the receiving station of a long distance radio link. Like the ship receiver, it is of the superheterodyne type, but is not portable.

CHANGING D.C. NETWORKS TO A.C.

Problems Connected with Replacement and Conversion of Apparatus—Case of d.c. Radio Eliminators.

AT the conclusion of a lecture on "Changing d.c. Networks to a.c. Networks," delivered by Mr. A. W. Crompton, A.M.I.E.E., to the London Technical Group on February 25th, he dealt briefly with problems connected with the replacement and conversion of apparatus. Mr. Crompton said that one of these problems was the sale or utilisation of displaced d.c. motors, etc. Some of these could be hired out, but in case the numbers in stock became too great, they might be sold to consumers at a nominal price on the condition that when the supply was eventually changed over, the consumer would bear the cost of the a.c. motor required. Considerable saving would be effected in future if arrangements were made with power consumers to wire for 3-phase motors and install 3-pole main switches in their power circuits.

In Manchester direct current battery eliminators for radio receiving purposes were not approved for use in conjunction with existing receiving sets and no responsibility in regard to them was accepted when the supply was changed over. Many other undertakings in Lancashire have adopted the same attitude as that of Manchester in regard to this question.

Undertakings which agreed to replace or pay compensation for d.c. eliminators irrespective of the condition of the receiving sets of which they formed part, were obviously condoning uses of the supply which were attended by considerable risk of shock or interference with the supply, and in the event of any consumer sustaining injury when using such apparatus, the undertaking might have to meet a charge of negligence.

The costs incurred in changing over in a particular area could not very well be taken as a definite indication of the costs which would have to be met elsewhere. The only apparatus involved in a simple change-over without alteration of the declared voltage consisted of motors, special lamps, battery chargers, etc., together with wiring and switchgear alterations, replacement of certain switches to comply with Factory Regulations relating to a.c. supplies over 125 V, meters, etc. There was also in some cases necessity for rewiring to be done due to the d.c. cables having been run in separate steel conduits. Where a change in voltage was carried out concurrently, all apparatus with few exceptions had to be dealt with. The average cost of changing lamps rated at 200 V for those of similar wattage at 230 V for a total of over 4 000 residential consumers was found to be about £1·6 per kW connected, heating and cooking apparatus about £0·28 per kW, whilst meters cost about £1·6 per consumer after allowing some credit for the d.c. meters which were removed.

Taking the total cost for all the work carried out which resulted in a considerable increase in capacity and improvement in voltage conditions, and comparing this cost with that which would have had to be expended on d.c. feeders and sub-stations in order to deal efficiently with the immediate loads, the increased cost only amounted to approximately 19 per cent., which was appreciably less than the increased capacity provided, and in addition there was on the credit side the saving in conversion losses.

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DISTRIBUTION DEVELOPMENTS.

Desirability of Looking Ahead—Mr. Willoughby-Ellis' Address at the British Industries Fair—Necessity for Standardisation.

"DISTRIBUTION Developments—Looking Ahead" was the subject of an address by Mr. H. Willoughby-Ellis, A.M.I.E.E., the president of the Electrical Contractors' Association at a conference at the British Industries' Fair, Birmingham, on February 27th, under the joint auspices of the Electrical Contractors' Association (Inc.) and the Electrical Wholesalers' Federation, Ltd. Mr. J. Wilson, president of the Electrical Wholesalers' Federation, presided.

Mr. Willoughby-Ellis stressed the need for more standardisation in the electrical industry. The lack of it, he said, had been an ever-present stumbling block in the path of electrical progress in this country. In the whole history of the industry, nothing had caused more trouble, loss, and inefficiency than this inability to standardise systems and pressures of supply. It was due to lack of knowledge, but far more to lack of vision, that they had permitted the setting up of a multiplicity of supply systems in this country, which represented a standing reproach to our business acumen. Even at present, could it be said with truth that this parochial individualism had been put under proper restraint?

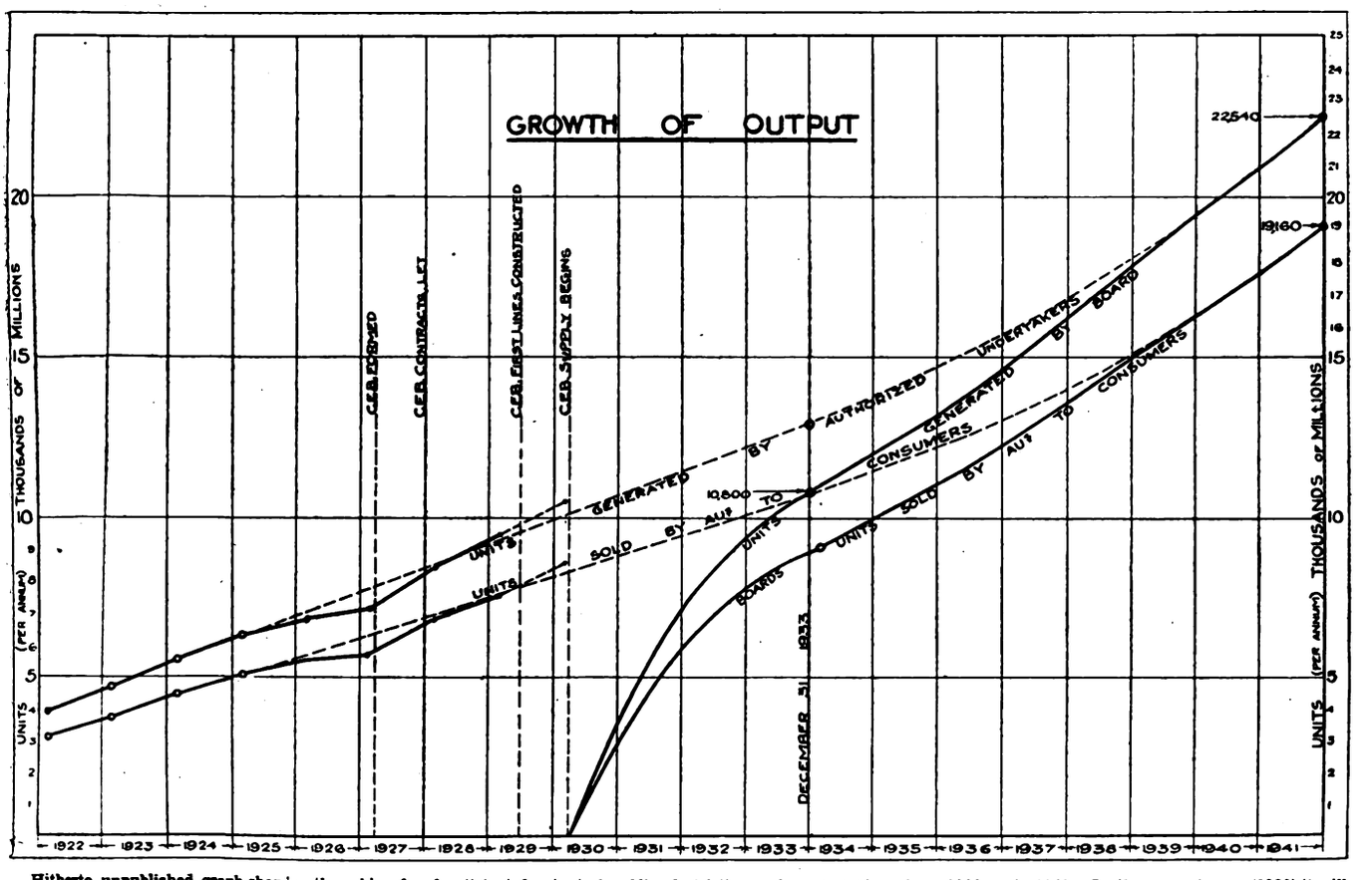
He doubted it. Notwithstanding the labours of the Electricity Board and the Electricity Commissioners, he continued, there were on all hands immense developments going forward at non-standard pressures, and there were big areas being developed at alternating pressures varying between 200 and 250 V. Thus additional future trouble was being accumulated. The non-standard systems were being developed and perpetuated in many parts of the country at the moment, and each day that passed made a final readjustment of these varying systems more difficult, costly, and damaging to achieve.

No one could deny that the electrical industry in this country had an immense leeway to make up before it could achieve anything like the degree of general electrification prevailing in America and on the Continent. The future held very great possibilities so far as main line electrification is concerned. The domestic field had enormous potentialities which he thought they were rather prone to under-estimate. The industry and the trade must address themselves seriously to the problem of providing really convenient installations and trouble-free equipment. Given genuinely economical rates, the immense advantages of electrification would make an irresistible appeal. The need for all sections of the industry to come together in some central Council of the Industry was daily becoming increasingly apparent.

At a luncheon at the British Industries Fair on Thursday of last week, organised by the President and Council of the Birmingham Chamber of Commerce and the Fair Management Committee on the occasion of the official visit of the various electrical associations, Mr. Walter Barrow, president of the Chamber of Commerce, who occupied the chair, referred to the efficient work done by the Electricity Commissioners.

Sir John Brooke (Electricity Commissioner) said the electrical manufacturing industry had risen to a place among the engineering group second only to automobile construction, and even motor cars would not be able to run without the assistance of the electrical industry, and certainly would not have reached their present popularity without the electrical auxiliaries. The industry was extending and deepening its export connections. The orders it had on hand represented a much greater horse power than at any previous time in its history. It was supplying new super-power stations for countries as far removed as the United States, Russia, Austria, and South Africa. It was engaged on railway electrification work in practically every market outside Europe and the United States. Owing to the development of the "grid," there had come into existence a home market for really high tension transmission, and manufacturers could face world competition with renewed confidence.

Mr. J. K. Brydges, president of the Incorporated Municipal Electrical Association, referred with satisfaction to orders which had been secured by British electrical manufacturers against keen foreign competition, including a recent order secured by one firm for switchgear in connection with the electricity supply to Strasbourg, amounting to about £200 000.



Hitherto unpublished graph showing the achieved and anticipated output of public electricity supply undertakings from 1922 up to 1941. In the present year (1930) it will be seen that the anticipated load has been slightly exceeded. The two heavier curves, showing the units to be sold by the Central Electricity Board, are of particular interest.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Bolometric Analysis of Metals.

[To the Editor.]

Sir,—On January 3rd and 17th I published in "English Mechanics" certain articles relative to a cheap method of producing "Talkie Pictures," making use of certain electrical devices, including a "Bolometer."

Since these experiments certain investigations have provided data and information that possibly may be found of interest and value to all to whom the quality and composition of irons, steels, coppers, bronzes and other metals and alloys are matters of great consequence.

We possess a considerable amount of knowledge relative to the ultra violet rays which extend beyond the visible violet rays of the spectrum, but very little knowledge of the ultra-red end of the spectrum band. Delicate thermometers and magnetic detectors will give certain information relative to these ultra-red rays, but up to the present this information is very meagre. At this end of the spectrum it is the bolometer which is of most service.

An improved type of bolometer which I have invented for these investigations consists of a slip of ebonite $\frac{1}{16}$ in. thick $\frac{1}{4}$ in. wide 4 in. long, with a series of nicks filed in the two 4 in. sides, this is wound with bare No. 40 B.W.G. copper wire, the two ends later being attached to terminals. The bare copper wire is given a thin wash coating of any kind of phosphorescent paint, when this is just tacky being again washed over with a strong solution of sulphate of quinine, the slip with its wire is then placed on a $\frac{3}{4}$ in. piece of glass tube whose ends are hermetically sealed, the terminal wires projecting. The tube is filled with olefiant gas, $\frac{1}{2}$–1 in. pressure. The bolometer is now complete, and is then connected to any ordinary wireless high resistance phone. If now the light of any low voltage battery electric lamp is allowed to fall on the bolometer the phone will "sound" and intermittent and alternating light will produce distinct differences in sounds. If we have a revolving vane breaking the light ray into fluctuating pulsating light, we have intermittent light. If instead of a vane we have a disc having red and violet transparent sectors we shall have what may be called "alternating" light and heat rays, for every light ray possesses certain calorific properties. Text books of physics contain particulars of a piece of apparatus known as "Koenig's manometric flame apparatus." Briefly described, this consists of a container divided into two compartments by a thin membrane of parchment or rubber, in one compartment (in our own particular case is fitted the telephone receiver), the other compartment has an external gas jet and pipe for admitting ordinary gas to the compartment. The jet is lit, and when the telephone "speaks" it causes the membrane to vibrate, the vibrations being communicated to the gas jet. If now a revolving mirror is placed in front of the gas jet, reflection of this pulsating gas jet will be perceived in distinct, visible manner, showing as a serrated or saw-like formation.

The bolometer is placed in circuit with the telephone; an "intermittent" beam of light is then made to fall on the bolometer. At once certain characteristic flame formations will be perceived.

Any sample of metal, irons, steels, coppers, zincs, bronzes, etc., is dissolved in any acid, and 1 cc. of metal solution is diluted with 50 cc. of distilled water, a current of air being passed through this solution and thence through a tube of calcium chloride to remove excess moisture, and this stream of air is caused to pass across the bolometer whilst "intermittent" light is falling on it. If the flame formations are examined it will be found for every metal, for every quality or composition of that particular metal, there will be a particular characteristic flame formation peculiar to that metal or quality of that metal. No two formations are the same, unless the two samples are of identical quality and composition.

The flame formations take the form of M, N and U formations, the U's being N's with very wide gullys between them, they vary in height, number and combination.

"Irons" give most marked M and N formations, differing in character and size with every different class or sample of iron tested. Coppers are characterised by M and U formation, zincs and coppers by M U and running series of N's; silver, aluminium and tin seem to be characterised by U's with terminal "N" and centre M formations.

By a bolometric device of this kind any kind of metal can be tested in a few moments, and by keeping records of formations any sample can be instantly identified and compared with any other.

Bolometric analysis promises iu the near future to place in the hands of every manufacturer a simple and reliable method for testing and determining quality and composition of all classes of metals.—I am, etc.,

Charles Mayfield.

Bristol,
February 14th.

Generator Interference with Wireless

[To the Editor.]

Sir,—The letter in The Electrician of January 10th, headed "Generator Interference with Wireless," reminds me that on the day when we started up a Diesel with a d.c. dynamo (about 650 r.p.m.) at a wireless station we could not hear anything in a wireless receiver on account of terrible noises generated by the dynamo. Batteries of condensers proved to be of no use and it took us many days to locate the origin of the trouble.

The Diesel and the dynamo had been mounted separately and only the dynamo was earthed by a heavy copper wire. The Diesel was earthed only by its waterpipes (cooling) and other pipes of similar kind. One day we made one copper connection to the Diesel and another to the dynamo, putting a milliampere meter between them. We noticed a deflection of the pointer announcing a steady current between Diesel and dynamo and the noises in the receiver had disappeared. We could hardly believe it but by taking off the connections the noises appeared again. So we made a heavy copper wire connection between Diesel and dynamo and the trouble was cured.

Very probably the whole trouble arose by interrupting the above-mentioned steady current by the oil film of the sliding bearings (*Gleitlager*) of the Diesel, the oil film (grease) insulating the shaft sometimes and sometimes not.

Perhaps "Q's" Diesel and dynamo are mounted in a similar manner and the mentioned connection may solve his problem just as it did ours. I shall be glad to hear if this suggestion proves useful.

In all cases when the Diesel and the dynamo were mounted on one iron bedplate no difficulties were encountered.

It is often useful to connect two series condensers across the brushes and to connect the point between the two condensers with the dynamo casing.—I am, etc.,

Ulrich Dickes.

Berlin-Schmargendorf,
Doberannerstrasse 6, III.
February 20th.

Defeatist Publicity.

[To the Editor.]

Sir,—With a persistence which, in a better cause, would deserve the highest commendation, we, as a nation, have been telling the world for the last three or four years that we cannot sell our goods, and at the same time we have been saying that "British goods are best." Has the time not now come to call a halt to this pernicious publicity?

In my opinion the whole effect of this "Salesmanship Campaign" has been most disastrous in its effect on our trade overseas. I believe that the world has received the impression that Britain has lost courage, and it might be as well to keep in mind the inspiring words of Emerson:—

> "Britain. I see her not dispirited, not weak, but well remembering that she has seen dark days before. Indeed with a kind of instinct that she sees a little better in a cloudy day, and that in storm and battle and calamity she has a secret vigour and a pulse like cannon. I see her in her old age, not decrepit, but young, and still daring to believe in her power of endurance and expansion. Seeing this, I say, All Hail! Mother of Nations, Mother of Heroes, with strength still equal to the time."

These words are still true, but for any sake, let us drop this inferiority complex which is damaging our national reputation and swelling the ranks of our unemployed.—I am, etc.,

J. Reid Adam.

West Bromwich.
February 27th.

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NEWS IN BRIEF.

The E.D.A. Annual General Meeting—Annual Dinner of Ex-Siemens' Men—An Exhibition of American Imports—The Television Society—Situations Vacant.

THE next meeting of the members of Institute of Fuel in London will be held in the rooms of the Chemical Society, Burlington House, W.1, on Wednesday, March 12th.

Seaham Harbour Electricity Committee has decided that where houses have been wired by the owners, and prepayment meters installed, four lamps be provided free by the Council.

Ilford Electricity Committee has authorised the Borough Engineer to invite tenders for the construction of the proposed new offices and central showroom and storerooms for the department.

The Devon and Cornwall section of the Electrical Power Engineers' Association met at Hayle last Saturday, and later visited Camborne, where a lecture was given by Mr. F. Nicholls, deputy chief engineer, Derby electricity department.

The estimated profit on the Hull Corporation telephones department for the present year is £11 516.

Applications are invited for the London University chair of physics, tenable at the East London College.

The Lancashire Electric Power Co. held a demonstration of electric cooking and domestic appliances at Ramsbottom last week.

A deputy electrical inspector and three junior electrical inspectors of mines and quarries are required. Application forms from the Establishment Branch, Mines Department, Dean Stanley Street, London, S.W.1.

A deputation from the engineering trades unions submitted to the Employers' Federation last week a request to subject the wages claim to arbitration. The employers suggested the appointment of a joint deputation to investigate conditions and costs of manufacture abroad, etc.

The U.S.A. Department of Argiculture is sending round the agricultural regions life-sized models of cows and pigs which have "windows", enabling electrically illuminated internal organs to be seen in operation. The performances are accompanied by appropriate phonograph "talkies."

Among the opponents at the inquiry into the application of the British Paper Box Manufacturers' Federation for an Order under the Merchandise Marks Act for compulsory marking of imported cartons, was the Electrical Importers' and Traders' Association. The hearing of evidence was concluded last week.

The Portsmouth Royal Dockyard Electrical Fitter Ex-Apprentices' and Apprentices' Association held its first annual dinner recently at Southsea. Among those present were Rear-Admiral L. A. B. Donaldson, director of dockyards, Mr. L. J. Steel, superintending electrical engineer, and Mr. B. Handley, borough electrical engineer.

The annual general meeting of the British Electrical Development Association will take place at the Savoy Hotel, London, at 3 p.m., on March 21st, and will be preceded by a luncheon at 1 o'clock at the same place, when the Minister of Transport will be the principal speaker. Tickets for the lunch, including wines, etc., from the offices of the Association price 17s 6d.

The Federation of British Industries has considered the recommendations of the Standing Committee on Mineral Transport with regard to pooling and standardisation of wagons. The Federation has expressed the opinion that abolition of private ownership would tend to perpetuate if not increase traffic difficulties, and states that it is opposed to the creation of compulsory wagon pools which would result in the working of collieries being practically controlled by the railway companies, and that complete standardisation of rolling stock must be preceded by standardisation of railway terminals.

The annual dinner of the Association of Ex-Siemens' Men will be held at Gatti's Restaurant, King William Street, Strand, W.C.2, on March 20th. Mr. J. Snow Huddleston, Dagenham Dock, Essex, is the Hon. Secretary and Treasurer.

The Business Efficiency Exhibition, organised by the Office Appliance Trades' Association of Great Britain and Ireland, opened at the White City, Shepherd's Bush, London, on Wednesday, March 5th, and will remain open until Saturday, March 15th.

An Industrial Exposition of American Import Trade is to be held at the Grand Central Palace, New York, from August 4th to 9th. This is claimed to be the first import exhibition to be held in any part of the world and no goods made in America will be admitted.

LOOKING BACKWARD.

FIFTY years ago, THE ELECTRICIAN *of March 6th, 1880, stated that the British Museum authorities had decided to adopt permanently the Siemens electric light in the Reading Room. The lamps were provided with suspended glass trays to catch red hot carbon sparks falling from the lamps.*

A company had just been formed "for the purpose of working the electric steering gear and engine room telegraph" for ships, an invention which had "met with the approval of several well-known admirals."

Formation of the Henley Telegraph Works Company, Ltd., with a capital of £70 000, was recorded.

* * *

TWENTY-FIVE years ago, according to THE ELECTRICIAN *of March 3rd, 1905, trials with electric trains were in progress on the Metropolitan section of the Inner Circle, between Aldgate and Notting Hill Gate.*

An account was printed of the improved Murray type-printing telegraph and the opinion was expressed that it would "possibly take a large place in replacing present methods of fast Wheatstone automatic work."

The North Somerset Electric Supply Co. at the end of February gave electric cooking demonstrations at Winscome, Wedmore, and Cheddar. At each place there was a display of electrical domestic appliances, in addition to wireless apparatus.

In a recent address to the East Devon Branch of the Electrical Association for Women, Mr. F. Marsh said, in regard to the elimination of glare, the pearl and opal lamps on the market to-day were probably the last word in lamp manufacture.

Stoke-on-Trent Electricity Committee has authorised the Engineer to give Miss Williamson, organiser of domestic teaching, such assistance as he may consider desirable and to lend cookers and other domestic appliances for the purposes of instruction on the use of electricity in the schools in the city.

At the E.D.A. Conference, North East Area, on February 26th, Mr. S. Burns chose for his subject "Modern Days—Modern Ways." The next conference of the area will take place on March 26th when Mr. K. M. McKensie will give a paper entitled "Generation and Supply of Electricity."

At the meeting of the Overhead Lines Association to be held on March 19th, Dr. Alfred Ekstrom will deliver a paper entitled "Overhead or Underground Cables for Rural Transmission Lines." The paper will be illustrated by a film showing cable laying by a special machine, largely used on the continent.

At a dinner given by the Institution of the Rubber Industry last week to its new president, Mr. Eric Macfadyen, Sir Arnold Wilson outlined a scheme for the building of central headquarters near Westminster to house a number of learned and technical societies. The cost would be £350 000, towards which nearly £100 000 had been promised. The scheme had the approval of the Prince of Wales and was backed by the Department of Scientific and Industrial Research.

The second annual general meeting of the Television Society will be held on Tuesday, March 18th. The presidential address will be delivered by Prof. Sir Ambrose Fleming, F.R.S., in the Botanical Theatre, University College, Gower Street, London W.C.1, on "The Relation of Governments to Invention." The annual exhibition of apparatus will be held this year on Wednesday, April 9th, at University College, London, from 3 p.m. to 9 p.m. A silver challenge cup, presented to the Society by Capt. B. S. Tuke, will be awarded annually for the best exhibit in relation to television shown by a member of the Society at the annual exhibition, while offers of suitable exhibits from non-members of the Society, bearing on the, subjects of television, picture telegraphy, or talking films will be considered if particulars are sent as soon as possible to the Secretary, at 4, Duke Street, London, W.C.2.

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BUSINESS ITEMS.

WILD-BARFIELD electric furnaces will be exhibited at the Leipzig Fair, and also at the Achema Exhibition at Frankfort-on-Main. Visitors to either of these will be able to witness demonstrations.

S. THOMAS PEMBERTON AND Co., 8, Church Street, Colmore Row, Birmingham, have recently been appointed to represent BRUCE PEEBLES AND Co., LTD., Edinburgh, in the midland counties of England. Mr. Pemberton, the principal, has for the last 28 years been the representative of Electromotors, Ltd., in the same district.

Our attention has been drawn to a mis-statement on page 269 of our last issue. The four photographs of gear manufactured by A. REYROLLE AND Co., LTD., reproduced on that page, are represented as having been exhibited at the British Industries Fair, whereas in fact they are various equipments now in service in the Argentine, Saskatoon, Jerusalem and Java, and were sent to us as illustrations of interesting export shipments in 1929.

An order has been secured by the SOCIETE ANONYME DES FOYERS AUTOMATIQUES of Paris for the Quaregnon power station, comprising three steam generators having an evaporation of 190 000 to 225 000 lbs. per hour at 950 lbs. pressure and 840 deg. F. final temperature. The boilers will normally be fired with pulverised coal, but provision will be made for using as fuel de-hydrogenated coke oven gas. Another order is for one steam generator of a similar design evaporating 80 000 to 90 000 lbs. per hour at a pressure of 400 lbs. per square inch and a final temperature of 800 deg. F. This unit will also be fired with pulverised fuel and is intended for the Hensies Pommeroeul Collieries.

As announced in our Tenders Accepted columns, an important contract has been placed with the General Electric Co., Ltd., London, by the Central Electricity Board for six 30 000 kVA three-phase transformers for the Mid-East England Electricity Scheme. These transformers, the windings of which will be suitable for pressure ratios of 132 000/11 000 and 132 000/6 600 V on a three-phase 50 cycle system, will be complete with G.E.C. on load tap changing gear and external automatically controlled forced air cooling equipment. They will be manufactured in Birmingham at the Witton works of the G.E.C. and installed in Yorkshire at Kirkstall, Bradford and Rotherham.

The Gamewell fire alarm system, installed by STANDARD TELEPHONES AND CABLES, LTD., for the Hendon U.D.C., was officially inaugurated at Mill Hill fire station last month. The system comprises 28 boxes, connected in two separate street circuits, and protects the Mill Hill district, the calls being recorded in the local fire stations and simultaneously in the Central Station at Hendon, where they are automatically timed and dated. Telephone facilities are provided over the same lines used for the fire alarm circuits, without interfering with or delaying the alarm bells. Portable hand-micro-telephones are supplied and a telephone call to the fire station can be put through from any box in the system by plugging the micro-telephone into the jack provided.

An interesting electric steam boiler installation, which shows the progress in poultry farming due to the effects of the "Marking Scheme," has just been completed in what is computed to be the world's largest poultry farm at Corstorphine, Edinburgh. Its size may be gauged from the fact that as many as 170 000 eggs (all White Leghorns) are hatched and the pullets reared up to six weeks of age in a mammoth incubator and brooder at one time. The chickens when hatched are placed in brooders and kept from that time to six weeks old in regulated temperature, which is decreased as the chickens grow up. The complete system of steam supply has been arranged by Comdr. Campbell Allen of Messrs. BASTIAN AND ALLEN, Slough, the whole installation being arranged to give automatic working under all conditions. Three "Mascarini" boilers working on a load of up to 900 kW on 400 V, three-phase supply, working in conjunction with a Ruths steam storage, supply the necessary steam to the brooders.

NEW G.E.C. SHOWROOMS AT BRISTOL.

The new showrooms and offices of the General Electric Co., Ltd., at Magnet House, 26, Victoria Street, Bristol, were officially opened on Wednesday. The proceedings were followed by a luncheon at the Grand Hotel. In the afternoon there were special demonstrations in the showrooms and the visitors were entertained to tea.

PERSONAL.

MR. T. Medcalf, transport manager at Swindon, has resigned after 27 years' service.

Sir George Sutton has retired from the directorate of the Enfield Cable Works, Ltd.

MR. BRIERLEY H. COLLINS (centre), who received last week a presentation on his retirement after nearly fifty years' service with the Liverpool Corporation Electricity Department. See note on this page.

Mr. J. Hanns, chief engineer of Colyton Electric Light Works, who has been seriously ill, is progressing favourably, and is now out of danger.

Mr. E. P. Barfield and Mr. J. P. Coleman, of Wild-Barfield Electric Furnaces, Ltd., have left England for an extended visit to the United States.

Mr. A. L. Keet has been appointed city electrical engineer at Exeter at a salary of £700 per annum, the position to be reviewed at the end of twelve months.

Burnley Corporation has appointed as manager of the tramways and transport department Mr. C. H. Stafford, deputy manager and assistant engineer to Reading Corporation tramways undertaking.

Estate of the gross value of £5 667, with net personalty £5 476 was left by the late Mr. C. A. Blashcheck, for 27 years chief electrical engineer to the Canterbury Corporation, who died on November 26th last, aged 55 years.

Mr. R. Borlase Matthews has been elected chairman of the Rural Reconstruction Association for the forthcoming year. He has for some time been a member of Council and Chairman of the Executive Committee, and has been responsible for the rural electrification policy of this Association.

Mr. Brierley H. Collins was the recipient on March 1st of a mains-driven wireless set from his colleagues in the Liverpool Corporation Electricity Department, on his retirement after forty-eight years' service, a record for the department. Mr. F. C. Wilson, chairman of the Tramways and Electric Power and Lighting Committee, in making the presentation, said Mr. Collins came to the undertaking in 1882, at the age of sixteen, and subsequently became secretary of the Liverpool Electric Supply Co., Ltd. Since the transfer of the company's undertaking to the Corporation, Mr. Collins had held the positions of chief clerk and latterly installation assistant. Mr. P. J. Robinson, the city electrical engineer, paid tribute to Mr. Collins's services, and two of the chief assistants, Mr. E. L. Morland and Mr. T. B. Drummond, supported.

Obituary.

SIR ALEXANDER GRACIE, on Sunday. He was a director of the English Electric Co., Ltd.

MR. HENRY WILLIAM BROOKMAN, on February 25th, aged 91 years, formerly superintendent of the Central Telegraph Office.

MR. H. L. THOMSON, on March 1st, aged 32 years. He was electrical engineer and manager of the Cannock electricity undertaking and was killed within five minutes of leaving his office on Saturday afternoon, when his motor-car burst into flames after a collision and overturned with him underneath it.

See page 315.

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ELECTRICAL TRAVELLERS.

Scheme for Reducing Unemployment Amongst Association Members.

THE fifth annual dinner of the Electrical Trades Commercial Travellers' Association was held at the Connaught Rooms, London, W.C., on February 28th, with Mr. R. W. Whitley in the chair. The number present approached 300, and during the evening Miss Angela Maude and Mr. H. C. Leonard entertained the assembly.

Mr. R. W. WHITLEY, in proposing "The President," drew the attention of members to a scheme which had been evolved for the benefit of those who were faced, or likely to be faced, with unemployment. The scheme was dependent upon members furnishing the Association with particulars of their experience, and with this end in view special forms had been prepared. Every member was allotted a number, and the information given on the returned form was filed under that number, thereby ensuring that the identity of each member was lost to all save the person concerned and the chairman of the Association. These numbers, according to the qualifications of their holders, were then filed under different headings, so that in the event of an inquiry being received for the most suitable man to fill a vacancy, information was readily available. Mr. Whitley pointed out that the response of members to the scheme had been good, and records of 70% of the full membership had been collected. Forms had been sent to all members, and it was particularly important that the remaining 30% of the Association's strength should make their returns as early as possible. The forms were in the shape of questionnaires, and allowed for recording sales experience under thirty-three different heads. Particulars of apprenticeship, technical training, workshop experience, advertising, drawing office, show room, power station, buying and other qualifications were asked for, while information as to whether members would consider a position abroad was also recorded.

Mr. ROBERT HORNBY, the President of the Association, in reply, pointed out that schemes similar to that outlined by the last speaker were used with good effect elsewhere, and recalled that whilst in Canada in 1915, he had wanted meter testers, but had no knowledge of where such men could be found. On a suggestion that he should try the Eaton Stores he then discovered that this firm kept a detailed record of each of its employees, with the result that he found the men he wanted in the ironmongery, stocking and similar departments. Continuing, Mr. Hornby said that he believed the electrical traveller to be the most important link in the chain of success. The object of the Association was not only to give recognition to the importance of the selling and distributing side of the industry, but also to raise the status of the electrical traveller, and thereby raise the status of the whole industry.

During the course of the evening a collection was made on behalf of charities, and the sum of £12 15s. 6d. was raised.

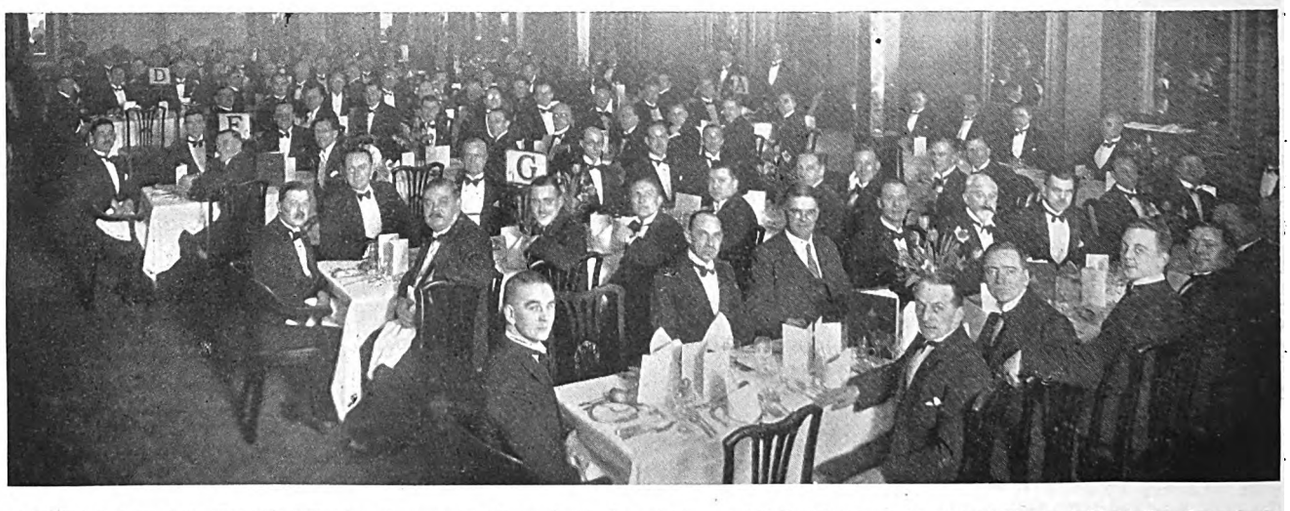
THE SOCIAL SIDE.

THE second staff dance of the season of Johnson and Phillips, Ltd., was held in Woolwich Town Hall on February 28th, and was attended by a more than usually large number of the staff, and their friends. Mr. J. Macgregor, chairman and managing director, and Mr. C. Stewart, director, were present, and prizes were presented for various competition items by Mrs. Macgregor and Mrs. Stewart.

A goodly proportion of the 1 020 employees who have served the Metropolitan Vickers Electric Co., Ltd., for twenty years or over, sat down to supper on February 24th, in one of the works' canteens, and afterwards enjoyed a lively entertainment provided for the most part by the M.V. Male Voice Choir and M.V. Orchestra. The Metropolitan-Vickers Electrical Company opened its works in Trafford Park less than 30 years ago, when it was known as the British Westinghouse Electric and Manufacturing Co., and it speaks well for the company's relations with its employees that more than a thousand of them have been with them almost from the start. Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., was the guest of the evening and Sir Philip Nash, chairman of Metropolitan-Vickers Electrical Co., Ltd., occupied the chair as President of the Long Service Association. Mr. Philip Lang, who was managing director of the company in its early years, was also present, and the popularity of his regime with these old timers was evinced when they called vociferously for a speech from him, and would not be denied. Sir Felix Pole thanked the association for inviting him, though a newcomer, to attend their annual meeting and congratulated them all on their good fortune in having served a firm of such standing for so long.

LIVERPOOL ELECTRO-HARMONICS.

Over 70 members of the Manchester and Liverpool electrical trades foregathered at the Angel Hotel, Liverpool, on February 28th, when the Liverpool Electro-Harmonic Society gave a dinner and concert, at which they entertained as guests about 20 members of the Manchester Electro-Harmonic Society. In the speeches there was a good deal of banter anent "the Manchester man and the Liverpool gentleman." Mr. H. A. Pryor, the secretary of the Manchester Society, who responded to the toast to the Manchester visitors, submitted by the chairman Mr. Sutton, added to the amusement by proclaiming that when a Manchester man secured business in Liverpool it demonstrated two things: (1) He deserved it; and (2) he needed it. He could not let the opportunity go by, he said, without alluding to the inactivity of an electro-harmonic society in London, which was all the more noteworthy since the two Lancashire societies seemed to be thriving. Neither of them however received the support they deserved to get from the younger members of the electrical industry. Mr. E. G. Pulford, Junr., the secretary of the Liverpool Society, appealed to all to make "Members' Night" (March 28th) "a jolly good night."



MEMBERS of the Electrical Trades Commercial Travellers' Association and their friends at the annual dinner held at the Connaught Rooms, London, on February 28th. Details of a new employment scheme, for the benefit of members, are given above.

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THE EVERLITE LAMP.

Further Developments of the Eight-hour Battery.

READERS will remember that we published in our issue of February 1st last year, details of an interview with Prof. A. Schmid, of Bale University, with regard to an invention of his which was to be put on the market by Everlite, Ltd., of Metropole House, Finsbury, London, E.C.2. It was pointed out at the time that the invention took the form of a wet battery having sufficient capacity to give a "straight-line" discharge curve over some hours, and so constructed that the charge could be renewed by refills.

An opportunity of inspecting the battery in process of manufacture was afforded our representative last week when a visit was made to the works of Everlite, Ltd., at Waltham Abbey. At the moment practical application of the invention is confined to the manufacture of lamps likely to interest the bicycle trade, though obviously the battery has possibilities in a number of other directions. The cell itself is contained within a "Metduro" casting, and resembles somewhat the Bunsen cell with its carbon and zinc electrodes. The electrolyte is made up in solid form, chromic and sulphuric acids being absorbed in a specially prepared block partly lead-covered. This block, which possesses the property of absorbing a volume of liquid equal to several times its own weight, also accommodates the zinc electrode, the carbon being permanently secured to the "Metduro" container and connected to one side of the lamp socket. The battery is made active by inserting the electrolyte and zinc block into the container, adding a small, but definite, quantity of water and screwing on the cap; this latter operation connecting the zinc electrode in circuit.

Turning the lamp causes the block to make chemical contact with the water, and thus converts the latter to the desired electrolytic solution. Turning the lamp again, to an upright position, lowers the electrolyte below the level of the zinc electrode, and so in effect disconnects the lamp by rendering the cell inactive.

It is claimed for this battery that, with the lamp used, eight hours continuous discharge at a constant rate is obtained, while the battery can be renewed for further use by renewing the electrolyte block and changing the water. The cells may, if desired, be connected in series or parallel and, it is stated, even though the cells be ready for immediate use, neither deterioration of the electrolyte nor erosion of the zinc electrode will occur until the container is turned into that position which causes the lamp to light.

INDUCTION FURNACES.

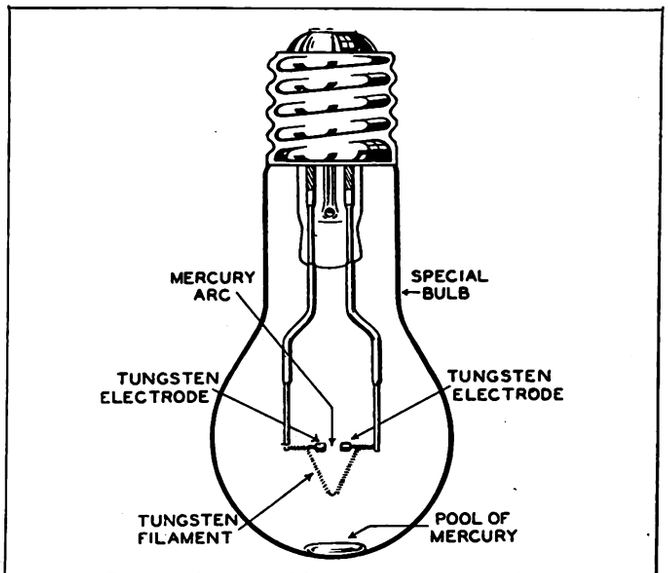
Electrical Penetration in the Steel Industry—Crucible Process Being Superseded.

THE UNITED STEEL COMPANIES, LTD., have placed with the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, an order for an electric induction furnace for steel melting to be installed at the works of SAMUEL FOX AND CO., LTD., Stocksbridge. The furnace will be of ¼-ton capacity and of the Metropolitan-Vickers standard design, which aroused considerable interest when the first installation was made a little more than a year ago. Since that time furnaces of this type installed at a number of works in Sheffield and elsewhere, including the works of Vickers-Armstrongs, Ltd., and Hadfields, Ltd., have been in continuous commercial operation. The performance of these furnaces in service has been the subject of considerable attention in the steel industry, especially with regard to the reliability of the equipment, the quality of the product and the cost of operation. It is now known that the equipments installed have operated in such a way as to give satisfaction and the placing of the present order is significant.

The results obtained, apart from demonstrating reliability, have confirmed that the coreless induction furnace gives more accurate control over the composition of the product and therefore over the quality of steel produced. As regards cost of operation, actual records over six months operation in a large steel works show that steel of crucible quality has been melted at an overall cost, including labour, power, overhead and depreciation charges, of about £9 per ton, as compared with £16 per ton for the crucible process. The ¼-ton furnace melts its charge in about one hour and the records show that for an output of about 50 tons per month the average overall power consumption has been about 770 kWh per ton.

SIMULATING SUNLIGHT.

ACCORDING to the "General Electric Review" the General Electric Co. of New York and its foreign affiliations have achieved a combination of a filament and an arc in the same bulb. In this Type S-1 Sunlamp the filament and a mercury arc (in pure argon) operate together, the V-shaped filament



Diagrammatic sketch of the type S-1 Sunlamp developed by the General Electric Co. of New York.

hanging downward with its tip near a small pool of mercury in the bottom of the bulb. Above this filament and in parallel with it is a pair of tungsten electrodes. The bulb contains pure argon. No tilting is necessary to start the lamp. Practically as soon as the filament is lighted the arc strikes. The lamp can be operated throughout a wide range of angles. The lamp is a low-voltage source and the volt-ampere characteristic of the transformer is important. At present the lamp is approximately 400 W. The no-load volts of the secondary are approximately 35. When the switch is closed the filament takes about 9 A and the drop across it is approximately 33 V. Almost instantly the arc begins to operate without any further action on the part of the user. Now the mercury arc between the tungsten electrodes is operating in parallel with the tungsten filament. The volts drop to 11 and the total current passing through the filament and the arc is approximately 30 A.

This Type S-1 tungsten-mercury lamp when used in a proper reflector, produces the same degree of erythema (reddening of the skin) in the same or even less time in 30 in. from the source as is produced by midday midsummer sunlight. An average of many tests indicates that, as measured in foot-candles, it is at least 20 times more effective than good summer sunlight. The character of the tan produced by successive reddenings of the skin by means of natural sunlight or this new artificial sunlight is claimed to be the same.

TORONTO ELECTRICITY SUPPLY.

The report on the Toronto Hydro-Electric System for 1927 and 1928, respectively, recently presented by the Commissioners to the Corporation of Toronto, shows that the gross income for 1927 was $10 380 960 and for 1928 $11 083 883, surplus of income on operating account was $2 826 033 and $3 274 244, and net income carried to reserve for stabilisation of rates $39 273 and $311 688. At December 31st, 1928, the funded debt, less sinking funds in the City Treasurer's hands, amounted to $21 013 926, the fixed assets with respect to the distribution plant in the City of Toronto amounted to $35 065 221, and the total investment in the system, including the share of capital investment of the Hydro-Electric Commission of Ontario in respect of the Toronto Hydro-Electric System for generation and transmission equipment, amounted to $83 360 941. Electrical energy purchased from the Hydro-Electric Power Commission of Ontario in 1927 cost $4 877 569, and in 1928 $5 215 185. The quantities of electricity sold in 1927 and 1928, respectively, were 603 626 754 and 675 026 262 kWh, the connected load was 711 744 and 800 124 H.P., and the peak load 238 849 and 259 579 H.P.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

BECKERMET READING ROOMS, near WHITEHAVEN.—Electric light installation. Particulars from the Secretary.

ERITH URBAN DISTRICT COUNCIL, March 7th.—Twelve months' supply of h.t. and l.t. underground cable, joint boxes and other accessories. Forms of tender, etc., from the Electrical Engineer, Walnut Tree Road, Erith.

KETTERING URBAN DISTRICT COUNCIL, March 7th.—Supply of certain transformers. Specifications from Mr. W. A. Walker, Electricity Offices, Rockingham Road, Kettering; deposit £1.

Wiring and Fittings.

LEICESTER CORPORATION, March 7th.—Installation of electric light wiring and fittings at Belgrave pumping station. Specifications, etc., from the City Surveyor, Town Hall, Leicester; deposit £1.

GRAVESEND CORPORATION.—March 8th.—Wiring to three extra points at 96 houses on King's Farm estate. Particulars from the Electrical Engineer, 17, Harmer Street, Gravesend.

EDINBURGH CORPORATION, March 8th.—Supply and maintenance of telephones, in Edinburgh, Leith and Portobello districts. Forms of tender, etc., from the City Architect, City Chambers, Edinburgh.

WEST RIDING EDUCATION COMMITTEE, March 8th.—Electric light installation in Shepley Council School. Specification from Mr. W. Heeley, 4, Macaulay Street, Huddersfield.

ABERDEEN CORPORATION, March 10th.—Electrical work in connection with erection of new shelter and public conveniences at Sea Beach. Specifications, etc., from Mr. T. F. Henderson, burgh surveyor, Town House, Aberdeen.

BEDFORD CORPORATION, March 10th.—Supply during one year of e.h.t., h.t. and l.t. underground cables; and incandescent lamps. Specifications from the Borough Electrical Engineer, Prebend Street, Bedford. Tenders from British manufacturers in the United Kingdom only are invited.

BERWICK-ON-TWEED CORPORATION, March 10th.—Electrical work in connection with erection of 16 houses at Prince Edward Road, Tweedmouth. Specifications from Mr. G. Davidson, borough surveyor, Berwick-upon-Tweed.

BLACKBURN CORPORATION, March 10th.—Manufacture and supply of electrical requirements for 12 months, including paper insulated, lead sheathed cable, rubber insulated wire, consumers' meters and gasfilled and vacuum incandescent lamps. Specifications, etc., from the Engineer and Manager, Electricity Offices, Town Hall, Blackburn; deposit 10s.

CHEDDLESTON (LEEK) MENTAL HOSPITAL, March 10th.—Supply of electric lamps for six months. Tender forms from the clerk and steward, Mr. F. G. Eve.

OLDHAM GUARDIANS, March 10th.—Supply of electric lamps and fittings. Particulars from Mr. F. W. Fletcher, clerk to the Guardians.

PORTSMOUTH CORPORATION, March 10th.—Alteration, supply and erection of electric food and goods lifts at the Guildhall, Portsmouth. Specifications, etc., from Mr. R. J. Jenkins, City Engineer, Guildhall, Portsmouth.

PRESTWICH URBAN DISTRICT COUNCIL, March 10th.—Twelve months' supply of lamp standards, electric lamps, etc., Forms of tender, etc., from Mr. H. T. Ainsworth, surveyor, Town Hall, Prestwich, Lancs.

TORQUAY CORPORATION, March 10th.—Supply and erection of 7 500 kW m.c.r. turbo-alternator and condensing plant. Specifications, etc., from Mr. G. J. Hollyer, Electricity Offices, Torquay; deposit £3 3s.

WARRINGTON CORPORATION, March 10th.—Supply of (1) motors, and (2) transformers. Specifications from Mr. F. V. L. Mathias, Electricity Works, Warrington; deposit £1 1s. for each.

EAST RIDING HOSPITAL COMMITTEE, March 11th.—Supply and erection of electric generating and storage plant, and for underground distribution cables and wiring work at Driffield Isolation Hospital. Specifications, etc., from Mr. J. Edwin Storr, 14, Park Row, Leeds; deposit £3 3s.

LIVERPOOL CORPORATION, March 12th.—Supply of 5 000 kVA, 12 500 kVA and 33 000 V step-down transformers and 6 000 V and 33 000 V metal-clad switchgear for sub-stations. Specification, etc., from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

STOKE-ON-TRENT CORPORATION, March 12th.—Twelve months' supply of (1) e.h.t. truck type switchgear (contract No. 3 004); and (2) a.c. and d.c. meters (contract No. 3 005). Specifications from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2 for each.

SHEFFIELD CORPORATION, March 14th.—Supply of tramway rails (section d) and copper bands (section e). Particulars from Mr. A. R. Fearnley, Tramways and Motors Department, Division Street, Sheffield.

HARROGATE CORPORATION, March 15th.—Supply of meter boards for one year. Forms of tender, etc., from Mr. N. McLean, borough electrical engineer, 33, Swan Road, Harrogate.

KEIGHLEY CORPORATION, March 15th.—Construction of l.t. overhead line. Specification, etc., from Mr. H. Webber, borough electrical engineer, Coney Lane, Keighley.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, March 17th.—Supply and laying of l.t. cables, etc. Specification, etc., from Mr. D. J. Keep, town clerk, Town Hall, Cambridge Road, Bethnal Green, E.2; deposit £2 2s.

MANCHESTER CORPORATION, March 17th.—Twelve months' supply of incandescent lamps. Forms of tender, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

WEST LANCASHIRE RURAL DISTRICT COUNCIL, March 17th.—Electric lighting scheme for Hesketh, Rufford and Tarleton. Specifications from Mr. J. Scott, 358, Royal Liver Buildings, Liverpool; deposit £2 2s.

CARDIFF CORPORATION, March 19th.—Supply of e.h.t. and l.t. paper insulated cable during 12 months. Specifications, etc., from the City Electrical Engineer, The Hayes, Cardiff. Only manufacturers on the King's National Roll are invited to tender.

METROPOLITAN ASYLUMS BOARD, March 19th.—(1) Installation of synchronised electric clocks at Joyce Green Hospital, Dartford; (2) installation of electric sewing machines at Southern Hospital, Dartford; (3) conversion of workshop power units to electricity at Darenth Training Colony. Specifications from the Office of the Board, Victoria Embankment, London, E.C.4; deposit £1 for each.

KENDAL CORPORATION, March 24th.—Supply and erection of electrically driven blower, electric lift for retort house and lathe with electric motor drive, at the gasworks. Specifications, etc., from the engineer and manager, Mr. T. Crowdy, Parkside Road, Kendal.

LONDON COUNTY COUNCIL, March 24th.—Supply and erection in Blackwall Tunnel of (1a) four electrically driven exhaust propeller fans, 8 ft. diameter, each with 15 B.H.P. motor; (1b) two centrifugal blowing-fan sets, each with 55 B.H.P. electric motor, and suction and delivery air ducts; and (2) girders, joists, platforms, etc. Specifications from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £5 in each case.

MORTLACH PARISH CHURCH, March 24th.—Electrical work in connection with alterations and additions to church. Schedules, etc., from Messrs. A. Marshall Mackenzie and Son, architects, 173A, Union Street, Aberdeen.

CENTRAL ELECTRICITY BOARD, March 31st.—Supply and erection of metering equipment required in the area of the North West England and North Wales Electricity Scheme. Specification (N.W.E.-G.M. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

VICTORIAN ELECTRICITY COMMISSION, March 10th (extension of time).—Two 6 000 kVA, 50 cycle, 11 000/2 200 V, oil insulated, self-cooled, outdoor type, three-phase transformers, with spare coils and bushings (specification 30/8). (Reference B.X. 6 014.)

MOROCCO POSTS AND TELEPHONES (FRENCH ZONE), March 11th.—Supply of glass insulators, bronze and copper wire and galvanised ironwork. (Reference B.X. 6 410.)

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NEW ZEALAND POSTS AND TELEGRAPHS, March 11th.—Supply of three-conductor cords (P. and T. No. 151/2 145). (Reference B.X. 6 173.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttleton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 11th.—Supply of bells and buzzers (schedule C. 552). (Reference B.X. 6 043.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, March 13th.—(extension of time).—Supply of electric tube butt welder. (Reference B. 6 116.)

ANTWERP MUNICIPALITY, March 20th.—Supply and erection of a signalling and lighting installation for a swingbridge at Antwerp Docks (No. 198). (Reference B.X. 6205.)

EGYPTIAN MINISTRY OF THE INTERIOR, March 20th.—Steel water tank, on steel tower, with piping and fittings; and electric water level indicator. (Reference A.X. 9 073.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, March 20th.—Supply of two 150 kVA motor alternator sets, for Durban workshops (tender No. 1 615). (Reference B.X. 6 115.)

POSTMASTER-GENERAL'S DEPARTMENT, March 24th.—Supply of dial parts (schedule C. 555). (Reference B.X. 6 047.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 25th.—Supply of cordless telephone switchboards (schedule C. 566). (Reference B.X. 6 071.)

EGYPTIAN PORTS AND LIGHTHOUSES ADMINISTRATION, March 27th.—Supply and installation of electric cables in the Port of Alexandria. (Reference B.X. 6 199.)

JOHANNESBURG MUNICIPALITY, March 27th.—Supply of paper insulated, lead covered, double steel tape armoured and jute served cable (contract No. 348). (Reference B.X. 6 200.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Supply of lead-covered switchboard cable (schedule C. 574). (Reference B.X. 6 202.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 22nd.—Supply of braided switchboard cable. (Reference B.X. 6 201.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, April 28th.—Supply and erection of electrically driven high lift and low lift pumping plants, etc., for South-West Tablelands Water Supply (tender No. 51, 1929/1930). (Reference A.X. 9219.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12.) (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

CHILEAN MINISTRY OF MARINE, May 15th.—Supply of 3 metric ton travelling electric crane and 4 metric ton stationary electric revolving crane. (Reference No. A.X. 9 186.)

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22nd.—Supply of three electric horizontal centrifugal pumping sets, piping control switchboard, etc. (Reference A.X. 9212.)

Tenders Accepted.

BLACKBURN CORPORATION.—J. Marsden, electric light installation at Free Library.

READING GUARDIANS.—J. H. Winter and Co., lighting new Casual Ward at Woodley, £425.

READING CORPORATION.—Forest City Electric Co., Ltd., five automatic point controllers, £63.

CHESTERFIELD CORPORATION.—Macintosh Cable Co., Ltd., £954 12s., supply of l.t. cables, £954 12s.

AYR EDUCATION COMMITTEE.—Darroch and Espie, electric light installation in eight blocks of 23 houses.

PLYMOUTH CORPORATION.—A. Reyrolle and Co., Ltd., twelve months' supply of switchgear. (Renewal.)

BRIGHTON CORPORATION.—W. A. Gooding and Sons, renewing electrical installation at open market, £420.

STOKE-ON-TRENT AND WOLSTANTON GUARDIANS.—Barnett and Soans, cables to proposed new nurses' home, £2 537.

LONDON, MIDLAND AND SCOTTISH RAILWAY CO.—Edison Swan Electric Co., Ltd., supply of electric lamps for 12 months ending December, 1930.

METROPOLITAN ASYLUMS BOARD.—Alpha Manufacturing and Electrical Co., Ltd., alterations to electric lighting at South-Western Hospital, £130.

CENTRAL ELECTRICITY BOARD.—General Electric Co., Ltd., six 30 000 kVA three-phase transformers, for Mid-East England Electricity Scheme.

Conversion of Street Lamps.

PITLOCHRY DISTRICT LIGHTING COMMITTEE.—J. Scott and Son, converting 57 lamps from gas to electricity and supply of 22 additional lamps, £309.

KETTERING URBAN DISTRICT COUNCIL.—Union Cable Co., Ltd., supply of e.h.t. cable, £6 020; Croydon Cable Works, Ltd., supply of l.t. cable, £8 505.

NATIONAL COMMITTEE FOR TRAINING OF TEACHERS.—J. Foggo and Son, electric light installation, etc., at Demonstration School, Edinburgh, £1 357.

BANGOR (CO. DOWN) CORPORATION.—Johnson and Phillips, Ltd., laying pilot circuit and telephone cable between Bingham Street station and the pumping station, £398.

GLASGOW CORPORATION.—General Electric Co., Ltd., e.h.t. switchgear for Pinkston power station, £32 080; Dorman Long and Co., Ltd., supply of tramway rails, £25 250.

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., supply and erection of rotary converting plant and switchgear (revised tender), £7 173. (Recommended.)

BRADFORD CORPORATION.—Yorkshire Repetition Casting Co., Ltd., supply of 60 tons of tramway hand brake shoes, £517 10s., and 60 tons of brake blocks, £510; English Electric Co., Ltd., supply of 100 tramcar motors, £96 15s. 6d. each; F. Ashcroft, electric lighting installation at Thornton Baths, £234.

RUGBY RURAL DISTRICT COUNCIL.—W. G. M. Robinson, electric lighting in connection with the following housing schemes: Wolston, 26 houses, Brandon, 12 houses, erected; Dunchurch, 16 houses, Newton, eight houses, Churchover, 12 houses, in course of erection, from £4 4s. to £4 19s. 6d. per house.

STOKE-ON-TRENT CORPORATION.—D.P. Battery Co., Ltd., renewing plates of storage battery, £229; Callender's Cable and Construction Co., Ltd., supply of mains and cables for 12 months; Metropolitan-Vickers Electrical Co., Ltd., supply of static transformers for 12 months; General Vehicle Co., Ltd., supply of 15 cwt. electric mains van, £404 5s.

GENERAL POST OFFICE.—Cable: supply, delivery, drawing-in and jointing, Manchester-Chester, British Insulated Cables, Ltd.; Reading-Oxford, W. T. Henley's Telegraph Works Co., Ltd; Chester-Whitchurch, W. T. Glover and Co., Ltd.; Dundee-Aberdeen and Southampton-Basingstoke, Pirelli-General Cable Works, Ltd.; electric lift, Sunderland Telephone Exchange, W. Wadsworth and Sons, Ltd.

DEWSBURY CORPORATION.—Rotary conversion plant at electricity works: 500 kW rotary convertor (with Yorkshire transformer), Harland Engineering Co., £1 285; 1 500 kW motor convertor, Bruce, Peebles and Co., Ltd., £3 200; d.c. switchboard, Electric Construction Co., Ltd., £1 549; battery switchgear, Tudor Accumulator Co., Ltd., £195 16s.; cable, Power and Lighting Cables, Ltd. (for German cable), £2 439.

METROPOLITAN WATER BOARD.—Palatine Engineering Co., Ltd., provision of two water level transmitters and recorders for the Bishop's Wood reservoir, to record at Kempton Park and Fortis Green pumping stations respectively, £178. (Recommended.) Also tendered: Gent and Co., Ltd., £257; Isenthal and Co., Ltd., £267; Glenfield and Kennedy, Ltd., £372; Telechron Electric Transmitter Co., £375; G. Kent, Ltd., £423.

LOWESTOFT CORPORATION.—Callender's Cable and Construction Co., Ltd., supply of equipment and erection of h.t. mains in connection with transmission to Kessingland, £9 399. (Recommended.) Also tendered: W. T. Henley's Telegraph Works Co., £9 824; Siemens Bros. and Co., Ltd., £9 809; Johnson and Phillips, Ltd., £9 782; British Insulated and Helsby Cable Co., Ltd., £9 788; Standard Telephones and Cables, Ltd., £9 715; W. T. Glover and Co., Ltd., £9 657; Pirelli and Co., Ltd., £9 564.

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ELECTRICITY SUPPLY.

Crediton Undertaking to be Sold—The Pangani Falls Project—Burnley and the Wireless Listener—Supply on the North-East Coast—Hastings' Big Scheme—The London Joint Authority.

REIGATE T.C. is about to have 50 gas lamps in the borough converted to electricity.

Subject to a loan of £10 000 for mains extensions being sanctioned, Kingston-on-Thames T.C. will extend the mains to several additional thoroughfares.

Poplar (London) Housing Committee has arranged with the Borough Council's electricity department for the maintenance of lighting services in the Council's houses and flats at 3s. per tenement per annum.

Hammersmith (London) Electricity Committee recommends that sanction be sought from the L.C.C. to the raising of the supply pressure from 110 V, which operates in the major portion of the borough, to 230 V.

Battersea (London) Electricity Committee has authorised electricity services to 91 premises at a cost of £903; extensions of mains for private services at a cost of £1 936 and replacement with armoured cable of old vulcanised bitumen distributors at a cost of £2 134.

Crediton U.D.C. has decided, subject to the approval of the Commissioners, to dispose of the electricity undertaking to the Whitehall Securities Corporation for £15 000, which will give a profit of £4 000 on the price the Council paid for the works some three years ago.

One of the last remaining areas in the Wirral peninsula was connected with Birkenhead Corporation's electricity supply last Saturday when Mr. C. W. Constantine, chairman of Wirral R.D.C., switched on the supply to the Burton district, the ceremony being witnessed by members of the Corporation and the R.D.C.

Negotiations are proceeding satisfactorily between the Tanganyika Government and Power Securities, Ltd., represented by Major Conrad Walsh, in matters relating to the generation of electric light and power from the Pangani Falls and the electricity supply of Dar-es-Salaam and other towns on the Central Railway. An account of the Pangani Falls project appeared in our issue of January 3rd.

Bury (Lancs) T.C. has received sanction to a loan of £6 660 for plant and incidental works in connection with extensions to the central power station. The Central Electricity Board has approved of the renewal of a portion of the h.t. switchgear at an estimated cost of £27 000, including buildings.—Slot meters are to be installed in Corporation houses where the supply has been discontinued on account of the non-payment of charges.

In reference to the application of Barnes U.D.C. for consent to extend its generating station, the Electricity Commissioners have notified that they are not satisfied that the Council would be in a position to give a supply of electricity adequate in quantity and regularity to meet the present and prospective demands of their consumers at a cost not greater than that at which they could give a supply if they obtained it from the London and Home Counties Joint Electricity Authority. The Commissioners have accordingly decided to refuse the consent applied for.

Guildford Electricity Committee recommends central lighting for the High Street. The main in Epsom Road is to be replaced by a larger one, at an estimated cost of £656. The Electricity Committee has considered an application from Messrs. Messenger and Morgan to complete the laying of mains on the Farnham Road estate. The borough electrical engineer reported that the estimated cost would be £762. It was decided that, having regard to the fact that this estate is not being developed rapidly, the owners be requested to bear 75% of the cost of laying the mains.

Owners of wireless sets in Burnley affected by the change-over from d.c. to a.c. resent the policy of the Corporation in disclaiming any responsibility. Mr. J. E. Starkie, borough electrical engineer, states that there is no precedent for the compulsory changing of wireless apparatus by electricity authorities; the revenue obtained from electricity for wireless apparatus is practically negligible, and is entirely disproportionate to the expense involved in alterations. The cost to the department, if the Corporation compensated every wireless user, would be between £12 000 to £15 000, equivalent to a 6d. rate.

Mr. Chas. Turnbull, borough electrical engineer, has reported to Tynemouth Electricity Committee that it has been definitely arranged that the North-East Coast shall change over from 40 periods to 50 periods. The scheme involves the building of a new super power station on the North-East Coast, and when such station is completed two supplies will be available—a 40-period supply and a 50-period supply. Arrangements will be made for transferring gradually over from one to the other supply.—There has been an enormous increase in the Corporation's meter department, and it is proposed to extend and improve the arrangements for meter testing.

Taunton T.C. has approved a recommendation of its electricity committee to borrow £15 000 to meet the cost of replacing existing cables and transformer sub-stations which had been in use for 25 years and upwards, and to provide for further cables in anticipation of additional supplies of electricity being required. The Unemployment Grants Committee is to contribute 30% of the loan charges.—The Council has also adopted a scheme for the free wiring of small dwellings, prepayment meters to be fixed and set to provide for an additional charge of threepence per unit to cover maintenance. Not less than two adjoining houses will be wired at one time.

Hastings Corporation's scheme for the electrification of an area which covers 250 sq. miles and embraces the boroughs of Rye and Winchelsea, the urban district of Battle, and the villages of Broad Oak, Brede, Waites Farm and Fairlight Cove; Pett, Icklesham, Beckley, Northiam, Sedlescombe, Westfield will cost upwards of £100 000. At Winchelsea and in the villages, except Northiam, the transfer was made from oil and candles to electricity. Farms are using the supply for motive power, milking, chaff cutting, water pumping, etc., in addition to lighting and heating. The Corporation has recently adopted a further scheme for extensions to more remote districts.

Seaham Harbour Housing Committee has decided to invite the Electrical Engineer to submit a tender for the wiring of the 80 cottages now in course of erection on the Carr House estate.—The Electricity Committee has approved the scheme submitted by the Engineer for the provision of an alternative source of supply, at an approximate cost of £4 000, and provisional arrangements made for the submission of the scheme to the Electricity Commissioners and the Unemployments Grant Committee and for approaching the Power Supply Co. for assistance in connection therewith.—The Committee reports an increase of rather more than 50% in the consumption of energy, compared with the corresponding month of last year.

A return issued by the London and Home Counties Joint Electricity Authority gives particulars of the output and an analysis of the accounts of each of the undertakings authorised to supply electricity in the Authority's area. These include 93 undertakings with 62 generating stations, and the total quantity of electricity generated in such stations during the year ended March, 1929, was 2 175 491 000 kWh, and electricity purchased increased the total to 3 236 625 632 kWh. The quantity sold, exclusive of bulk supplies, was 1 758 752 078 kWh, against 1 493 880 881 kWh in the previous year. Total working costs were 0·71d. per kWh sold, against 0·82d., and the gross surplus on the year's working was £8 005 061. Electricity generated by railway and tramway undertakings and not included in the above figures, was 863 077 995 kWh.

Brighton Lighting Committee is to lay a new feeder from the Lewes Road station at a cost of £3 300. The committee has decided to establish a sub-station at Warren Farm and lay a ring main extension to Rottingdean, at a cost of £12 433.—Mr. W. M. Selvey, who has been called in to advise in connection with the grit and dust trouble from the chimneys at Southwick, advises that certain equipment be installed to enable him to carry out experiments. He recommends alterations to ducts in connection with pulveriser vent to furnace through the primary air fans, estimated cost, £200; construction of temporary wooden flue for carrying off effluent to the beach, £150; installation of circulating pump for spray washers, piping, etc., £375; and modern type sprays for precipitating finer particles of dust, £75. The Committee has authorised the Engineer to put the works in hand.

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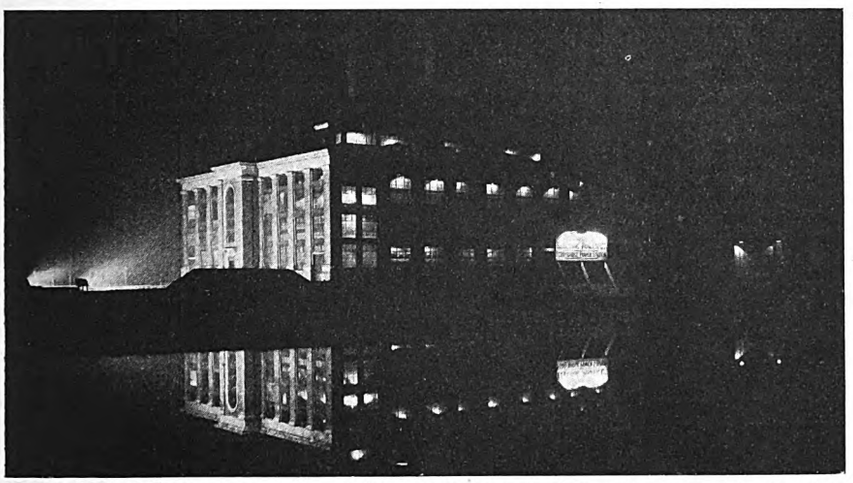
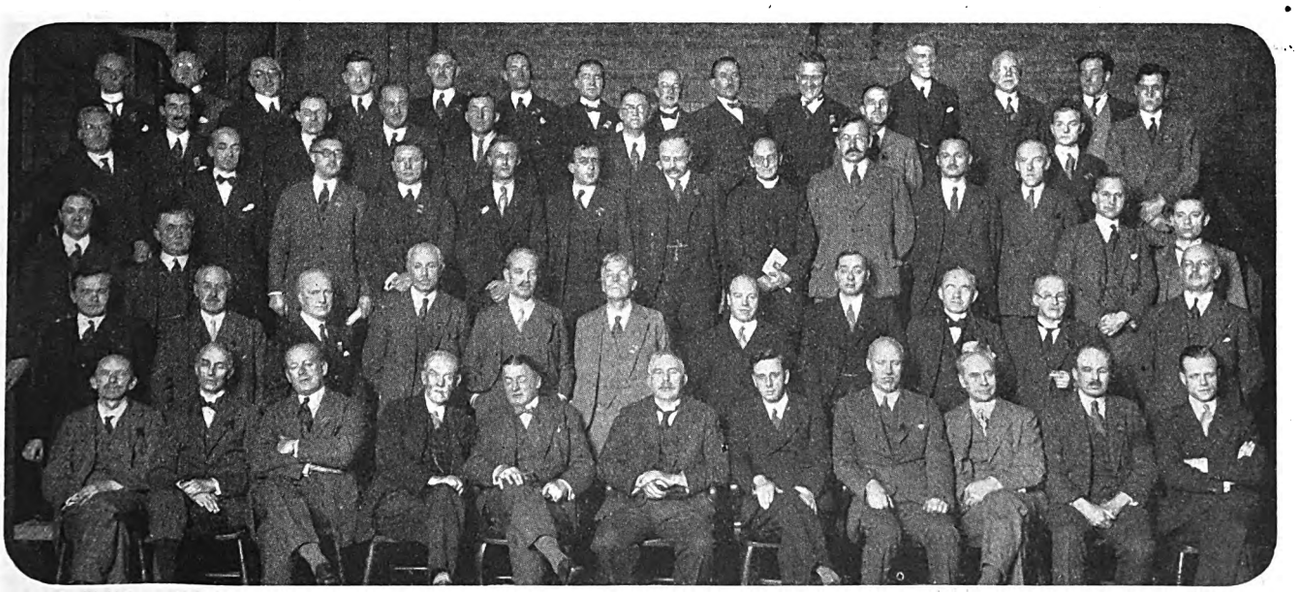
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

The Faraday House Old Students' Association and Faraday House Rugby Club gave a successful supper dance at the Hotel Russell, Russell Square, London, W.C., on February 26th. Over 200 old and present students and their friends attended, and some of the revellers may be recognised in this group taken during the early part of the evening.



An unusual and attractive view of the Ferrybridge station of the Yorkshire Electric Power Co. The floodlighting of power stations is a form of propaganda which could very usefully be developed, and if treated in the right way would do much towards popularising the idea of floodlighting public and other buildings.

Mr. Harold L. Thomson, chief engineer and general manager of the Cannock electricity department, whose death is referred to on page 309.



Some well-known faces in the electrical engineering world are seen in this group taken at the works of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, on the occasion of the official opening of the new high tension laboratory on February 28th. A description of the building, together with photographs taken during some of the tests, are given on pages 295-297.

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COMPANY NEWS.

Decline of Cables and Wireless Ordinary Stocks—Southern Railway Main Line Electrification—Directors' Reports and Dividends—New Companies.

CABLES and Wireless issues continue to absorb attention. The definite confirmation by the Postmaster-General of the long-current rumours that the Post Office does not intend to make use of the Marconi beam stations for its overseas telephone service, has elicited a reply from Imperial and International Communications, Ltd., in a letter to the Prime Minister, which makes out a strong case for a full inquiry into the subject and reconsideration of the important issues at stake. The one undoubted fact that already emerges is that the sympathetic fall which has taken place in Cable and Wireless stocks far and away exceeds the amount of any rental which would have been received from the Post Office, and is entirely unjustified. Shareholders, however, have become unsettled, and continue to sell, with the result that the "A" stock is down to 56, and the "B" to 26.

American Telephone and Telegraph capital stock is 5 points higher at 245, and Radio Corporation of America shares are nearly 50. Hydros are quoted over 44⅛ without the dividend. Home manufacturing favourites have been weak, Electric Constructions falling from 15s. to 11s. 3d., Insulateds, Callender's and Consolidated Signals losing half-a-crown apiece, and Henley's and Enfields 1s. 3d.

At the annual meetings of the shareholders of the Underground Electric Railways Co. of London, Ltd., and the companies which it controls, including the London Electric, City and South London and Central London Railway Companies, the Metropolitan Electric and London United Tramways, the South Metropolitan Electric Tramways and Lighting Co., the London and Suburban Traction Co. and the London General Omnibus Co., Lord Ashfield said passengers carried showed some small advance upon 1928. The total number carried by railway, tramway, and omnibus amounted to 2 175 000 000. They had put before the Government a programme for raising and expending some £13 500 000 for the extension and completion of their railway system. The gross income of the Underground Co. amounted in 1929 to £1 182 533, increase £28 735. See also p. 318.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	" " "C" Cum. Pref. ..	21/-	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	61/3	61/3	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	80	80	81	77½
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95¾	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/-	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	35/7½	35/7½	44/6	26/6
8	" " " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	44/4½	44/4½	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	45/7½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6*	13/9	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P... ..	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	87	87	92	80½
—	Hydro Electric Securities.. ..	44⅛*	42⅞	87	20
—	International Holdings	4⅞	5	35½	6
(e)	Kensington & K'bridge Ord. (£1)	26/6	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9⅝	Lon. Elec. Sup. Ord. (£1).. ..	27/-	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	99	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
1/9⅝	Metro. Elec. Sup. Ord.	40/-	40/-	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
[illegible]	Mid. Counties E.S. Ord.	28/-	28/6	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	32/6	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1 2⅝	N'castle-upon-Tyne Elec. Sup. Ord..	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅞	10⅞	11¼	9⅞
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(c)	St. James' & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94½	94½	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	58/9	58/9	69/-	46/3
1/9⅝	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/-	24/-	25/4½	18/9
6	" " 1st Mt. Deb. ..	103½	103½	106	97½
8	Yorks Elec. Power Ord.	31/10½	31/10½	38/9	24/6
6	" " " 6% C.P. ..	23/-	23/-	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	90½	90½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	" " " " 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	13/1½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
4	Cent. Lon. Ry. Ord. Stk. (asstd.)..	73	73	74¾	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	76½	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	79	42½
4	" " " " 4% Pf. Stk.	72	72	77	68
4	" " " " 4% Deb. ..	76½	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " " 5% Deb. ..	70½	70½	72¾	65½
3½	Met. Rly. Cons. Ord. Stk. ..	65	64½	81	54½
3½	" " " 3½% Pf. Stk. ..	62	62	76	60½
3½	" " " 3½% Deb. ..	67½	67½	73¾	67½
5	Met. Dist. Rly. Ord. Stk. ..	74½	74½	81¾	52½
4½	" " " 4½% 1st Pref. ..	80½	80½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118¾	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	86½	86½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	23/6	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	55	57	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	26/6	26/6	58/6	26/3
8	" " " 8% C.P.	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	77/6	99/4½	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153¾	120
15	Callender's Cable Ord.	72/6	75/-	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	35/-	37/6	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	15/-	32/6	23/6
7	" " 7% C.P. ..	18/9	20/-	22/9	20/-
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	96/3	97/6	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb... ..	65½	65½	107¾	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	17/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/6	28/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	46/3	81/3	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	120/-	121/3	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	25	26½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	245	240	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3⅜	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk.	101½	102½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	21/10½	21/10½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	56	60	90½	73½
—	"B" Ord. Stk.	26	30½	104	33
—	5½% Cum. Pref. Stk. ..	96	96	99	90
3½	Eastern 3½% Pref. Stk.	63½	63½	70½	58½
4	" 4% Deb.	77	77	82½	73
4	Eastern Extension 4% Deb. Stk.	76	76	80½	73
22	Great Northern Telegraph (£10)	30½	30½	43½	26
—	International Teleph. & Teleg. ..	$71½	$72½	161½	48½
15	Marconi Int. Mar.	45/-	42/6	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	97½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	49½	46	115¾	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	87½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(a) 19⅜d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7.181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅜d. per share.
*Ex dividend.

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Directors' Reports, etc.

GENERAL ELECTRIC CO. OF NEW YORK.—Qrtrly div. of 40 cents on new stk. has been declared.

HYDRO-ELECTRIC SECURITIES CORPORATION.—Qrtrly div. of 50 cents on common shs. is announced.

FARNHAM GAS AND ELECTRICITY CO.—Rev. £63 321, exes. £44 104. Fin. div. on ord. 3¾%, makg. 7½%. Fwd. £4 123.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Qrtrly. div. of 3/ p. sh., less tax, on pref. and 5/ p. sh. net on ord. will be payable on March 31.

CENTRAL STATES POWER AND LIGHT CO.—The company has acquired ownership of Canada Electric Co. and Eastern Electric and Development Co.

TYNEMOUTH AND DISTRICT ELECTRIC TRACTION CO., LTD. Half-yearly div. on 5 % cum. pref. shs., due March 15, is postponed, as financial results of 1929 workg. does not justify paymt.

WASTE HEAT AND GAS ELECTRICAL GENERATING STATIONS, LTD.—Fin. div. of 5½%, makg. with intm. div. paid in Aug., 1929, total div. of 8% for year ended Jan. 31, 1930, has been declared.

SOUTH METROPOLITAN ELECTRIC TRAMWAYS AND LIGHTING CO., LTD.—Net blce. from workg. for 1929, £57 651, less provisn. for renewals and res. £30 000, div. of 5% proposed. Fwd. £11 790, agst. £11 139.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—Pft. for 1929, £98 482 ; brt. in £21 904. Div. on ord. cap., 9%, less tax, of wh. 4½% was paid in Aug., 1929, on shs. issued prior to 1929. To res. £17 500 ; fwd. £23 657.

BERLIN TELEPHONE FACTORY CO.—This company's loss for year 1928 was £174 500 ; and the board recommends acceptance of an offer by Standard Electricity Co., of America, to take over sh. cap. at the rate of 70%.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—Directors propose fin. div. of 4% actual, makg. 8% for year 1929, on "A" ord. shs. and div. of 7½% for year on "B" ord. shs., both less tax.

DAVIS AND TIMMINS, LTD.—Net pft. for 1929, £26 068, agst. £23 417. Blce. div. on ord., 12%, makg. 20% for year (same) ; to gen. res., £4 912, agst nil ; to income tax acct. £1 153, agst. nil ; fwd. £20 819, agst. £21 317.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Net rev. for past yr., £79 127. Fin. div. of 6% recommended, makg. 10% ; to depreciatn. £38 973 ; to obsolescence of plant and machinery £10 000 ; to gen. res. £7 000. Fwd. £9 770.

LAUNCESTON AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Rev. receipts for 1929, £5 212, agst. £5 217; gross pft., £2 798; net pft., £1 596, plus £1 653 brt. in. To res., £600 ; depreciatn., £1 000 ; ord. div. for year 8 %, tax free, £512 ; fwd., £1 136.

LIVERPOOL OVERHEAD RAILWAY CO.—Receipts for 1929, £95 339, working exes., £78 360 ; to contingency fund, £400 ; int. on deb. stk. £6 755, surplus £9 824, plus £3 730 brt. in. Div. for year on pref. shs. 5 % payable March 13. Fwd. £5 623.

ENFIELD CABLE WORKS, LTD.—Fin. div. on ord. shs. of 10%, with cash bonus of 5%, making 25% for year, compared with 30% (= 20% p.a.) for preceding 18 months. An issue of 50 000 £1 shs. was offered to ord. shhldrs at £2 p. sh. last week.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—On March 20 shhldrs. will meet to consider a plan under which it is proposed to convert the ord. and pref. cap. into shs. of no par value and to take power to issue 400 000 new shs. of no par value.

DUBLIN UNITED TRAMWAYS CO. (1896), LTD.—Net rev. for 1929, £86 240, agst. £152 961 ; amt. available £62 638. Div. at rate of 6% p.a., less tax, to be paid on pref. stk. for half-year endg. Dec. 31, 1929 ; set aside towards renewal of track, £20 000. Fwd. £12 038.

AMERICAN COMMONWEALTH POWER CORPORATION.—Gross earngs. of corporation and affiliated companies for year to Jan. 31, 1930, $25 857 407, agst. $17 903 764 ; net earngs. $115 227 42, agst. $7 077 798. Blce. for reserves, taxes, common stk. divs. and surplus, $3 887 252, agst. $2 599 794.

INTERNATIONAL LIGHTING ASSOCIATION.—Net pft. for 1929, £1 405, agst. £1 270. After paying pref. div. for 1929 and directors' fees for 1928 and placg. £366 to special res. for pref. div., carry fwd. is £50. Holdg. of 6% pref. shs. of Para Electric Railways and Lighting Co. remains as before, but div. on same is 7 years in arrear.

ELECTROBEL CO.—This company is to be reorganised for the purpose of organising on a sound basis the production and distribution of electricity throughout Belgium. The company's activities will be placed under the control of the Société Générale, the Banque de Bruxelles, the Banque de Paris et des Pays Bas, the Mutuelle Solvay, and the Sofina Co.

NORTH AMERICAN CO.—Income statemt. of company and subsidiaries for 1929 shows $26 986 790 for common stk., after mtg. exes. and providg. for depreciatn., reserves and pref. divs. Earngs. equal to $5.03 p. sh. on average number of common shs. of parent company outstandg., agst. $4.68 p. sh. Output of subsidiaries 6 772 637 073 kWh, increase 10·97%.

RUSHDEN AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Net rev. for 1929, £7 696, agst. £6 864, after placing £5 027, agst. £3 007, to depreciatn. Deb. int., £1 663, agst. £1 434 ; loan int., £250, agst. £202 ; income tax, £324, agst. £25 ; to res. £500 (same), deb. exes., £500, agst. nil ; fin. div. 4½%, makg. 8% (same) ; fwd. £1 259, agst. £1 250. Output increased from 2 256 707 kWh to 3 056 654.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—Gross rev. for 1929, £1 019 502, agst. £901 753 ; carried to net rev. acct. £348 201, plus blce. brt. in and int. and divs. from investmts. and allied undertakgs., makg. total £494 736. Blce., after provn. for deb. stk. and loan int., sinkg. fund. pref. div., etc., £234 746. Div. on ord. shs. at rate of 14% p.a. recommended. makg. 10% for year. Fwd. £84 746.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Pft. on workg. for 1929, £171 833, plus £25 437 brt. in and int. from investments, etc., £46 939. Deductg. int. charges, £23 494, and provisn. for sinkg. funds £33 994, left blce., £186 721, agst. £181 206. Fin. divs. of 3% on pref. shs. and 5% on ord. shs. makg. 9% for year, are recommended. To special res. fund (ord. shhlders' benefit under sliding scale for year) £90 941. Blce. £46 832, allocated to co-partners. Electy. sold 248 144 007 kWh, agst. 203 711 271.

LANCASHIRE DYNAMO AND MOTOR CO., LTD.—Pft. for 1929, after charging £7 535 for depreciatn. and obsolescence, and £2 399 for deb. int., £18 157, agst. £21 003. Div. 5% (same), directors' fees £700 (same), res, £5 000 (same), fwd. £7 227, agst. £7 809. During year extnsns. have been made to works of Crypto Co., in view of which a further 12 250 of their ord. shs. have been taken up. Severe competitn. has continued, reducg. prices to an unremunerative level. Amt. of orders on hand is greater than has been the case for some considerable time.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has granted official quotations to £52 730 7½ % non-cum. "A" ord. stk., £27 412 "B" ord. stk. and £50 516 5½% cum. pref. stk. of Cables and Wireless, Ltd. ; 867 066 ord. shs. of no par value of the Brazilian Traction, Light and Power Co., Ltd. ; 600 000 5s. fully paid ord. shs. of Crampton Parkinson, Ltd. ; 200 000 £1 fully paid ord. shs. of James Keith and Blackman Co., Ltd. ; and 150 000 £1 fully paid 6% cum. pref. shs. of the Shropshire, Worcestershire and Staffordshire Electric Power Co.

CABLE, TELEPHONE AND GENERAL TRUST, LTD.—Net rev. for 1929 £35 909, agst. £26 202, plus £1 050 brt. in. Directors recommend div. on ord. shs. of 6%, agst. 4%. Fwd. £3 706. Authorised cap. was increased in July last from £550 000 to £710 000 by creatn. of 145 000 "A" preference shares of £1 each and 15 000 ord. shs. of £1 each, and a total of 160 217 shs. was issued. As a result of changes in investmts. during year a credit blce. has arisen, wh. has bn. applied in writg. off office furniture and fittings, and blce. has been deducted from figure of other investments in blce.-sheet.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Net pft. for 1929, £36 650, plus £10 663 brt. in. Directors propose blce. divs. on 1st pref. shs. in respect of 6 months to Dec. 31 at rate of 3%, accrued divs. on 2nd pref. shs. in respect of 3 months to Dec. 31 at rate of 1¼%, makg. 5% for year ; and blce. div. on ord. shs. at rate of 10·1811d. p.sh., makg., with intm. div. already paid, standard div. for year of 1s. 7·1811d. p. sh. To special res.—ord. shhldrs' benefit under sliding scale, £10 317 ; appropriation to co-partners, £3 998 ; fwd., £2 123. Electricity sold 19 448 096 kW, agst. 16 404 067, increase 18·56%.

Company Meetings.

ENGLISH ELECTRIC CO., LTD.—At the adjourned meeting of the 6% debenture stock holders last Friday, Mr. W. L. Hichens, chairman, announced that the number of votes polled for the resolution approving the proposed reorganisation of capital, which was discussed at the meeting on February 25th, was 769 401, and the number against was 9 100. He therefore declared the resolution carried by the requisite majority.

UTILITIES AND GENERAL TRUST, LTD.—Mr. Wm. Shearer, presiding at the meeting on February 27th, said one found in

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reviewing the past year an inflation of prices to points where yields did not enter into calculation, followed by sensational declines, rapid changes in the price of money, and abnormal unsettlement of exchanges. Keeping in view all the happenings of the last six months, it is not surprising that they should have suffered depreciation, and this amounted to approximately 8% on the figure at which investments stood in the balance-sheet. The investments stood in the balance-sheet at £851 609. Income amounted to £52 065, against £38 173. There was a net profit of £25 448, to which had to be added the balance brought forward of £3 170, making a total available of £28 618. There had been paid dividend on 5% preference stock for the year, and interim dividend on ordinary stock of 3 per cent. It was proposed to pay a final dividend of 3% less tax on the ordinary stock, and carry forward £3 118 1s. 1d. The report and accounts were adopted.

Mersey Railway Co.—Mr. James Falconer, presiding at the meeting last Friday, said the net receipts from railway working for 1929 at £89 294, showed an increase of £5 942, and the Board recommended a dividend on the ordinary stock of ¾%, against ½% for last year. Some time ago the Rt. Hon. J. H. Thomas, Lord Privy Seal, intimated that he had approved an application by the London Midland and Scottish Co. for the electrification of the Wirral section of that railway. The electrification of the Wirral Railway was, of course, a matter primarily for the L.M. and S. Co., but it was a step which the Mersey Co. would cordially welcome. The Mersey Railway was in a position, at comparatively small expenditure of capital, and at short notice, to take part in a joint service, and. deal efficiently with all traffic to and from the Wirral area He need not dwell on the important development in that area which might be expected from an adequate service of electric trains between it and Liverpool. The Board assured the L.M. and S. Co. of their readiness to co-operate with them in affording to the public a frequent service of through trains.

Northampton Electric Light and Power Co., Ltd.—At the meeting last Friday, Mr. F. H. Thornton (chairman) said their net capital expenditure during the year was £122 255, making their total capital expenditure £1 385 513. Revenue from sale of current had risen from £158 487 to £190 917, and electricity sold from 26 500 000 to 33 000 000 kWh. During the past year approximately 40 miles of high and low tension mains had been laid in the area covered by the Brackley, Buckingham and Winslow Order. They had purchased the distributing plant and goodwill of the Buckingham Electric Light Co. Brackley and four villages in that neighbourhood had been connected. The use of cookers, the design of which had been much improved lately, had grown enormously. Many large country houses and even cottages used no other form of cooking stove, and automatically controlled electric water heaters were growing in popularity. They had also adopted assisted wiring schemes. It was proposed to pay a final dividend of 6% on the ordinary shares, making 10% for the year. The report and dividend were approved.

Mather and Platt, Ltd.—Mr. L. E. Mather, presiding at the meeting last Friday, said the directors were able to report an increase of profit on the previous year of £27 000, which, with the smaller amount brought forward, still gave a slightly larger sum available for distribution. This profit was arrived at after full depreciation had been made, as hitherto. They therefore recommended the same dividend and bonus as last year, leaving £109 855 to be carried forward. The results now shown had been produced by a larger turnover in all departments. He would like to say a few words with regard to Russia. The reopening of diplomatic relations between Great Britain and the U.S.S.R. gave them confidence that more business might now be possible. It was encouraging to find that British exports for the last three months of 1929 were nearly three times what they were for the same period of 1928. Unfortunately, these exports largely consisted of raw materials, but the need for manufactured goods was great. The demand for their own productions had not yet revived, but one of their representatives was again in Moscow, and they hoped more business would result. The report was adopted.

Electrical Distribution of Yorkshire, Ltd.—Mr. R. W. Wickham, presiding at the meeting on Tuesday, said for 1929 they had a profit of £96 481, which enabled them to pay nearly £20 000 more in dividends than last year, to put away £17 500 to reserve, and to slightly increase the carry-forward. The results put before the shareholders to-day had certainly exceeded his expectations. Trade in the company's area had been very difficult, and to have produced such figures as these reflected the greatest credit on Mr. Woodhouse and all his staff. This coming year they would feel the full burden of the dividend on the new capital, and to maintain their dividend would require another £24 000. On the other hand, they paid £11 000 odd in bank interest He was quite prepared to repeat his last year's prophecy that they would be able to pay their usual dividend for 1930. In 1921 the total units sold, excluding traction and large power, was 1 379 000. Their sales last year were 16 608 000. In 1921 the average price per unit sold was 4·6d. per unit; in 1929 it was 3·1d., a drop of 32%. At the end of 1923 the issued capital was £150 000. Since that date four issues had been made, bringing the total capital issued to £1 400 000. The shares issued last year were offered at 5s. premium, and after paying the costs of the issue the balance was added to the share premium account, bringing that account to £315 615, which was available with the reserve fund for depreciation and other purposes. The company had been authorised during the past year to supply electricity for all purposes under new Orders, which increased the company's area of supply to 1 197 square miles, with a population of 744 000. The report and accounts were adopted.

Southern Railway Co.—At the meeting on February 27th, Brig.-Gen. Everard Baring (chairman) announced that under the remission of the railway passenger duty the board had decided to proceed with the electrification of the London to Brighton and Worthing lines. This extension presented a different problem from the electrification of the suburban lines. They had not only to decide the type of motor and the type of carriage best suited to the requirements, but also whether the system should be worked on the higher or the lower of the voltages laid down in the Order about to be issued by the Ministry of Transport. This Order would prescribe a maximum voltage of 750 for trains worked under the third-rail system and a maximum of 1 500 for a system worked by means of overhead conductors. It might be desirable to recall that in 1923 the company decided to adopt the 660 V third-rail system as a standard, in preference to a higher voltage system. Nearly 800 miles of line had been electrified at 660 V, and any increased voltage which it would now be practicable to adopt for the present scheme would confer no benefit. They therefore decided that the extension to Brighton and Worthing should be worked on the same voltage. They had decided to adopt the multiple unit system rather than electric locomotives. It was proposed that south of Coulsdon electricity should be obtained from the "grid," and this would be supplied through sub-stations at Croydon, Three Bridges, and Southwick. Supply would be given at each point as three-phase energy at a pressure of 33 000 V between phases and a frequency of 50 cycles per second. North of Coulsdon electricity would be supplied from Deptford, with the exception of a small portion which would come from Durnsford Road. The steam train mileage that would be discontinued amounted to about 1 972 000 miles per annum. They proposed to substitute for this an electric train service with a mileage of about 4 921 000, thereby providing an increase in the train service of no less than 150%. The total cost of the whole scheme, including the resignalling of the line from Purley to Brighton, was estimated at £2 700 000.

Underground Railways.—Lord Ashfield presided on February 27th at the annual general meetings of the Underground Electric Railways Co. of London, Ltd., and the companies which it controls, including the London Electric, City and South London and Central London Railway Companies, the Metropolitan Electric and London United Tramways, the South Metropolitan Electric Tramways and Lighting Co., the London and Suburban Traction Co. and the London General Omnibus Co. The chairman said passengers carried showed some small advance upon 1928. The total number carried by railway, tramway, and omnibus amounted to 2 175 000 000. The tramways carried 9% of this total, the railways 18%, and the omnibuses 73%. During last year the passengers carried by the railways increased by 7%, those carried by the tramways increased by 4%, and those carried by the omnibuses by just over 1%. In 1929 the total car miles run by the companies in that group were 281 000 000, an increase of ¾%. Since 1918 they had spent £29 000 000 upon the provision of traffic facilities, but it was not enough. They had put before the Government a programme for raising and expending capital to the extent of some £13 500 000 for the extension and completion of their underground railway system. The common fund for 1929 amounted to £1 150 426. It was £22 761 less than in 1928. The total amount appropriated to reserves for contingencies and renewals by this group of companies was £813 357, and, including certain

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miscellaneous provisions for the equalisation of expenditure and other purposes, the sums set aside in 1929 amounted altogether to £1 161 676, or £14 128 more than in 1928. In this last year the receipts of the three tramway companies from traffic amounted to £1 275 552, an increase of £48 007. Steps had been taken, in anticipation of assistance, for the construction of 46 new tramcars for working the Uxbridge Road. The gross income of the Underground Co. amounted in 1929 to £1 182 533, an increase of £28 735, due chiefly to the interest and dividends received from the increased holdings in the stocks and shares of the North Metropolitan Electric Power Supply Co. The expenses of the company, including the interest charges, required £587 786, a reduction of £16 372. The reports and accounts of the several companies were adopted, and the dividends, as set out in our issue of February 21st, were approved.

MIDLAND COUNTIES ELECTRIC SUPPLY CO., LTD.—Mr. George Balfour, M.P., presiding at the meeting on Monday, said he was glad to be able to report continuation of the progress of the business of the subsidiary companies owned by that company. With an expenditure of something like £400 000 per annum in recent years, largely for providing services in new territory each year, it was no small achievement to be able not only to maintain but to increase the dividend so as to provide a moderate return on the shareholders' capital. Compared with the movement of capital, the trading balances had grown from £48 391 in 1919 to £349 209 in 1929, of which £340 000 was from electricity supply. The balance of the transport earnings, amounting to £23 000, was left as depreciation in the subsidiary companies. With regard to the power and lighting properties, the electricity sold during the past year aggregated 165 602 000 kWh, an increase of 32 006 000, or 24 % over the output for 1928. The output for 1929 was more than three times that of 1924. An additional 5 604 consumers were connected during the year, bringing the total up to 26 181. In 1919 the number was 2 567. The total load connected was now 125 180 kW, an increase of 19 880 kW compared with the previous year. The maximum load on the generating plant was 50 400 kW, to which must be added 1 200 kW obtained from other sources, or a total of 51 600 kW, compared with less than 5 000 kW in 1919. Extensions in the transmission and distributing system involving the provision of 118 miles of e.h.t. lines and 135 miles of l.t. distributors, had been brought into operation during 1929. They now owned 746 route miles of extra high pressure line and 598 route miles of l.t. line. The accounts showed an available balance of £158 578, and it was proposed to pay a dividend at the rate of 7 % on the ordinary shares. If the Coal Mines Bill was passed in its present form, it was very probable that the cost of coal would be increased, and the additional cost would be passed on to the public. An advance of 1s. per ton would mean an increased burden upon the company's consumers of £8 000 per annum. Whatever legislation was sound and necessary they must accept, take the rough with the smooth, but he could hardly believe that this artificial attempt to readjust industry could be of any benefit to the country. A proposal to increase the authorised capital by £500 000 to £4 500 000 was approved.

New Companies.

COMMERCIAL RADIATORS, LTD.—Cap., £700. Electrical and general engineers. Reg. Office: 4, Vicarage Mews, Blackboy Lane, London, N.15.

RADIO IMPROVEMENT CO., LTD.—Cap., £500. Wireless, electrical, telephone and general engineers, wireless experts, etc. Solicitor: J. S. Crook, "Amalfi," Forest Road, Meols, Cheshire.

PORTHCAWL ELECTRICITY CO., LTD.—Cap., £20 000. To carry on the business of an electric light and power company. Reg. Office: Magnet House, Kingsway, London, W.C.2. (Public Co.).

SHOOLBRED ELECTRICAL CO., LTD.—Cap., £5 000. To carry on business of electrical and general engineer hitherto carried on by H. G. Shoolbred, as Shoolbred and Connell at Luton and elsewhere, etc.

DRONFIELD AND DISTRICT ELECTRIC SERVICE, LTD.—Cap., £500. —Electricians, electrical and mechanical engineers, manufacturers and workers of and dealers in electricity, etc. Reg. Office: Rose Hill, Dronfield.

C. W. OUTRAM AND CO., LTD.—Cap., £50 000. To acquire business of a manufacturer of electrical porcelain, etc., carried on by W. Hassall, at Boothorpe Works, Excelsior Works, Rawdon Works, and Little Thorn Pottery, Woodville, Derbyshire. Solicitor: A. H. Timms, Swadlincote.

BRITISH DOMINION FIRE ENGINEERING CO., LTD.—Cap., £2 000. To acquire the business of fire engineer carried on by W. D. Rees at Neath, Glam., as "South Wales Fire Appliance Co.," and to carry on same and business of contractors for fire prevention work, electrical engineers, etc. Solicitor: A. Jestyn Jeffreys, Neath.

KINETIC WIRELESS AND ELECTRIC SUPPLIES, LTD.—Cap., £2 500 —To acquire business of dealer in wireless and electric supplies now carried on by A. L. Chatfield at 5, Godstone Road, Caterham, and 82, Godstone Road, Whyteleafe, Surrey, as "Kinetic Wireless and Electric Supplies." Reg. Office: 5, Godstone Road, Caterham, Surrey.

LANCASHIRE ELECTRIC SIGN CONSTRUCTION CO., LTD.—Cap., £1 000. To acquire from W. Donegani, the inventor and patentee, his invention called the "Controlagraph," and to carry on business of advertising contractors, suppliers of electrical, luminous, and other signs, signalling apparatus, etc. Solicitors: Robert B. Batty and Co., 4, Clarence Street, Manchester.

UPAC PUBLICITY CO., LTD.—Cap., £500. To acquire business of advertising contractors and agents carried on by W. Coop and F. E. Milner at Blackpool as "Universal Publicity and Advertising Co."; to manufacture and deal in lamps, lanterns, electrical devices, and all kinds of materials used in connection with displayed advertisements, etc. Solicitors: Jacob Parkinson and Co., 17, Birley Street, Blackpool.

INTERNATIONAL MARINE RADIO CO., LTD.—Cap., £60 000. To carry on business connected with owning, operating, purchasing, selling, leasing, hiring, and maintaining telephonic or telegraphic apparatus, etc., for communicating by radio-electric means, between fixed points and mobile stations, and also between any two or more mobile stations. Solicitors: Johnson, Jecks and Colclough, 24, Austin Friars, London, E.C.2.

FERGUSON SHIERS AND CO. (FAILSWORTH), LTD.—Cap., £125 000. To acquire business carried on by F. A. Shiers as Ferguson, Shiers and Co., at Phœnix, Failsworth, Manchester; to carry on said business and that of manufacturers of, and dealers in, compositions and mouldings, articles and parts used in connection with accumulator and electrical trades., etc. Solicitors: Mayo Elder and Co., 10, Drapers Gardens, London, E.C. (Public Co.)

BRITISH RADIOSTAT CORPORATION, LTD.—Cap., 1 000 000 shs. without par value. To acquire, develop and turn to account trademarks, formulæ, secret processes, trade names and distinctive marks, all inventions, improvements and processes used in connection with, or secured under, patents or otherwise of Canada or elsewhere, etc. British address: 29, George Street, Hanover Square, London, W.1. (Company incorporated in Canada).

TITANIUM AND RARE METALS, LTD.—Cap., £7 500. To acquire from W. G. Moore all his existing patents and the benefit of all his patent rights and pending applications throughout the world in relation to the manufacture and use of electrodes of special metals and alloys, and in particular of alloys of Titanium and rare and other metals with tungsten for the purpose of rays for therapeutic and other purposes, etc. Reg. Office: Panton House, 25, Haymarket, London, S.W.1.

METAL AND CHEMICAL PRICES.

TUESDAY, March 4th.

	Price.	Inc.	Dec.
Copper—			
Best Selected	£76 15 0 per ton	—	10s. 0d.
Electro Wirebars	£84 5 0 „	—	—
H.C. Wires, basis	11½d. per lb.	—	—
Sheet	11¼d. „	—	—
Phosphor Bronze—			
Wire (Telephone), basis	1s. 2½d. per lb.	—	—
Brass (60/40)—			
Rod, basis	9d. per lb.	—	—
Sheet „	10¾d. „	—	¼d.
Wire „	10¼d. „	—	—
Pig Iron—			
Cleveland Warrants	£3 15 0 per ton	—	—
Galvanised Steel Wire, basis 8 S.W.G.	£14 15 0 „	—	—
Lead Pig—			
English	£21 5 0 per ton	—	£1
Foreign or Colonial	£19 15 0 „	—	£1
Tin—			
Ingot	£167 15 0 per ton	—	£4 7 6
Wire, basis	2s. 3½d. per lb.	—	¼d.
Aluminium Ingots	£95 0 0 per ton	—	—
Spelter	£18 10 0 „	—	10s. 0d.
Mercury	£23 0 0 per bottle	—	—

Sulphur—Flowers, Ton £12 0 0 Roll, „ £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10s. *Boric Acid* (Crystals) „ £30 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2½d.

Sodium Bichromate—Per lb., 3½d.

Rubber—Para fine, 8¼d.; plantation, 1st latex, 8¼d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

The market opened last week with an easier tone, but, according to James Forster and Co., on support from producing interests, prices were bid up to a higher level. In spite of this, Tuesday saw a bad break, the market finally closing 20s. per ton lower on the day. Wednesday's market was steady, but on Thursday an easier tone was seen once more and prices fell a further 10s. per ton. The American price was lowered on February 27th, from 6.25 to 6.10 cents per lb., in sympathy with values in London.

Closing prices on February 28th were £20 1s. 3d. for February and £20 for March, April and May, 22s. 6d. to 20s. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BROWNING, Mr. T. E., 28, Pleydell Avenue, Stamford Brook, wireless dealer. £13 17s. 1d. December 10th.

CARRUTHERS, Mr. T., 23, Waver Street, Silloth, radio engineer. £12 11s. 11d. December 9th.

ELECTRADIO CO., LTD., 25, Westbourne Grove, W., electrical engineers. £19 4s. 3d. January 13th.

ESSEX MANUFACTURING CO., County Chambers, Southend-on-Sea, gramophone and wireless dealers. £53 12s. 5d. November 26th.

HOLLAND, Mr. E. A., 62, Station Road, Kirkby-in-Ashfield, wireless dealer. £17 6s. 1d. December 9th.

KEELEY AND CO., 2, Crescent avenue, Crumpsall, electrical dealers. £11 6s. 6d. January 30th.

LEONARD (J. W.) AND SON, 32, East Street, Wareham, electrical engineers. £48 9s. 5d. January 17th.

SHACKLETON, Mr. S. M., 5, Main Avenue, Heworth, wireless dealer. £10 3s. 2d. January 24th.

SHORTHOUSE, F. A. AND CO., 922, Stratford Road, Sparkhill, Birmingham, wireless dealers. £31 3s. 2d. December 9th.

STRACHAN, Mr. W. E., 14, Upper North Street, Brighton, wireless dealer. £14 12s. 2d. January 20th.

SUSSEX RADIO, 1, South Street, Eastbourne, wireless dealers. £16 12s. 11d. December 9th.

WIRELESS FANCY GOODS SUPPLIES CO., Litchfield Street, Charing Cross Road, W.C., wireless dealers. £29 12s. 11d. January 23rd.

WOODWARD, Mr. R., High Street, Lyndhurst, wireless dealer. £17 17s. 9d., January 24th; £10 7s. 4d., December 9th, and £12 13s. 8d., January 13th.

Deeds of Arrangement.

HOLT William Percy, trading as W. P. HOLT AND CO., 14, Chester Street, Bradford, electrical contractor. Dated February 21st, filed February 22nd. Trustee, P. Hodgkinson, 48, Sunbridge Road, Bradford. Liabilities unsecured, £1 986; assets, less secured claims, £1 315.

KERSHAW, Selwyn, and ORMIAN, Harold, trading at Broad Lane, West Derby, and 4, Daulty Street, Liverpool, as S. KERSHAW AND CO., electrical and radio engineers. Dated February 19th, filed February 26th. Trustee, P. S. Booth, 2, Bixteth Street, Liverpool. Liabilities unsecured, £457; assets, less secured claims, £260.

WOODMAN, William, trading as T. WOODMAN AND CO., 44, Norton Street, Liverpool, electrical contractor. Dated February 24th, filed March 1st. Trustee, P. S. Booth, 2, Bixteth Street, Liverpool. Secured creditors, £901; liabilities unsecured, £1 039; assets, less secured claims, £627.

Receiverships.

CRANMER BROWN (R.), LTD.—H. L. Haller, estate agent, of 62, Whitefriargate, Hull, was appointed receiver on February 22, 1930, under powers contained in mortgage dated November 14th, 1920.

BOWYER-LOWE CO., LTD.—R. L. Marsh, of Ethelburga House, Bishopsgate, E.C., was appointed receiver on February 25th, 1930, under powers contained in debenture dated December 3rd, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

AEONIC RADIO, LTD., London, E.C.—Registered February 12th, £16 000 (not ex.), charge, to Bank; charged on Salfords, Horley, and 15, Cromer Street, King's Cross.

Satisfaction.

SIEMENS BROTHERS AND CO., LTD., London, S.W., telegraph engineers.—Satisfaction registered February 17th, £34 800, part of amount registered January 21st, 1918.

Private Meetings, etc.

[Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.]

EDISON ILLUMINATING, LTD., 55, Victoria Street, S.W., electrical and wireless factors. The statutory meeting of creditors was held on February 27th at the offices of Hacker, Rubens, Horner and Co., C.A., 23, Surrey Street, Strand, W.C., when Mr. Gotelee, who had been nominated the liquidator of the company, submitted a statement of affairs which disclosed liabilities of £1 817, of which £471 was due to creditors for goods; there were loan creditors amounting to £262; expense creditors amounted to £277; there was a bank overdraft of £517, and directors' fees amounted to £89. The assets totalled £142, thus disclosing a deficiency of £1 675. Mr. R. Alfred, the managing director of the company, presided. The liquidator said that the company was formed in August, 1927, with a capital of £400, all of which was issued for cash. The principal product of the company was the Sun-Glo Lamp which was obtained from America, and in many cases when the supplies arrived in this country many were broken, and consequently a number of the orders had to be cancelled. In November, 1928, it was arranged that the supplies should be obtained from this country, and the consignments from America cancelled. By that time, however, the working capital of the company had been expended, and although the directors obtained a further £200, it proved totally inadequate for the carrying on of the business. In October, 1929, the managing director of the company got into touch with people who were prepared to put up additional working capital, but unfortunately that proposition never matured. The managing director, however, was satisfied that the product was a good one, and several substantial contracts were practically completed, and he considered that if he were allowed to carry on the business it could be conducted successfully in the future. With that end in view, he was prepared to offer the creditors a royalty of 7½ % on all future sales until 10s. in the £ had been paid to the creditors. A creditor asked how long Mr. Alfred anticipated it would be before the creditors would receive their 10s. in the £ if the scheme were eventually formulated. Mr. Alfred replied that he considered that the full amount would be paid in less than two years. Answering a creditor, the liquidator said that for the year to November, 1928, the sales were £2 054; the purchases were £993; there was a gross profit of £1 100; and a net loss of £450. From November, 1928, to February 15th of this year the sales were £1 185; the purchases, 769; there was a gross profit of £368 and a net loss of £1 300. After discussion, it was decided that the liquidation should be continued, with Mr. Gotelee as liquidator, and a committee of inspection consisting of the representatives of two of the largest creditors, was also appointed.

BURGOYNE WIRELESS, LTD.—The statutory meeting of creditors in this voluntary liquidation was held on March 3rd at the offices of Baker, Sutton and Co., C.A., Eldon Street House, E.C., when a statement of affairs was presented which disclosed liabilities of £4 120, of which £4 003 was due to unsecured creditors, and net assets expected to realise £1 635, or a deficiency of £2 485. Mr. Milner Gray stated that the present company was formed on December 14th, 1928, with a nominal capital of £6 000 in £1 shares. The company took over the business of Burgoyne Manufacturing Co., Ltd., which was formed in May, 1928, and in which Fordhams, Ltd., had a debenture and appointed a receiver in October, 1928. Fordhams, Ltd., held 4 000 shares in Burgoyne Wireless, Ltd. The solicitor for the company said that Messrs. Fordhams could not make an offer because a receiver had been appointed of that company, and it had also gone into liquidation. The future of Messrs. Fordhams was a very problematical one. He, as the solicitor to the company, had been approached by a firm to know whether Burgoyne's would sell their assets and goodwill. The receiver for the debenture holder had sent out a price which would enable the creditors to have a fairly good dividend if the negotiations materialised. He was going to suggest that a strong committee of inspection should be formed to investigate the whole of the affairs of the company and, if necessary, to report to a further meeting. On the motion of the representative of Messrs. Mullards, seconded by the representative of the Fuller Accumulator Co., it was decided that Mr. Baker should be appointed as liquidator with a committee of inspection.

M'QUEEN (H. A.) AND CO., LTD., electrical engineers, 182, West George Street, Glasgow. A meeting of the creditors of the above was held on February 28th at the Accountants' Hall, St. Vincent Street, Glasgow. The statement of affairs submitted showed ranking liabilities of £3 773. The assets were estimated to realise £5 868, or an apparent surplus of £2 095 9s. 11d. It was reported that the company commenced trading on October 1st, 1928, there having taken place an amalgamation of two existing businesses. The idea was that the company should carry on a trading business, and also start the manufacture of switchboards. It was estimated that the profits from the trading would be sufficient to enable the company to carry on until such time as the manufacturing end paid its way. The vendors were allotted fully paid shares in payment of the assets transferred. The existing premises were unsuitable. Other premises were acquired, and were fitted up at a cost of approximately £1 200. Subsequently further alterations were carried out, bringing the total cost up to £2 100. The company found itself short of working capital owing to the fact that the turnover on the trading side of the business did not come up to expectations. A resolution was passed, confirming the appointment of Mr. Hutcheson as liquidator of the company, with a committee consisting of the representatives of the General Electric Co., the British Electric Co., Walter and W. B. Galbraith, and Mr. McMillan.

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SYMPHONY GRAMOPHONE AND RADIO CO., LTD.—At a meeting of the creditors, held on February 28th, when a scheme was approved providing for the payment in cash of all creditors under £10 in two months from the date of the scheme becoming operative; payment in cash of all preferential or essential service creditors; payment in cash to the other unsecured creditors, other than Symphony (Foreign), Ltd., rateably 5s. in the £ within two months of the scheme being operative, and the issue to creditors of second debenture stock. The scheme also provided to pay in cash all debts and liabilities incurred on or after January 2nd last, working capital to be provided by creation of a series of first debentures to an aggregate amount not exceeding £50 000, carrying interest at the rate of 6%, and charged by the way of floating charge upon the whole of the company's undertaking and property. The outstanding debts and liabilities of the company were set out in the scheme, which showed trade creditors for approximately £44 664; Symphony (Foreign), Ltd., were put down as creditors for £13 578; royalties due, £10 464; a cash advance by Mr. D. M. Davies, £1 400; and contingent claims on contract, approximately £41 000. The issued and fully-paid up capital of the company was £189 958.

London Gazette, etc.

Winding-up Petition.

M. E. D. A. S., LTD. A creditor's petition for winding-up has been presented by Dualite, Ltd., 52-53, Fetter Lane, and is to be heard at the Royal Courts of Justice, Strand, London, on March 10th.

Companies Winding-up Voluntarily.

ARCTIC ELECTRIC SUPPLIES, LTD. Meeting of creditors, Anderton's Hotel, Fleet Street, London, E.C.4, on March 10th, at 3 p.m.

DUALITE, LTD. By special resolution, January 17th. W. E. Ogden, Audrey House, Ely Place, London, chartered accountant, appointed as liquidator.

EDISON ILLUMINATING, LTD. By reason of its liabilities, February 26th. B. C. Gotelee, chartered accountant, 23, Surrey Street, Strand, W.C.2, appointed as liquidator.

Bankruptcy Information.

CLEMENTS, Miss M. K., trading as K. RAYMOND, 27 and 28A, Lisle Street, Leicester Square, London, wireless apparatus dealer. Receiving order, February 27th. Creditor's petition. First meeting, March 13th, 11.30 a.m., and public examination, April 2nd, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

COLLER, Lawrence James, 63, Henton Road, Leicester, electrical engineer, trading as J. AND F. COLLER. Receiving order, February 25th. Debtor's petition. First meeting, March 11th, 3 p.m., Official Receiver's Office, 1, Berridge Street, Leicester. Public examination, April 4th, 11 a.m., The Castle, Leicester.

FRANKLIN, Victor, Newtown Garage, Malvern, Worcester, automobile engineer and electrician. Receiving order, February 24th. Debtor's petition.

Notices of Dividends.

BARNETT, Timothy, 934, Woodborough Road, Mapperley, Nottinghamshire, electrical contractor. First and finald dividend, 7d. per £, payable March 10th, 18, Low Pavement, Nottingham.

GATESHILL, Harry, 113, Witham, Kingston-upon-Hull, wireless engineer. First and final dividend, 8d. per £, payable, March 4th, Official Receiver's Office, 37, Scale Lane, Hull.

JONES, Thomas Ernest (trading as BERRINGTON JONES), 138, Northgate Street, Chester, electrical engineer. First and final dividend, 5s. 4d. per £, payable, March 7th, 5, Hunter Street, Chester.

MARSH, Basil, 17, Victoria Road, Brighton, Sussex, electrician. First dividend, 5s. per £, payable, March 7th, A. E. Orbell, 6 and 7, Old Steine, Brighton.

Application for Discharge.

COHEN, George, 49, Newman Street, Oxford Street, London, electrical engineer. Hearing, March 26th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Order Made on Application for Discharge.

COHEN, George, 49, Newman Street, Oxford Street, London, electrical engineer. Discharge suspended for five years, until February 5th, 1935.

Bankruptcy Proceedings.

Frank Walter Charles HOEY, late of 29, Sicilian Avenue, London, W.C., wireless and electrical dealer. A sitting for the public examination of the debtor was appointed in the London Bankruptcy Court on Friday before Mr. Registrar Mellor. The debtor who was adjudged a bankrupt on January 7th, has lodged a statement of affairs showing ranking liabilities £4 635 and estimated assets £2 409. The Official Receiver said that the debtor was a patient in hospital suffering from dysentery, having been admitted on February 3rd. He would probably be discharged six weeks from that date. He understood that the debtor was not in a fit state to be interviwed, and in these circumstances he applied for an adjournment of the public examination until May 1st. This application his Honour granted.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

293 705 M. BUCHHOLZ. Device for protecting transformers, switches, motors, generators, and similar electrical machines and apparatus. (8/7/27.)
321 438 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Electric discharge tubes. (9/7/28.)
321 439 G. D. POWELL. Method of supporting the armatures of electromagnetic devices such as loud-speakers. (10/7/28.)
321 441 J. L. BAIRD and TELEVISION, LTD. Television apparatus and the like. (11/7/28.)
321 391 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Processes for coating metallic or non-metallic bodies with vanadium. (27/7/28.)
321 409 J. A. CRABTREE. Electric couplings of the plug-and-socket type. (30/7/28.)
321 392 J. W. CAIRNS and F. A. THOMASSIN. Volume and tone control systems in electrical sound reproduction. (31/7/28.)
321 426 RELAY AUTOMATIC TELEPHONE CO., LTD., BRITISH POWER RAILWAY SIGNAL CO., LTD., and J. H. GRAHAM. Electric signalling or indicating apparatus. (1/8/28.)
321 427 R. GOLD and J. SCHMAUSS. Electric motors. (2/8/28.)
321 428 J. A. CRABTREE. Electric switch mechanism, and the mounting of such mechanism in boxes, cases, and the like. (3/8/28.)
321 393 LANCASHIRE DYNAMO AND MOTOR CO., LTD., and J. W. HOWARD. Alternating current electric motors. (4/8/28.)
321 412 H. F. HOWELLS and E. C. HOWELLS. Electric motors. (7/8/28.)
321 430 G. R. SEARLE. Loud-speakers for wireless apparatus or the like. (8/8/28.)
321 446 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.) Water-cooled vacuum tubes. (9/8/28.)
321 449 H. T. LOGAN. Electric switches. (9/8/28.)
295 397 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electrical circuit interrupters. (11/8/27.)
321 454 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and O. A. PEARCE. Telephone systems. (10/8/28.)
296 085 GENERAL CABLE CORPORATION. Method of heating the non-metallic covering of electric conductors, such as a single or stranded wire, cables, or the like. (26/8/27.)
300 192 L. GASTON. Mechanism for automatically controlling the lighting of electrically lighted vehicles. (22/8/28.)
321 490 GENERAL ELECTRIC CO., LTD., and E. P. L. WESTELL. Circuits comprising thermionic valves. (1/9/28.)
296 762 A. BLONDEL. Signalling systems for giving audible signals. (7/9/27.)
321 502 L. H. REID. Push-pull electric switches. (17/9/28.)
321 503 G. H. COLLINS and H. F. COLLINS. Electric heaters. (18/9/28.)
321 513 A. G. ELLIS, H. DIGGLE, and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Gas-treating devices for enclosed electrical apparatus. (27/9/28.)
321 522 P. A. SMITH, DR. O. FABER, and DRAKE AND GORHAM, LTD. Fittings for electric lighting and the like systems. (5/10/28.)
298 209 IGRANIC ELECTRIC CO., LTD. Reproducer units adapted to be actuated by a gramophone record for producing electrical impulses. ((5/10/27.)
321 523 W. SCHWEITZER. Electromagnetic switch. (8/10/28.)
298 987 BRITISH THOMSON-HOUSTON CO., LTD. X-ray tubes. (18/10/27.)
321 531 ELECTROLUX, LTD. (INVENTIA PATENT-VERWERTUNGS GES.). Machines for washing clothes. (23/10/28.)
321 533 W. V. BUTTERFIELD, A. W. BUTTERFIELD, and S. BUTTERFIELD (trading as MYCROMET MANUFACTURING CO.). Ceiling-roses and like electric fittings. (24/10/28.)
321 534 W. V. BUTTERFIELD, W. E. EVANS, A. W. BUTTERFIELD, and S. BUTTERFIELD (trading as MYCROMET MANUFACTURING CO.). Cord grips for electric lamp-holders, adapters, and the like. (24(10/28.)
312 335 SIEMENS AND HALSKE AKT.-GES. Telephone cables. 26/5/28.)
321 549 J. LUCAS, LTD., E. O. TURNER, and E. H. C. ROBINSON. Electric dynamos or motors. (8/11/28.)
321 553 MULLARD RADIO VALVE CO., LTD., and B. KROL. Electrode construction for electron-discharge tubes. (9/11/28.)
321 560 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Thermionic amplifier circuits. (12/11/28.)
321 562 G. A. COX. Apparatus for maintaing a constant speed of electric motors. (13/11/28.)
301 868 O. NEISS and H. BOLLMANN. Induction heating-apparatus. (7/12/27.)
321 571 LODGE-COTTRELL, LTD. (METALLGES. AKT.-GES.). Method of and means for cleaning the electrodes of electrical gas-cleaning apparatus. (27/11/28.)
307 012 SCINTILLA AKT.-GES. Electric reversing switches. (1/3/28.)
304 290 INTERNATIONAL GENERAL ELECTRIC CO., INC. Regulating transformers. (18/1/28.)
321 612 H. N. SKERRETT (H. FULD AND CO. TELEPHON-UND TELEGRAPHENWERKE AKT.-GES.). Micro-telephones. (29/1/29.)
305 632 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Direction-finding radio apparatus. (8/2/28.)
309 955 BRITISH THOMSON-HOUSTON CO., LTD. Electric transformers. (18/4/28.)
311 293 DR. P. MEYER AKT.-GES. Mercury electric switches. (8/5/28.)
321 415 RELAY AUTOMATIC TELEPHONE CO., LTD., BRITISH POWER RAILWAY SIGNAL CO., LTD., and J. H. GRAHAM. Electric signalling or indicating apparatus. (1/8/28.)
321 463 C. W. COX and C. E. C. SHAWFIELD. Switch-fuse. (9/6/28.)
321 416 J. A. CRABTREE. Electric switch mechanism, and the mounting of such mechanism in boxes, cases, and the like. (3/8/28.)
321 696 J. E. ALLAN and S. B. FREEMAN. Method of manufacturing insulated electric cables. (17/5/28.)
321 661 E. W. L. COWAN, W. E. KING, and MEASUREMENT, Ltd. Electric time switches. (9/6/28.)
292 086 AKT.-GES. BROWN, BOVERI, ET CIE. System of automatic control for the generation of energy in an electric power plant according to a prescribed table in dependence on the time. (11/6/27.)
294 200 RADIO FREQUENCY LABORATORIES, INC. Thermionic valve circuits. (20/7/27.)
321 663 E. R. AND F. TURNER, LTD., and F. H. JOHNSON. Eddy current brake. (13/7/28.)
321 671 J. NEALE. Delayed action electric relay service. (9/5/28.)
321 644 F. A. MITCHELL. Thermionic valve amplifiers.
321 673 CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., and J. URMSTON. Telephone repeater circuit arrangements. (15/5/28.)
321 678 BRITISH ELECTRIC TRANSFORMER CO., LTD., and J. L. THOMPSON. Means for dissipating the heat generated by electrical apparatus immersed in liquid within a casing. (11/8/28.)
295 689 DR. S. LOEWE. Method of mounting electric leads in thermionic valves. (17/8/27.)
321 664 A. ZAJDLER. Electrical advertising apparatus. (14/8/28.)
321 681 S. C. WHAITE. Electric storage batteries or electric accumulators. (15/8/28.)
321 682 STANDARD TELEPHONES AND CABLES, LTD., and A. H. REEVES. Electric signal systems. (15/8/28.)
321 686 NALDER BROS. AND THOMPSON, LTD., and C. L. LIPMAN. Electric relays of the time selective type. (15/8/28.)
321 688 P. WILSON. Mounting of vibrating reeds, more particularly for use in connection with electromagnetic gramophone picks-up, loud-speakers, an the like. (15/8/28.)
321 710 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Submarine cables. (16/8/28.)
321 711 GENERAL ELECTRIC CO., LTD., and W. H. PETERS. Inductance coils for wireless signalling apparatus. (16/8/28.)

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296 025 British Thomson-Houston Co., Ltd. Systems of electric distribution. (23/8/27.)
297 318 Associated Telephone and Telegraph Co. Telephone systems. (17/9/27.)
321 745 A. C. Winter. Sign for use with daylight or artificial light for advertising purposes. (24/8/28.)
321 750 Universal and General Radio Co., Ltd., and L. M. Myers. Television or like systems, and apparatus therefor. (28/8/28.)
321 752 L. E. Fillmore and L. W. Fillmore. Slow motion or fine adjustment mechanism for electrical tuning apparatus. (30/8/28.)
296 411 British Thomson-Houston Co., Ltd. Electric discharge devices. (31/8/27.)
321 757 Electrolux, Ltd. (Aktiebolaget Filtrum). Apparatus for treating liquids. (4/9/28.)

Applications for Patents.

November 1st.

33 307 Automatic Telephone Manufacturing Co., Ltd., F. A. S. Scarlett and A. H. Williams. Telephone systems.
33213, 33 214 G. J. Blake and G. D. G. Leadbetter. Mercury vapour arc lamps.
33 278 British Thomson-Houston Co., Ltd. Electric discharge apparatus. (8/11/28, U.S.)
33 263, 33 266 Celia, Ltd., and J. J. Drumm. Secondary batteries, etc.
33 235 W. Fairweather (Singer Manufacturing Co.) Electric suction cleaners.
33 282 Federal Telegraph Co. and F. A. Kolster. Radio transmitting system.
33 206 P. Henry. Means for disinfecting telephone mouthpieces.
33 298 Holophane, Ltd. (W. A. Dorey and T. W. Rolph). Illuminating apparatus.
33 275 International General Electric Co. Inc. Transformers. (1/11/28, Germany.)
33 276 International General Electric Co. Inc. Electric switches. (1/11/28, Germany.)
33 277 International General Electric Co. Inc. Controlling devices for electric vehicles. (1/11/28, Germany.)
33 264 J. Y. Johnson (I.G. Farbenindustrie A.G.). Conversion of hydro-carbons by electric discharges.
33 316 J. J. Mettes. Radio receiving sets.
33 201 R. W. Minshall. Thermionic valves.
33 325 Petters, Ltd., and P. J. Swaffield. Thermostatic control gear for electric starting motors for engines.
33 296 Radio Frequency Laboratories, Inc. Audion amplifiers. (3/10/29, U.S.)
33 232, 33 233 G. B. Renouf. Apparatus for converting continuous into alternating currents.
33 312 N. M. Rust and G. M. Wright. Coupling devices for microphones.

November 2nd.

33 408 E. A. Barrett. Thermionic valves.
33 395, 33 396 F. R. Butherus and G. F. Shotter. Electric relays.
33 352 W. L. Colassi. Electrical sound reproducing apparatus.
33 435 C. J. V. Féry. Electric clocks. (2/11/28, France.)
33 377 E. Giebe and A. Scheibe. Exciting transverse, etc., vibrations in piezo-electric crystals. (3/11/28, Germany.)
33 353 S. J. Harley. Electric distant controlling system.

November 4th.

33 563 Automatic Telephone Manufacturing Co., W. J. Brown and S. R. Smith. Impulse senders for telephone systems.
33 445 British Brass Fittings, Ltd., and A. Logan. Electric water heating apparatus.
33 492 British Thomson-Houston Co., Ltd. Circuit controlling devices. (3/11/28, U.S.)
33 483 G. Buckley. Contact breaker for magnetos.
33 565 F. T. Cash. Electric table lamps, etc.
33 499 L. N. Cox and H. A. Storry, Ltd. Thermionic valve circuits.
33 517 Emkabe Radio Co., Ltd. (Emkabe Radio-Ges.). Indicating dials.
33 518 Igranic Electric Co., Ltd. Counting systems.
33 557 T. B. Nelson. Electric cooking stoves.
33 461 A. M. Taylor. Transformers.
33 523 Westinghouse Electric and Manufacturing Co. Alternating current distribution systems. (3/11/28, U.S.)
33 521 J. S. Withers (General Steel Wares, Ltd.). Electric switches.

November 5th.

33 617 Akt. Ges. Brown, Boveri et Cie. Mercury vapour rectifiers. (8/11/28, Germany.)
33 618 Akt. Ges. Brown, Boveri et Cie. Synchronising, etc., a.c. generators. (9/11[28, Germany.)
33 658 Associated Electrical Industries, Ltd. Electric protective systems. (6/11/28, U.S.)
33 659, 33 660 Associated Electrical Industries, Ltd., and D. B. Hoseason. Dynamo-electric machines.
33 661 Associated Electrical Industries, Ltd., and D. B. Hoseason. Electric motors.
33 664, 33 665 F. Bentley, British Electric Meters, Ltd., and R. W. Jolly. Prepayment meters.
33 637 British Thomson-Houston Co., Ltd. Current regulating devices. (5/11/28, U.S.)
33 696 Electrical Research Products, Inc. Continuously loaded conductors. (8/6/29, U.S.)
33 687 Etablissements E. Belin. Picture telegraph apparatus.
33 662 Etablissements Industriels de E. C. Grammont et de A. Grammont. Manufacture of filaments for electron discharge tubes. (10/12/28, France.)
33 636 B. B. Grace, A. H. Roche, E. K. Sandeman, T. S. Skillman and Standard Telephones and Cables, Ltd. Printing telegraphy.
33 577 E. L. Harrison. Lamp reflectors for shop window illumination.
33 644 G. P. Kendall. Wireless receiving apparatus.
33 645 Kolster-Brandes, Ltd. Loud speakers.
33 646 Kolster-Brandes, Ltd. Pick-up devices.
33 674 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone systems.
33 615 F. H. Royce. Electrical turning gear for starting engines.
33 635 Standard Telephones and Cables, Ltd. (Western Electric Co.). Voltage regulation in an intermittently closed circuit.
33 702 A. M. Taylor. Electric power transmission.
33 698 Telefonaktiebolaget L.M. Ericsson. Automatic telephone systems. (8/11/28. Sweden.)
33 699 Telefonaktiebolaget L.M. Ericsson. Electric meters.

November 6th.

33 807 F. V. Abbott, A. E. Honey and J. Stone and Co., Ltd. Switchgear for train lighting, etc.
33 869 Allgemeine Elektricitats Ges. Electro-optical devices, etc. (6/11/28, Germany.)
33 827 Associated Electrical Industries, Ltd. Circuit breakers. (6/11/28, U.S.)
33 829 Associated Electrical Industries, Ltd. Electric switches. (6/11/28, U.S.)
33 783 Associated Fire Alarms, Ltd., and A. H. McNeil. Automatic fire alarms.
33 830 E. L. Boissette. Adjusting means for condensers of wireless sets. (17/7/29, France.)
33 817 British Thomson-Houston Co., Ltd. Current controlling devices. (6/11/28, U.S.)
33 759 A. W., S. and W. V. Butterfield, and Mycromet Manufacturing Co. Electric plug and socket connections.
33 854 S. Chapman, J. G. Flint, E. M. S. McWhirter and Standard Telephones and Cables, Ltd. Exchange systems for interconnecting telegraph apparatus.
33 849 Elektra-Lacke-Werke Ges. System Dr. Kronstein. Manufacture of insulating material. (9/2/29, Germany.)
33 855 J. G. Flint, E. M. S. McWhirter and Standard Telephones and Cables, Ltd. Exchange systems for interconnecting telegraph apparatus.
33 815 International General Electric Co., Inc. Insulating material. (9/11/28, Germany.)
33 770 A. R. Kuhl. Telephone circuits.
33 841 C. Lorenz Akt. Ges. Lighting trains. (16/11/28, Germany.)
33 842 C. Lorenz Akt. Ges. Operating wireless transmitting apparatus. (17/11/28, Germany.)
33 787 G. Marr. Electric plug bases, etc.
33 801 R. J. Musto and Quasi-Arc Co., Ltd. Dynamo-electric machinery for arc welding.
33 856 G. Newton and C. P. Smith. Switching mechanisms for telephone systems.
33 776 N. Rimmer. Electric signalling apparatus.
33 755, 33 756 J. H. Runbaken. Electric bells.
33 757 J. H. Runbaken. Water heaters.

COMING EVENTS.

Friday, March 7th (To-day).

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London. Paper by Messrs. A. E. Moore and W. T. Slater on "An Investigation of the Frequency Variations in Induction Watt-hour Meters." 7 *p.m.*

North-East Coast Institution of Engineers and Shipbuilders.—Institution Rooms, Bolbec Hall, Newcastle-upon-Tyne. Informal meeting. Discussion on "The Effect of the Use of Electricity in Workshops on Efficiency and Costs." 7.15 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Armstrong College, Newcastle-upon-Tyne. Paper by Mr. W. A. Cook on "Insulation Testing." 7.15 *p.m.*

Friday, March 7th—Saturday, March 15th.

Business Efficiency Exhibition.—White City, Shepherd's Bush, London, W

Saturday, March 8th.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

Electrical Power Engineers' Association.—Café Royal, Regent Street, London. Annual dinner and dance. 6.45 for 7 *p.m.*

Monday, March 10th.

Electrical Contractors' Association (Hastings Branch).—Lewcock's Restaurant. Ordinary meeting.

Electrical Contractors' Association (Liverpool Branch).—Ordinary Meeting.

Institution of Electrical Engineers (Western Centre).—Merchant Venturers' Technical College, Bristol. Paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched Arc Switch" 6 *p.m.*

Institution of Heating and Ventilating Engineers (Associate Members' and Graduates' Section).—Borough Polytechnic, Borough Road, London, S.E. Paper by Mr. L. J. Fowler on "Some District Heating Systems." 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-upon-Tyne. Paper by Mr. H. H. Harrison on "Developments in Machine Telegraph Systems and Methods of Operation." 7 *p.m.*

Tuesday, March 11th.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting. Corridor Chambers. 2.30 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, Leeds. Annual dinner. 7 for 7.30 *p.m.*

Electrical Power Engineers' Association.—Junior Institution of Engineers, 39, Victoria Street, London. Paper on "Condensing Plant and Accessories." 7.15 *p.m.*

Institution of Electrical Engineers (North-Western Students' Section).—Engineers' Club, Albert Square, Manchester. Paper by Mr. A. M. Robertson on "Electrical Insulating Materials." 7.15 *p.m.*

Institution of Electrical Engineers (South Midland Students Section).—Birmingham University. Paper by Mr. F. J. Baldwin on "Overhead Line Work." 7.30 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Freemasons' Hall George Street, Edinburgh. Faraday lecture on "Broadcasting by Electric Waves," by Capt. P. P. Eckersley. 8 *p.m.*

Wednesday, March 12th.

Electrical Contractors' Association (Eastbourne Branch).—Ordinary meeting.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting.

Institute of Metals (Swansea Local Section).—Thomas's Café, High Street. Paper by Mr. A. Glynne Lobley on "Electric Heat-Treatment Furnaces." 7 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Royal Technical College, George Street, Glasgow. Annual general meeting. 7.30 *p.m.*

Thursday, March 13th.

Electrical Contractors' Association (East Yorks. Branch).—Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Institution of Electrical Engineers.—Institution, Victoria Embankment, London. Paper by Messrs. H. A. Humphrey, D. M. Buist and J. W. Bansall on "The Imperial Chemical Industries Limited's Steam and Electric Power Plant at Billingham." (To be illustrated by a cinematograph film.) 6 *p.m.*

Institute of Patentees.—Caxton Hall, Westminster, London. Lecture by Mr. P. Marshall on "The Inventor's Workshop." 8 *p.m.*

Friday, March 14th.

Birmingham Electric Club.—Grosvenor Room, Grand Hotel. Annual dinner.

Ex-British Westinghouse Association.—Hotel Cecil, Strand, London. Re-Union Dinner.

Institute of Metals (Sheffield Local Section).—Non-Ferrous Section of the Applied Science Department of the University, St. George's Square. Paper by Mr. A. Glynne Lobley on "Electric Heat-Treatment Furnaces." 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Paper by Mr. W. A. Sallis on "An Outline of Siemens No. 50 Telephone Switching Equipment." 7.30 *p.m.*

Saturday, March 15th.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

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THE ELECTRICIAN

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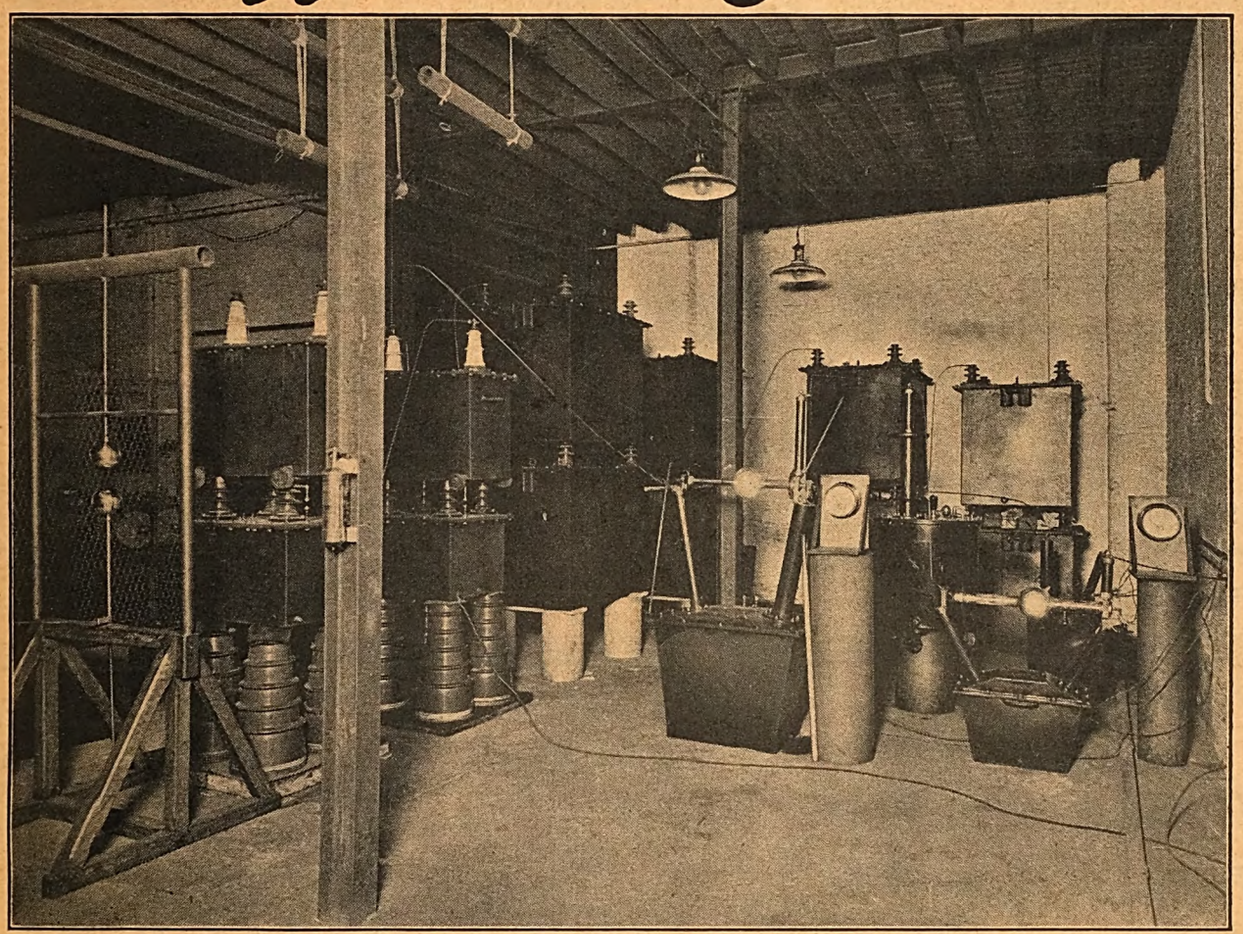
The Effective Surge Absorber



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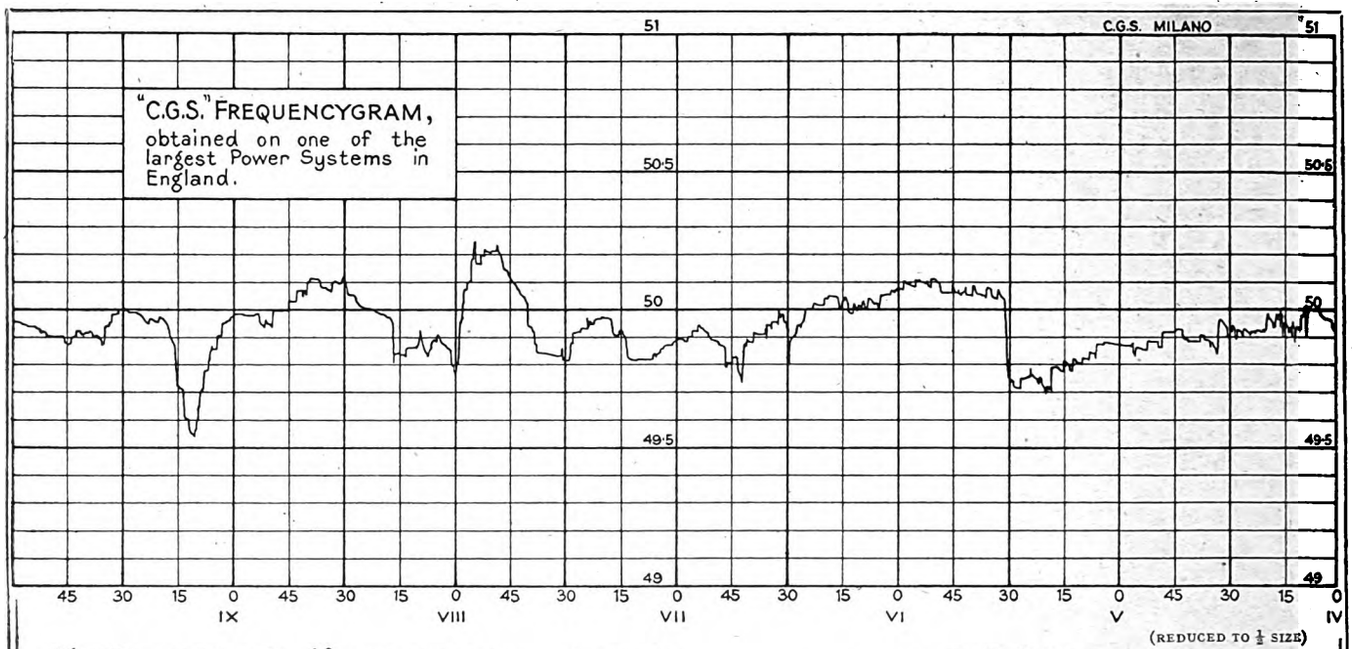

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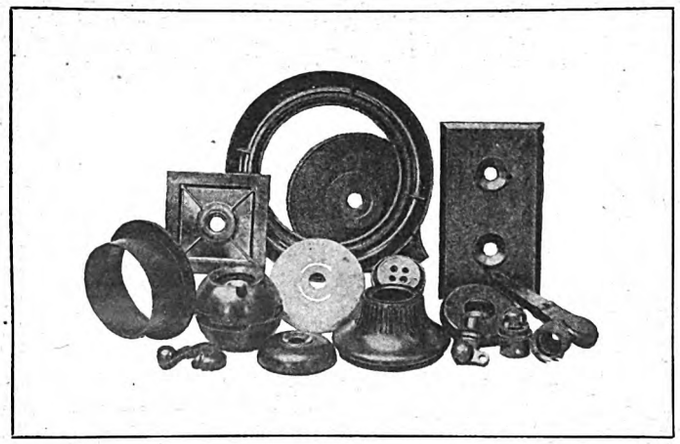

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

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Telephone: City 0244 (Ten lines).

[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Patriotism and Publicity.

SIR FELIX POLE, at the end of the address which he gave to the Batti Wallahs Society last week, quoted the views of an anonymous friend on the subject of increased publicity for the electrical industry. These views, which are given in full on page 331 of this issue, are emphatic and clear. "A full dose of modern publicity and salesmanship" is all that is required, in his opinion, to bring the consumption of current into line with present output capacity. That highly desirable condition would not only bring prosperity to supply undertakings and installation contractors. It would also benefit manufacturers by "an unprecedented accretion of home orders." They, in turn, if they would "bring their publicity and business-getting machinery at home and abroad to the same fine pitch as their workshop machinery" would soon be handling outputs that would permit them "to pay bigger dividends and to reduce prices." This unknown mentor sums up the necessities of the industry in the slogan: "Patriotism and Publicity." He explains that the first word means "loyal support by each individual of the respective organisations representing the electrical industry at large and of his section of the industry." Both collective and individual effort are to be understood as implicit in "Publicity."

It is certainly the case that, taken as a whole, the expenditure of the electrical industry on publicity is much below that of most large undertakings which sell goods or services to the public. The recommended scale of contribution to the funds of the British Electrical Development Association is modest enough, and could be multiplied many times without placing the supply undertakings in any danger of being accused of extravagance. Yet in actual practice E.D.A.'s income amounts only to about half the annual income that would be available if all supply undertakings contributed on the recommended basis. As to the value of the work which is being accomplished by E.D.A. with its limited financial resources there is no question. We give a description on another page of the exhibit which the Lighting Service Bureau of E.L.M.A., in collaboration with E.D.A., has placed in the booking hall of Charing Cross Underground station—one of the most useful small display sites in London. This is a form of propaganda which could be greatly extended with advantage, given the necessary funds.

Hitherto electrical publicity has only touched the fringe of the field that is open to effort. Even such admirable productions as "The House You Want" must, in the nature of things, appeal mainly to the more comfortable classes. A somewhat less ambitious model of domestic electrification designed to meet the possibilities of the small wage earner's pocket is a logical further development. But, as Sir FELIX POLE pointed out, in addition to propaganda, educational publicity and personal canvass, "adequate facilities must be given to the consumer to provide himself with apparatus on easy payment terms." Coming into the industry from another sphere Sir FELIX POLE has clearly been much impressed with the insufficiency of the present expenditure and effort on selling electricity and electrical manufactures. It is not unusual for newcomers to see things that have not attracted the attention of those who have grown up within the fold, and thus have had less opportunity of making accurate comparisons. It is true that such expressions of opinion are sometimes based on an incomplete appreciation of all the relevant factors but in this case we do not think that Sir FELIX POLE can be charged with attempting diagnosis before he has had time to acquaint himself with the symptoms and constitutional inheritance of the patient—if we may use that word in connection with an industry which is endowed with such youthful vigour and enjoys such wonderful prospects of growth. Yet perhaps the word is not altogether inappropriate, for there are signs of asymmetrical development of the organism. If these tendencies are corrected in good time it will have a healthier future than might otherwise be the case, and the prescription recommended by Doctor POLE and his friend appears to be well suited to actual conditions.

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Current Topics.

The Brighter Side of Unemployment.

UNEMPLOYMENT continues to be the principal topic in industrial and political discussion, and no one can deny the extreme gravity of the problem. At the same time, the facts of employment are apt to be obscured by the stress laid on unemployment, and there is in consequence a widespread lack of realisation of the brighter side of the picture. The importance of remembering this aspect of industry was emphasised by Sir JOSIAH STAMP, in a discussion with Mr. MAYNARD KEYNES broadcast from London some days ago. In the first place, the official figures do not give a true idea of the situation. It is not true that there is a solid mass of unemployment in which over a million men find themselves continuously without work. In Sir JOSIAH'S opinion, probably 50 per cent. of those unemployed at any particular moment will be in work again a month later. In the second place, it is estimated that the normal figure of unemployment due to seasonal fluctuation and other natural causes, would under the best conditions almost certainly be between 300 000 and 400 000. Out of an insured population of over 11 000 000 two-thirds have been hardly touched by the problem since the war. Recent tests over a period of two and a half years showed that 8 000 000 drew no unemployment pay at all.

Absorption of Labour.

BRITISH industry has shown a remarkable power of actual absorption since the war—there are over a million persons more in employment. When we consider the broken and unstable conditions of industry it is very much to the credit of this country that we have been able to achieve the task of employing 150 000 more annually. The slower rate of growth of the population should ease matters and in future there will not be so many people entering into industry in excess of those going out. The basic problem is mainly one of balance between specialised skill and specialised capital, and there is no doubt that the "dole" has affected the methods of economic adjustment, retarding the necessity for moving about or taking another kind of job that acted automatically before the war. In the distribution of unemployment there are thus geographical as well as industrial factors, the tendency being for expansion of business in the South and contraction in the North.

Wages Out of Equilibrium.

COMPARISONS with conditions abroad are often made to our detriment, but figures published in the International Labour Review show that the average wage in this country is 27 per cent. higher than in Germany, 43 per cent. higher than in France, and 53 per cent. above the figure for Italy. Since wages enter into production costs, our higher level adds to the difficulty of quoting a competitive price in neutral markets. The cost of the social services must also be taken into account. Sir JOSIAH STAMP gave the comparative figures of 1911 —a representative year before the war—and of 1928 as 14s. 6d. and 91s. 6d. per head respectively. At first sight it would appear that wages are too high, but the view of the economists was rather that the rates in various trades are out of relation. There is also an element of the vicious circle about the problem. The important conclusion, however, is that British industry bears highly favourable comparison with conditions in other countries, and that for ten years past we have steadily added to our employment roll at the rate of 3 000 a week.

Sir Hugo Hirst.

IT was a pleasant surprise for all who were present at the opening of the new Bristol showrooms and offices of the General Electric Company last week to see Sir HUGO HIRST about again and to hear from Lady HIRST that he is making good progress towards full recovery. Sir HUGO HIRST, who is convalescing in the West Country, motored over to Bristol in ignorance of the function which was taking place, but the short informal reception which he and Lady HIRST held in the new showrooms was regarded as an excellent augury for the first sub-branch of the G.E.C. to be established; it is this year celebrating its 21st birthday. By a happy coincidence Alderman SENNINGTON, who performed the opening ceremony by flashing an electric torch on a photo-cell which switched on the illumination, was elected to the Bristol Electricity Committee in 1909, the year in which the G.E.C.'s branch at Bristol was inaugurated.

Burden of Rates.

AT the general meeting of the Metropolitan Electric Supply Co. last week the chairman, Mr. GEORGE BALFOUR, M.P., drew attention to the relation between charges for electricity and local rates, and said that the constantly increasing amount payable in rates did much to stop the cheapening of the supply. In 1924 the Metropolitan and its subsidiary companies paid about £27 000 in local rates. Five years later, in 1929, the amount had risen to £58 000, but as the latter sum excludes about £20 000 which was included in the price of the bulk supply to cover local rates on the Willesden power station, the true comparison is between £27 000 and £78 000—an increase of nearly 189 per cent. in five years. Mr. BALFOUR also referred to the effect of the De-rating Act on supply undertakings, and complained that it was more difficult to induce customers to change over to electric power when they benefited from de-rating, so that the electricity supply industry was burdened with this "illogical surtax method" of determining their valuation for rating purposes.

New Rôle for Power Stations.

IF the forecast of Mr. E. H. SMYTHE and Mr. E. G. WEEKS proves accurate, power stations in the future will take their place with gas works as producers of motor spirit and heavy chemicals. In their paper on "The low-temperature carbonisation of fuel, with special reference to its production of electricity," which was read before the North-Western Centre of the I.E.E. last week, they suggested that the inauguration of the grid transmission system and the co-ordination of power production afforded favourable conditions for combining the latter with the distillation of coal. The electric-power plant of the future might take in coal as its raw material, but would deliver, in addition to electricity, motor spirit, fuel oil, creosote, pitch and other derivatives of coal tar. The authors claim that a new situation exists in which a practical process of coal distillation has been evolved in conjunction with the generation of electricity, and that as a result a definite step forward in the better utilisation of coal is now due.

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AUTOMATIC SUB-STATIONS FOR JAPAN.

English Electric Equipment for the Ise Electric Railway—Demonstration at Stafford—1 000 kW 750 V Convertors and Ancillary Plant.

AT Stafford on Wednesday, the English Electric Co., Ltd., had on view one of three complete sub-stations which it is manufacturing for the Ise Electric Railway of Japan. A comprehensive series of tests was demonstrated.

The capacity of each sub-station is 4 000 kW and the d.c. voltage is 1 500 V. Each set of equipment consists of four 1 000 kW, 750 V rotary convertors working in series pairs for 1 500 V. The e.h.t. supply to the sub-station is 3-phase, 60 cycles, 11 000 V, and the equipment shown included one 11 000 V, 3-phase, 60 cycle truck type switchboard; two 2 100 kVA O.I.S.C. indoor type, step-down transformers, each with double wound secondary windings for supplying two convertors in series; four sets of l.t. a.c. starting and controlling relay equipments including cam shaft controllers; two common relay panels; four 1 000 kW shunt wound rotary convertors with direct coupled exciters and running at a speed of 900 r.p.m.; one set of 1 500 V d.c. switchgear including track feeder breakers; and one desk type control board.

The general scheme provides for the control of the incoming supply to the automatic and auxiliary equipments by one feeder supply oil circuit breaker which can be closed by the control switch on the desk control board, or by the manual hand operating gear if desired. After the supply has been made available the first unit, consisting of two machines, can receive its starting impulse either from a time switch or from a "start" push button on the control desk. The second unit can be brought into operation by a prolonged overload on the first unit by means of an overload relay or by the operation of the machine thermostat.

The rotary convertors are started by means of low-voltage tappings on the transformers and are provided with roller bearings. The English Electric Co. has specialised in the use of roller bearings on tap-started rotary convertors; the disadvantages of this method have now been overcome, so that the saving in first cost and in the space occupied due to the omission of the starting motor can be fully realised. Use of roller bearings obviates the need of a brush lifting device and the starting operations are as simple and straightforward as for a pony motor started machine. With roller bearings, the starting current taken from the h.t. mains compares favourably with that taken by a motor started convertor. Of well over 100 rotary convertors supplied by the company to Japan during recent years, not one has been started by means of a pony motor, and several repeat orders indicate that this system of tap-starting with roller bearings deserves the serious consideration of engineers dealing with this class of plant. All English Electric Co. rotary convertors fitted with roller bearings are now provided with a patented system of oil lubrication which is giving every satisfaction.

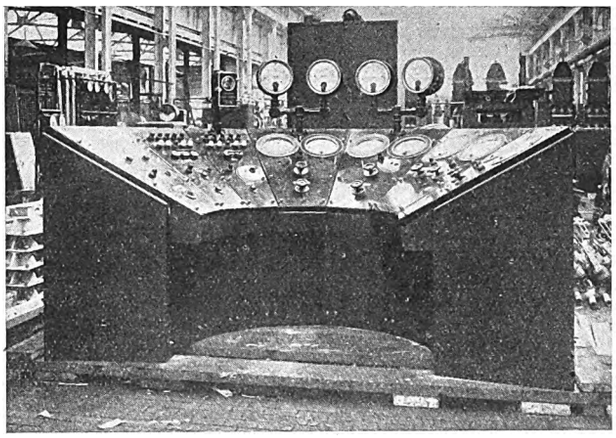

Fig. 1.—Desk type remote control board for automatic sub-station, Ise Electric Railway, Japan.

By the adoption of a new type of rotor, developed by the company, it is possible to use a pony motor of the same synchronous speed as the rotary convertor, and at the same time to retain a construction devoid of windings of any kind and, therefore, indestructible.

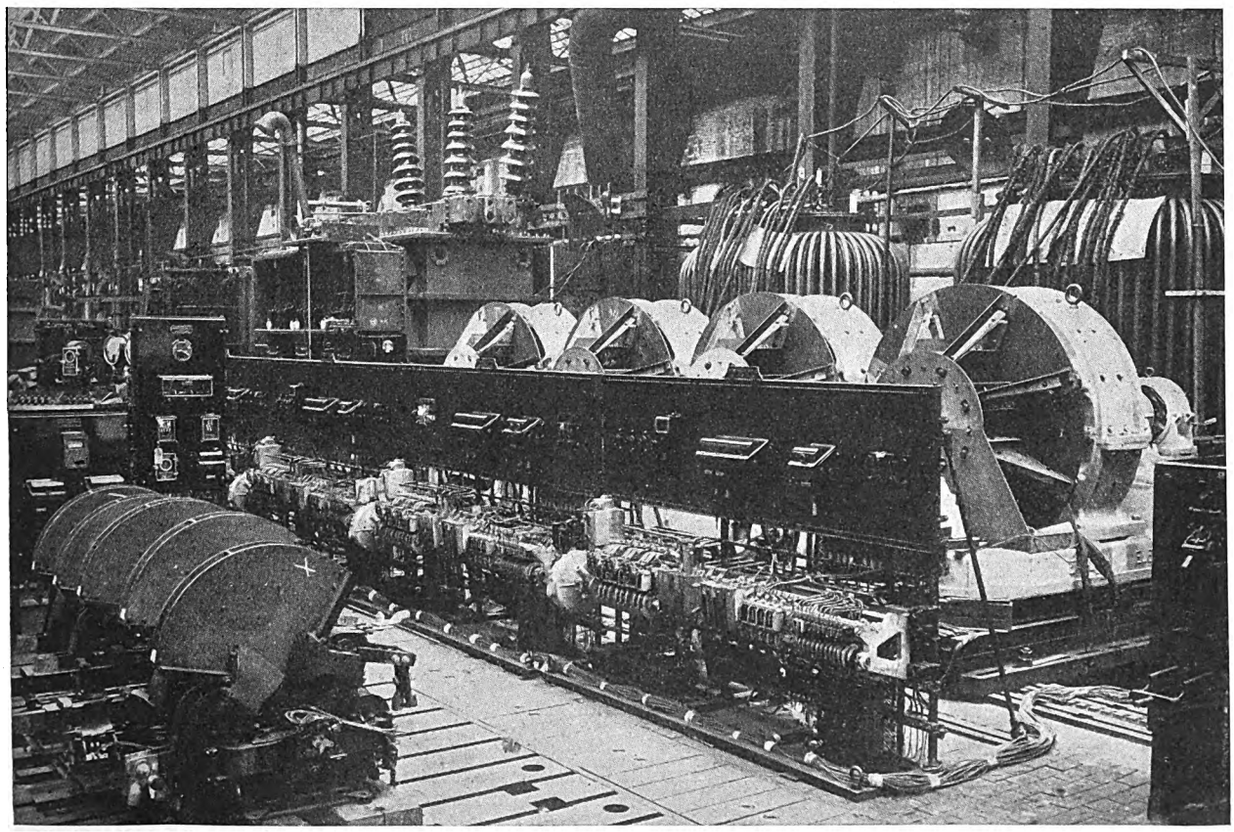

Fig. 2.—One of three sets of English Electric automatic sub-station equipment for the Ise Electric Railway, Japan, showing the special open type camshaft control equipment in front of the machines and the high-speed circuit breakers in the foreground. Normally the camshaft controller is housed in a sheet steel cubicle. The open type used in this instance was built to the specification of Japanese engineers.

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MOULDED INSULATING COMPOSITIONS—II.*

Influence of Heat—Electrical Tests—Effect of Immersion—Mechanical Tests—Arc and Heat Resisting Materials—Hot, Moderate and Normal Temperature Materials.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

IN the earlier part of this article a brief review was made of the great variety of moulded insulating compositions used in the electrical industry, and some account was given of the different compositions available, indicating the various basis or bonding materials used, with a test by means of which they may be identified, and outlining the methods of manufacture. Since, as has been pointed out, a moulded composition almost invariably assumes the characteristics of its basis material, the particulars there given would serve to indicate approximately the service to be expected. For the safe use of materials under various conditions, however, precise information regarding the mechanical, electrical and physical properties is necessary.

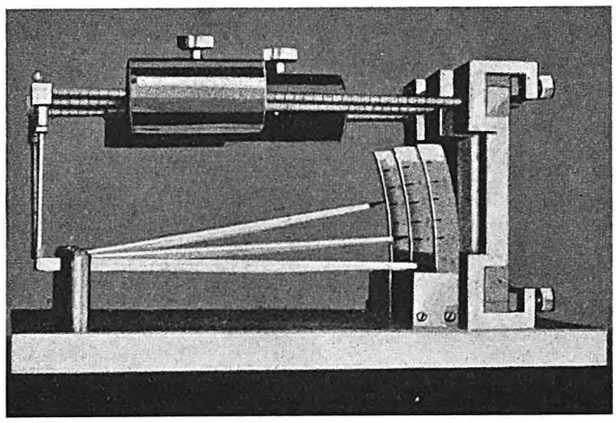

Fig. 8.—An improved "Martens" softening point tester.

As a means of ascertaining such information special tests have been adopted, many of which have been standardised by the E.R.A. The following notes describe some of the most important of these tests and indicate the results which may be expected from moulded compositions classified according to temperature conditions of service.

The effect of heat can best be ascertained by one or more of the following tests, which have been suggested by the E.R.A. :—

(1) Charring test by a carbon arc playing on the surface of the material under test. This test is usually applied to compositions with a hydraulic cement base.

(2) Ignition test by radiant heat uniformly increased at the rate of 300 deg. C. per hour, noting the temperature of ignition if this occurs, and also whether the material continues to burn in air when removed from the influence of the heat.

(3) Charring test by fuse-wire of copper ·036 in. diameter, in intimate contact with the moulding, repeatedly fused by the passage of a current of 100 amps. at 500 volts.

(4) Ignition test in the flame of an E.R.A. standard Meker burner, noting the time necessary to cause ignition and also the time taken for the material to cease burning when removed from the source of heat.

(5) Softening point test indicating the temperature at which the material yields under stress.

The first four tests of the above list are intended for arc-resisting and non-ignitable mouldings. These materials are easy to identify. It is proposed to deal more fully with the tests in a later article on arc-resisting and non-ignitable boards.

Test No. 5 is intended for materials of lower heat resistance, which may be taken as embracing about 80% of the moulding materials used. For this reason the method of test and some of the considerations involved in its application are dealt with more fully here.

The best method of carrying out the softening point test is one which was originally suggested by Prof. Martens, at one time director of the Material-Prüfungs-Amt. of Berlin. In this test a rectangular bar, made from the moulding material to be tested, is held in a vertical position and subjected to a constant and uniform bending stress throughout its length by means of a weighted lever. The stress applied is adjusted to 50 kg. per sq. cm. of cross section of the test specimen.

Fig. 8 shows an improved testing apparatus of this type developed by the Metropolitan-Vickers Electrical Company for use in its Research Department. In this apparatus three specimens can be tested simultaneously, the yield of the materials being shown by the movement of the pointers on the scales. The test is carried out in an electrically-heated oven in which the temperature is raised at the rate of 1 deg. C. per minute, starting from atmospheric temperature. The accepted softening point is regarded as the temperature reached when the drop at the end of the weighted cantilever is actually 6 mm. Typical results obtained on various mouldings tested by this method are shown in Fig. 9 .

Another method of testing the softening point consists of noting the penetration of a weighted standard needle into the specimen with gradually increasing temperature until the penetration increases rapidly without appreciable increase in temperature, this being taken as the point of collapse. This method of testing would be useful for small specimens, but further research work is required to calibrate the results for comparison with those of the Martens test.

The necessity for actually testing samples of materials for softening point is shown by the fact that it is not safe to assume that the use of certain base materials will result in the same softening point values. Considerable differences

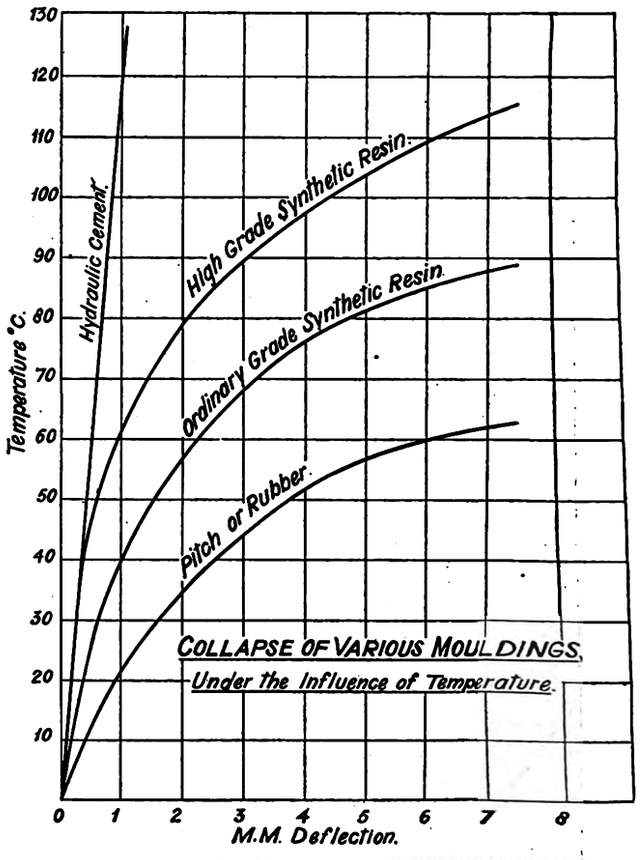

Fig. 9.—Typical results obtained with improved "Martens" tester.

can be obtained from identical mixtures by varying the curing period in manufacture. as is shown by the test results given in Fig. 10. The specimens used in this test were typical synthetic resin mouldings made from the same powder, and it will be noted that by varying the curing period from 5 to 10 minutes the softening point (6 mm. deflection) was varied, from 60 deg. C. to 95 deg. C. and 110 deg. C. The products of

* The first part of this article appeared in our issue of February 14th.

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the longer curing period were also of a better quality in other respects.

It should always be borne in mind that the stated softening point does not mean that no deformation will take place at a lower temperature. The curves of Fig. 10 clearly show that collapse takes place quite gradually as the temperature increases and there is no sharp kink which would indicate a critical temperature. Further, where stresses are increased, deformation or "creep" will occur even at temperatures well below what is called the softening point. Fig. 11 shows

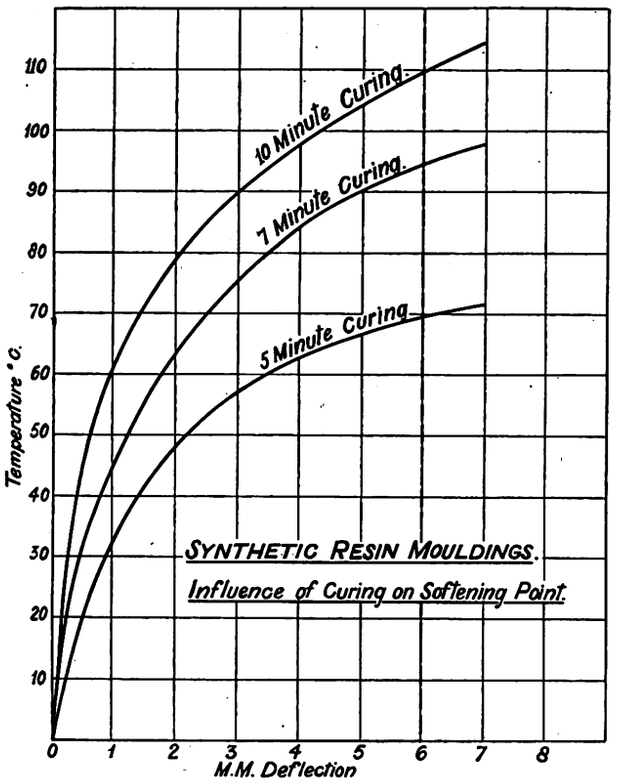

Fig. 10.—Gradual collapse with temperature increase.

a shellac moulding which has collapsed under the combined influence of the stress of clamped up contacts and temperature of about 80 deg. C. The stress and the temperature were both excessive, but either excess would produce a similar result. In view of these considerations it is important to examine the flowing properties of a material even at temperatures considerably below the test softening point, and to employ materials in service only for stresses and temperatures which are well below the test values.

The electrical properties of mouldings are generally obtained from specially moulded specimens so designed in shape and size as to give results which can be associated with those obtained from the various shaped articles used for electrical work, and therefore give some idea of the service to be expected. A group of such specimens for electrical and mechanical tests is shown in Fig. 12. The disc on the left is for electric strength test; the flat, square piece for shrinkage; the large cylinder for absorption of liquids; the small cylinder for compression; the notched bar for impact; the plain bar for softening (Martens); the special moulding on the right for surface-resistivity.

Electrical strength tests on mouldings are usually carried out under one of the following conditions:—

(1) Normal temperature and humidity.
(2) Highest temperature permissible.
(3) Before and after immersion in water for 24 hours.

Where surface-resistivity is of importance the special moulding shown in Fig. 12 is used. The details of the moulding now recommended as standard are shown in Fig. 13. The surface resistance is measured at the end of each minute over a period of 10 minutes under a potential difference of 500 V and a curve is plotted showing the relationship between surface-resistivity and time.

For practically all commercial work the most important test on mouldings, other than arc-resisting and non-ignitable, is the electric strength test. There is some divergence of opinion concerning the form of the test specimen to be recommended. In earlier recommendations the type of specimen shown in Fig. 14 was adopted. This is a 4-in. disc with a concave depression in the middle. It was soon found, however, that the values obtained with such specimens exceeded those obtained in service, and it is now generally accepted that tests carried out on a plain 4-in. disc approximately $\frac{1}{8}$ in. thick give values nearest to those obtained on commercial mouldings. The modern method is to test such a disc between the flat surface of cylindrical electrodes of $1\frac{1}{2}$ in. and 3 in. diameter respectively, usually under oil to prevent flash-over.

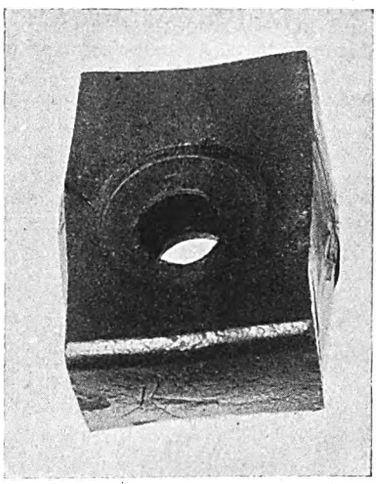

Fig. 11.—Collapsed shellac moulding.

Where the electric strength is of importance, it is always advisable to carry out the tests at the highest temperature expected in the service contemplated. The necessity for this is shown by the great variation in electric strength exhibited by most moulded materials when tested cold and hot. Typical examples of such variation are shown in Table I. The electric strength values here given should be regarded as typical only of ordinary products. Improved values are possible with synthetic resin products, for instance, when the powders are kept free from moisture or are vacuum dried before moulding. Superior results are also obtained where effective curing periods are allowed either during the moulding process or by the adoption of a lengthy baking period afterwards. By the exercise of special precautions remarkable test values have been reached, an example being the production of a tube only 12 in. in length which successfully withstood over 250 000 V when tested along its length in oil at 90 deg. C. Mouldings of this class are essential for such applications as tap-changing apparatus on high voltage transformers. Examples of materials for such work were on exhibition at the recent British Industries Fair.

In addition to the electric strength of materials, the surface flash-over values are generally of importance, especially if repeated flash-over is accompanied by a decrease in the voltage necessary to cause flash-over again. The test is usually made in air between cylindrical brass electrodes of $1\frac{1}{2}$ in. diameter standing on the test specimen with a distance of 1 in. between their nearest points.

Service conditions for many insulating mouldings involve immersion in various liquids, the most common of which are transformer oil, dilute acid, dilute alkali and water. For

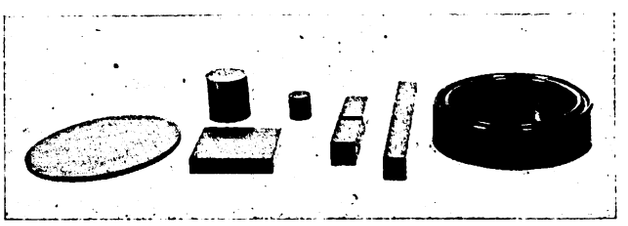

Fig. 12.—Moulded shapes for electrica and mechanical tests.

research purposes it is usual to study the effect of immersion for various periods, but fairly reliable results can be obtained after the periods of 24 hours and 6 days for water, 6 days for transformer oil, 24 hours for 20% soda solution, and 6 hours for sulphuric acid of Sp.g. 1·4. The effects produced vary considerably with different base mouldings, but a general conception can be obtained from the results indicated in Table VI.

The mechanical properties of most mouldings are usually compared from the results obtained on recognised specimens. There is, however, a variation in the dimensions suggested by various authorities, which therefore rather confuses the comparison of test results. The variation in the dimensions of the suggested test specimens are summarised in Table II.

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The actual mechanical properties are very greatly influenced by the process of mixing the various components, but as a general rule practically all arc-resisting materials can be considered as brittle and poor mechanically. The mixtures embracing synthetic resins are generally strong and tough, and in this respect are superior to those with a pitch or bitumen base. The inclusion of long fibred fillers greatly adds to the mechanical properties, as in the case of asbestos wool when included in hydraulic cements and bitumen or pitch

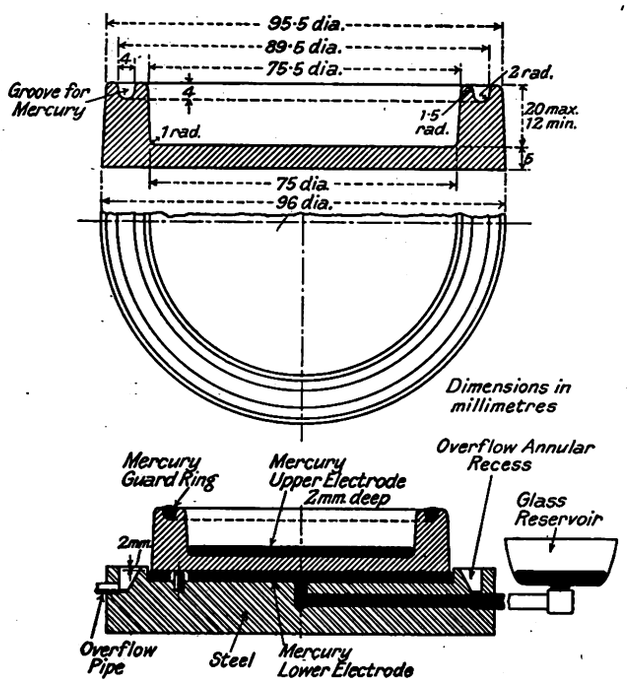

Fig. 13.

mouldings; flaked fabrics are also employed when very tough synthetic resin mouldings are required.

Good synthetic resin mouldings should give a compression strength of approximately 30 000 lb. per sq. in., and a transverse strength of 8 000 to 12 000 lb. per sq. in. Tensile strength tests are included in those called for by the American Society for Testing Materials, but are not covered by the recommendations of the V.D.E. or E.R.A. The average tensile strength for synthetic resin mouldings is approximately 4 500 lb. per sq. in.

The following notes, giving particulars of the properties of moulded insulating materials, are grouped according to temperature conditions of service, on the basis which has already been suggested for their classification.

Arc-resisting materials are usually made from an hydraulic cement base. Their principal use is for arc-shields on switchgear and control gear. The characteristics desired are similar to those associated with non-ignitable and self-extinguishing boards, practically all incorporating asbestos. The materials should show no deformation under stress at temperatures up to their fusion point and should be non-ignitable. The electric strength is usually low, and most of the materials are inclined to be brittle and lacking in mechanical strength. Because no carbonisation is permissible under arcing, no impregnation can be used, and it is thus practically impossible to protect the materials from their tendency to absorb moisture. The general characteristics of the class are indicated in Table III.

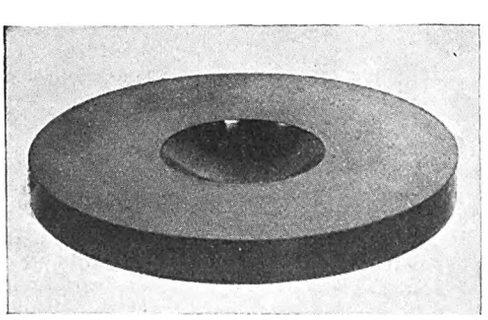

Fig. 14.

Many materials of the heat-resisting class are impregnated varieties of arc-resisting materials, and are therefore better electrically than the latter. Heat-resisting materials find a somewhat limited field of use in heating equipment, including domestic electric kettles, irons and heaters. The main characteristics of the group are summarised in Table IV.

Hot service materials should be immune from distortion under stress up to about 120 deg. C., the choice is limited to some of the higher grade synthetic resin base mouldings, where conditions permit of their use, or a combination of synthetic resin with various solidifying resins which cure only after a prolonged heating process. These latter materials have an advantage over ordinary synthetic resin mouldings in the fact that they do not carbonise so readily. This class of materials has found favour in connection with electric traction equipment, switchgear, and for service in which absolute alignment of contacts at elevated temperatures must be maintained. The main characteristics of the materials of this class may be taken as conforming with those shown in Table V.

Moderate temperature service materials should be capable of continuous service at 90 deg. C. without distortion. This class of material is also confined to the synthetic resins and specially cured preparations. The materials available are very limited and are only to be found among the products of manufacturers of repute. The characteristics of the class may be taken as similar to those given for hot-service materials in Table V, with, however, a lower plastic yield point.

Under the heading of Normal Temperature Service Materials come a vast number of mouldings, including products of synthetic resins, pitch, bitumen, rubber, shellac, cellulose acetate, cellulose nitrate, and caseins. The separation of these products into their spheres of effective use depends upon their ability to withstand different conditions of service. A guide to the characteristics of the materials in this class is given by the typical test results set out in Table VI. With regard to the last column of this table, it should be noted that the particulars and classification given are the result of observation and experiment, and are not based on manufacturers' descriptions.

TABLE I.—Typical Test Results Showing Influence of Temperature on Electric Strength.

Grade.	Type of Moulding.	Thickness (inch)	Elec. Str. (volts/mil). Normal	Hot
Arc-resisting	Hydraulic Cement	·20	10	15 at 180 deg. C.
Heat-resisting	Special Mixtures	·375	36	30 ,, 180 ,, ,,
Hot Service	Synthetic Resin	·110	390	100 ,, 90 ,, ,,
Moderate Temp.	Rubber ..	·130	350	200 ,, 75 ,, ,,
Normal Temp.	Cellulose Acetate	·09	600	400 ,, 60 ,, ,,
	Pitch ..	·125	200	100 ,, 60 ,, ,,

TABLE II.

Test Specimens Suggested by :

Test.	V.D.E.	E.R.A.	A.S.T.M.
Compression Strength ..	None.	A cylinder 15 mm. dia. × 15 mm. long	A cylinder 286 mm. dia. × 31·8 mm. long
Transverse Strength ..	10 mm. × 15 mm. × 120mm. Supports 100 mm. apart.	15 mm. × 15 mm. × 200 mm. Loaded at one end.	12·7 × 12·7 × 127 Supports 102 mm. apart.
Impact Strength ..	10 mm. × 15 mm. × 120. Plain specimen.	15 mm. × 15 mm. × 80. Notched specimen.	None.

TABLE III.—Characteristics of Typical Arc-Resisting Materials.

Spec. Gravity .. .. 1·8 to 1·9

Moisture Absorption (24 hours immersion), 17 to 20 per cent.

Surface Breakdown between electrodes, 1½ in. dia. spaced ½ in. apart.

	Normal.	*Dry.*
	Depends on humidity.	19 kV.

Fuse Wire Test .. .. No damage should occur after intimate contact with 10 explosions of 100 amps. at 500 V through fuse wire of ·036 in diam.

Elec. Str. in air at 20 deg. C. On specimen of approx. $\frac{3}{16}$ in. thickness puncture should not occur at less than 18 kV or approx. 96 V per mil.

Radiant Heat Test.. .. No ignition should take place.

Carbon Arc Penetration .. A specimen $\frac{3}{16}$ in. thick under a carbon arc of 10 amps. 45 V should not be penetrated at a greater rate than 1 mil per 2·5 secs. (Fig. 15).

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TABLE IV.—Characteristics of Typical Heat-Resisting Materials.

Spec. Gravity	about 1·8
Moisture Absorption (24 hrs. immersion) ..	0·5 to 1·0 per cent.
Surface Breakdown—electrodes 1½ in. diam. spaced ½ in. apart.	
Normal.	*Dry.*
23 kV.	24 kV.
Fuse Wire Test	Carbonisation is usually evident after the 5th or 6th explosion.
Elec. Str. in air at 20 deg. C.	Sample approx. 3/16 in. thick puncture should not occur at less than 22 kV or approx. 120 V per mil.

TABLE V.—Characteristics of Typical Synthetic Resin Mouldings for Hot Service.

Spec. Gravity	1·35 to 1·39
Softening Point (Martens)	120 deg. C.
Elec. Str. on flat disc 4 in. diam. and ⅛ in. thick :	
In oil at 20 deg. C.	250/395 V per mil.
In oil at 90 deg. C.	90/280 V per mil.
Cross Breaking Strength.	From 6 000 lb./sq. in. to 1 100 lb./sq. in. at normal temp.

Note.—The mechanical features depend very much on the type of filler used.

In conclusion, the authors' acknowledgments are due to the Metropolitan-Vickers Electrical Co., Ltd., for illustrations and for permission to publish information gained in research work.

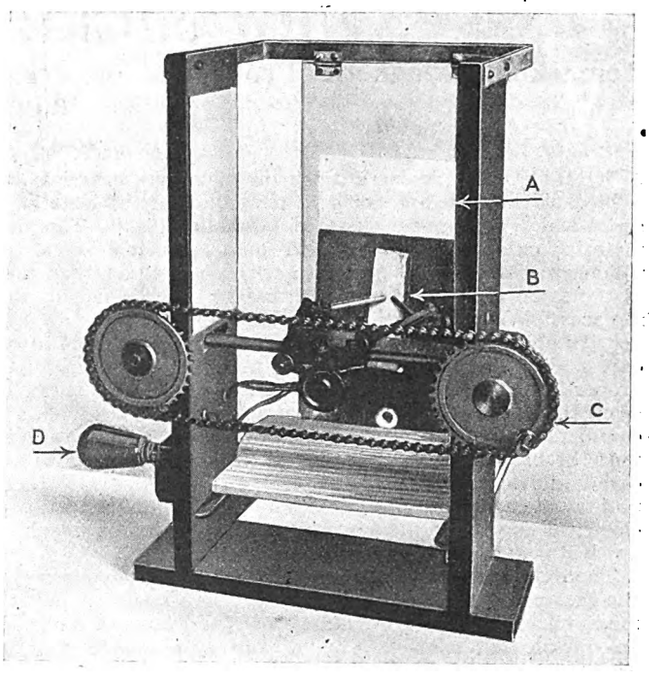

Fig. 15.—The Metropolitan-Vickers carbon arc penetration tester. (A) metal earth-plate; (B) arc carbons resting on test specimens; (C) arc control gear; (D) indicator lamp.

Table VI.—Some Typical Results of Some Standard Tests on Moulded Compositions.

Grade.	Material base.	Electric arc.	Fuse wire explosion.	Meker burner.	7 days in water.	7 days in hot oil.	6 hours.	24 hours. in 20%	Materials apparently typical in various classes.
Arc resisting	Hydraulic cement or Asbestos	Small local fusion.	No carbonisation after 10 explosions.	Non.	S.A.	Nil.	Nil.	S.A.	Tenacit 2. Clemateite.
	Silicate of Soda, or Special.	—	—	—	S.A.	Nil.	Nil.	—	Australitz.
					A.	Nil.	S.A.	—	Gummon "C."
					S.A.	Slight.	Slight.	—	Fermit II.
Heat resisting	Mica and lead Borate	Local fusion	Local disintegration.	Softens	0·02%	Nil	Nil	Nil	Mycalex.
	Special.	—	—	—	—	Nil	—	—	Ebonestos 91.
Hot-service	Synthetic resins	B.A.	Carbonised	Burns with phenol smell	1%	1%	Nil	A	Elo. Mouldensite. Fabrolite.
Moderate temperature	Syn-resin-Urea	Destroyed	B.A.	Burns with characteristic smell	S.A.	S.A.	S.A.	A	Pollopas. Beetle. Lorival.
	Special		B.A.		0·067%	0·8%	Nil	Nil	Belleroid.
Normal temperature	Bitumen or Pitch.	—	—	Burns	S.A.	A.	Nil	A.	Litholite. Crystalate.
					1·05%	4·17%			
	Shellac	—	—	Burns	S.A.	A.	—	—	Kalonite.
	Rubber	Destroyed	Fairly good	Burns with smell of rubber.	Nil	B.A.	Nil	Nil	Norite. Ebonite. Dexonite.
	Caseïn	—	—	Chars with smell like cheese.	Swells	Shrinks	S.A.	B.A.	Erinoid. Galalith.
	Cellulose Acetate	—	—	—	2%	Swells	Nil	B.A.	Trolite, Lumarith.

Note.—The entries A. (affected), S.A. (slight affected) and B.A. (badly affected) here refer only to the direct physical effect of the test and not to resultant effects as upon electrical properties.

N.P.L. Researches.

Vol. XXI, 1929, of the Collected Researches of the National Physical Laboratory has been published (Stationery Office, £1 2s. 6d. net). It contains 21 papers on the following subjects :—

"A Primary Standard of Mutual Inductance for Presentation to the Imperial Government of Japan"; "A Field of Force near the Neutral Point produced by Two Equal Coaxial Coils, with Special Reference to the Campbell Standard of Mutual Inductance"; "A Precision Method for the Comparison of Unequal Mutual Inductances at Telephonic Frequencies"; "The Properties of Mutual Inductance Standards at Telephonic Frequencies"; "Note on Shielded Non-Inductive Resistances"; "The Calculation and Application of High Resistances of Small Self-Inductance for all Frequencies"; "A Method of Measuring very Small Capacities"; "Note on the Capacities of Small Air Condensers"; "The Input Impedances of Thermionic Valves at Low Frequencies;" "The Piezo-Electric Quartz Resonator and its Equivalent Electrical Circuit"; "Improved Cathode-Ray Tube Method for the Harmonic Comparison of Frequencies"; "The Measurement of the Inductances of Four-Terminal Resistance Standards"; "A Contact Theory of Dielectric Absorption and Power Losses"; "A Magnetometer for the Measurement of the Earth's Vertical Magnetic Intensity in C.G.S. Measure"; "The Power Losses in Magnetic Sheet Material at High Flux Densities"; "The Determination of the Directions of the Forces in Wireless Waves at the Earth's Surface"; "An Investigation of Wireless Waves arriving from the Upper Atmosphere"; "Further Measurements on Wireless Waves Received from the Upper Atmosphere"; "The Cause and Elimination of Night Errors in Radio Direction-Finding"; "The Attenuation of Wireless Waves due to the Resistance of the Earth;" "The Propagation of Radio Waves"; and "The Polarisation of Radio Waves."

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NEW NICKEL-IRON ALLOY.

Remarkable Magnetic Properties of Permalloy "C"—Some Applications in Electrical Manufacturing.

(FROM A CORRESPONDENT.)

CONTINUOUS research work on magnetic materials has led to the development of a new alloy of the Permalloy series which has been designated Permalloy "C." This new material exhibits magnetic and manufacturing properties which are considerably better than those of the earlier alloy of the same group known as Permalloy "A," which it now replaces. With one exception (that of the maximum flux density obtainable) it is greatly superior in all respects to the earlier alloys. It is now, from the point of view of magnetic properties, the softest material available, and possesses, at the same time, the advantages of having the high resistivity of commercial grades of silicon steel and of requiring a simpler form of heat treatment than has been necessary with the earlier alloys. With these advantages Permalloy "C" should find a considerable application in the lighter branches of electrical engineering, such as the construction of telephone apparatus and electrical measuring instruments.

The data for Permalloy "C" and for silicon steel given in the accompanying table were obtained by a series of ballistic measurements on ring stampings of a thickness of 0·014 in., an outside diameter of $3\frac{1}{16}$ in. and an inside diameter of $1\frac{15}{16}$ in.

Comparison of D.C. Characteristics of Permalloy "C" and other Magnetic Materials.

Property	Permalloy "C"	Silicon Steel	Iron
Initial permeability μ o (at 200 p.p.s.)*	6 000	400	250
Maximum permeability μ max. ..	100 000	6 500	5 000
Magnetising force at μ max. (gauss)	0·035	0·75	1·2
Maximum flux density B max. (lines per sq. cm.)	9 000	16 000	20 000
Remanence from B max. (lines per sq. cm.)	4 500	9 000	9 000
Coercive force from B max. (gauss) ..	0·035	0·6	0·8
Hysteresis loss for B=5 000 (Ergs per c.c. per cycle)	50	550	1 000
Resistivity (microhms per cm. cube) ..	55	55	10

* The initial permeability at 200 p.p.s. is given, as this value is more reliable than that obtained by the usual d.c. methods.

With silicon steel the initial permeability remains substantially constant throughout the frequency range up to 1 800 p.p.s., but for magnetic materials having a very high initial permeability, such as Permalloy, this is not the case. The reason is that the eddy currents which are set up cause an irregular distribution of the flux, with a consequent diminution of the apparent or effective permeability. It follows that those materials with the highest initial permeability will have the steepest permeability-frequency curve, other factors being equal. Furthermore, the higher the resistivity of the material, the lower will be the rate of decrease of permeability with frequency.

Magnetic Sensitivity.

Comparison of the magnetic properties of the materials under consideration shows that Permalloy "C" is, magnetically, the softest material available for use in the construction of telephone and kindred apparatus. Also, its marked susceptibility to the influence of magnetising forces renders it superior to any other material at present employed where high sensitivity is of cardinal importance, or where a reduction in size for a given performance is desired. Simultaneously with these important advantages Permalloy "C" possesses a high value of resistivity, comparable with that of the commercial varieties of silicon steel. Furthermore, its use will enable considerable reductions to be made in the dimensions of apparatus, and consequently in manufacturing costs.

As the magnetic properties of nickel-iron alloys are somewhat sensitive to excessive strain the same care should be exercised in handling parts made of this material as is common in dealing with silicon steel laminations. For this reason it is desirable, in order to obtain the best results, to heat treat the material after the component has attained its final shape. Processes, such as drilling, riveting, etc., should not be carried out after heat treatment, although operations such as coil winding and assembling under ordinary workshop conditions may be carried out with impunity at this stage. Transformer stampings which have been badly buckled should not be taped up into cores, or the permeability will be impaired and the hysteresis loss increased. In this respect, however, Permalloy does not differ from silicon steel.

Hitherto the heat treatment of nickel-iron alloys has been a somewhat complicated process and, as the heat treatment has had to be carried out by the manufacturer of the material, the user has been involved in greater expense and delay. A feature of very considerable importance in connection with the manufacture and application of Permalloy "C" is that this new material requires only a single heat treatment—nothing more than a straightforward simple annealing process—which is actually simpler and more rapid than the process usually employed to anneal silicon steel stampings. Apart from the manufacturing advantages outlined the simplicity of the heat treatment is also of importance from the point of view of application of the material, since it greatly facilitates the attainment of uniform results in the finished product.

Method of Manufacture.

Permalloy "C" is made by melting the constituents in a high frequency electric tilting furnace. It is capable of being rolled easily to any desired shape, and can be supplied in sheet, rod or wire form of any thickness. Some of the directions in which it may be employed with advantage are :—

Instrument Transformers.—The advent of a magnetic material having such high permeability at low inductions and such low hysteresis loss is of considerable importance as regards the construction of instrument transformers used in connection with the measurement of high-tension currents and voltages. It will be possible to extend the use of the "straight-through" bushing type of transformer to the measurement of currents of much lower magnitude than has yet been possible, and considerably to increase the accuracy of this type of transformer, both as regards transformation ratio and phase angle error. The low cost and the convenience of this type of construction will enable transformers of the "wound-primary" type to be replaced to a considerable extent by the "straight-through" type. Further, the reduction in the size and number of ampere-turns, made possible by the use of a Permalloy core, will greatly simplify the precautions necessary to guard against the effect of short circuit currents in both types of transformer. The increased accuracy resulting from the application of Permalloy to bushing-type transformers also applies to wound-primary transformers. The high permeability and low hysteresis loss of Permalloy enable current transformers to be designed having less than one-third of the ratio and phase angle errors of similar transformers with silicon steel cores.

A striking instance of the utility of the high nickel content nickel-iron alloys in the design of heavy current resistors was noted by Messrs. Spilsbury and Arnold in a paper read before the Institution of Electrical Engineers on February 7th. The authors had at first considered it inadvisable to adopt air-cooled resistors for the measurement of alternating current by electrostatic methods above about 200 amperes on account of the extreme bulk entailed. While this matter was being considered, however, the remarkable properties of nickel-iron alloys of high nickel content became known, and it was at once seen that current transformers with cores of such materials might solve at one stroke all the difficulties in the design of heavy-current resistors.

High Quality Audio-Frequency Transformers.—The use of Permalloy for the cores of audio-frequency transformers has contributed very largely towards the high quality of the transmission now attainable. There were two principal reasons for its choice—to obtain the best available transmission characteristics, and to secure a reduction in size. The former reason has been the more influential, but instances have occurred where extreme compactness, such as could not have been obtained with a core of silicon steel, has been of primary importance. Where a transmission as nearly uniform as possible between the frequencies of 40 and 6 000 p.p.s. is required the use of Permalloy will produce the desired result. In the construction of output transformers a marked improvement in transmission at the lower frequencies, comparable to that obtainable for transformers, can be made, under most conditions, by the use of Permalloy cores. The use of a Permalloy core is not, of itself, an assurance of high quality

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transmission at the lower frequencies; there are other conditions to be satisfied, such as a suitable type of core assembly and suitable circuit conditions. With these conditions fulfilled, however, the transformer with the Permalloy core would give the results indicated.

Electrical Measuring Instruments.—Owing to their cheapness in comparison with moving-coil instruments, it has long been desired to produce moving-iron ammeters and voltmeters which could be used with accuracy on both alternating current and direct current circuits. Up to the present it has been difficult to manufacture such instruments owing to the hysteresis errors introduced, and to the variations with frequency resulting from their high inductance. The low hysteresis loss and high permeability of Permalloy will enable these errors to be reduced to negligible proportions. Permalloy may also be employed, with advantage, in the construction of moving-coil milli-ammeters and voltmeters. In this type of instrument stray magnetic fields are a constant source of trouble, but their effects may now be eliminated by the use of covers made of Permalloy, which, owing to its high initial permeability, makes a very effective shielding material. Dynamometer-type watt-meters are also subject to interference from external fields, and the use of Permalloy shields will enable the accuracy of this type of instrument to be increased considerably.

A further application of Permalloy is in the magnetic circuit of ironclad dynamometer-type instruments, where its use would result in a considerable increase in the strength and concentration of the magnetic field, and in the elimination of errors due to hysteresis.

Sensitive Relays.—The fact that Permalloy is so very much softer, magnetically, than the softest annealed iron, together with its high permeability, will make it possible to design and manufacture relays of much greater speed and sensitivity than has hitherto been possible.

Permalloy, with the methods and processes for its manufacture and heat treatment, is protected by the International Standard Electric Corporation's patents in most countries.

BATTI WALLAHS ENTERTAIN SIR FELIX POLE.

Anomalies in the Electrical Industry—Disadvantages of the Small Undertaking—Need of More Publicity.

SIR FELIX POLE was the guest of the Batti Wallahs, at the Hotel Cecil, on March 6th. Mr. H. A. Howard, the president, before calling upon Sir Felix Pole to speak, mentioned that the annual dinner of the Batti Wallahs, on March 21st, would be the last to be held at the Hotel Cecil before the closing of the hotel and restaurant, and that future gatherings would take place at the Hotel Metropole.

The company stood in silence for a few moments as a tribute to the late Mr. A. A. Campbell-Swinton.

Sir Felix Pole, after a reference to the large number of luncheons and dinners given by the electrical industry, said that he gathered that the one object of the Batti Wallahs was to expand the electrical industry, and he imagined that it was due to the society that the P. & O. Co. had become pioneers in adopting electric propulsion for their newest liners. They were right in pushing this new and highly successful development.

Unremunerative Prices.

He was surprised at the anomalies in the electrical industry. On the one side, he found the very highest engineering skill in design and manufacture; and on the other, the selling of these products at prices which could only be regarded as far too low. Again, there were factories which were so full of work that Sir John Brooke was reported to have said, at a recent luncheon at the British Industries Fair, at Birmingham, that the orders in hand represented a much greater horse-power than at any previous time in its history. He believed that the same issue of "The Times" recorded a financial reconstruction of one of the largest electrical manufacturing companies. The industry deserved to be so prosperous that the writing down of capital ought to be as remote from our thoughts as a capital levy should be from the financial schemes of the Chancellor of the Exchequer. Electric supply undertakings had no competitors at their end of the industry. He wondered what they would say if he suggested that no new firm should be allowed to start the manufacture of electric appliances without Parliamentary sanction. A new political party was needed to carry this reform. (Laughter.)

We should soon have one enormous main transmission area inter-connected over all its extent, and controlled by one organisation—the Electricity Board. It was one thing to carry 132 000 V high tension mains over the country, but what had to be done was to bring the current into every house in the country. There were undoubtedly many ways in which the convenience of electric lighting and adaptability of electric power would assist the farmer in his efforts to make a living. Looking at the matter on broad lines, the future development in rural areas would depend, just as it did in the town, on the energy and ability with which the distributing undertakings of the country set out to sell their goods. The distribution of electricity in rural areas was not going to be an easy matter, as the revenue in certain areas of small population would not be very great at first, and the utmost economy in capital expenditure would have to be exercised to ensure an adequate return. An active selling organisation must be developed in every distributing undertaking, and every effort made to explain to the community, by propaganda, educational publicity and by personal canvass, how electricity could be used. Adequate facilities must be given to the consumer to provide himself with apparatus on easy payment terms, either by hire, hire purchase or deferred payments.

The small undertaking was at a very great disadvantage, and undertakings of less than a certain size could not provide the facilities required, give the service that the consumers had a right to expect, or provide an adequate selling organisation. Each undertaking should at least be large enough to employ a staff in which the selling organisation was separate from the engineering organisation, as engineering talent did not always go with the commercial mind, and vice versa. The Bedford demonstration area was linked up with the Bedford supply undertaking, being, in fact, part of that supply undertaking's area, so that in the administration and commercial development of the demonstration area the expert staff of the Bedford municipal undertaking would be available.

As regards electrification as a whole in this country, he was told that he was taking a generous figure if he suggested that of the maximum possible field at home we had conquered 15 per cent. In the domestic field, at any rate, not more than 18 per cent. of the houses were wired, and of these not one in fifty was completely electrified. That showed the scope; and what we needed was to avail ourselves more and more of the science of publicity and salesmanship. All sections of the industry should combine in a much greater collective publicity campaign, and by intensive collective effort we could enormously increase the use of electricity.

Patriotism and Publicity.

He had asked a friend to give him his views on the subject generally, and quoted his reply:—

"In my view, all that the electrical industry needs to absorb its output capacity, which at present exceeds the demand, is a full dose of modern publicity and salesmanship. If the electric supply undertakings and installation contractors spent four times as much as they do to-day on attracting new business, that would bring them not only a huge additional turnover with consequent prosperity, but the manufacturers would also benefit by an unprecedented accretion of home orders. And if the manufacturers would, at the same time, bring their publicity and business-getting machinery at home and abroad to the same fine pitch as their workshop machinery, they would soon find themselves handling such outputs that they could afford to pay bigger dividends and to reduce prices, thus strengthening their power in foreign markets.

"To sum up, in two words, what you need is Patriotism and Publicity. By patriotism I mean electrical patriotism, loyal support by each individual of the respective organisations representing the electrical industry at large, and of his section of industry. And by publicity I mean collective as well as individual publicity, the whole art of persuading possible customers to buy."

Mr. A. W. Blake sounded a note of caution in regard to expenditure on rural electrification, and suggested that the money being devoted to standardisation of frequency in districts where things were now working quite smoothly might be better devoted to other purposes.

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STANDARDISATION—TRUE AND FALSE.

A Danger to be Avoided.

By Charles C. GARRARD.

THE benefits which the engineering industry owe to the self-sacrificing labours of the members of the many committees and panels whose work during recent years as embodied in the published specifications of the British Engineering Standards Association are gratefully acknowledged by all members of the industry who are familiar with the facts.

One branch of electrical standardisation deserving of special mention is that of switchgear. In a paper read before the Institution of Electrical Engineers in 1918—see " Journal I.E.E.," Volume 56, p. 213—the present writer called attention to the unsatisfactory state of affairs, which then existed, as regards switchgear standardisation. Since that time, however, great changes have taken place and to-day the established British Standards in this branch of engineering surpass in comprehensiveness those of any other industrial country. Indeed, so far has this developed that there is a danger of the enthusiasm of the engineers engaged in this work carrying them into fields where standardisation is not only superfluous but positively harmful.

It is not necessary to repeat the well-known arguments in favour of standardisation ; they are accepted by all. But it is necessary to point out that standardisation should not be allowed to prevent the expression of the personality of the engineer or the embodiment of beautiful shapes and arrangements in his work. Great engineering work is generally beautiful. The bridges of Brunel and the lines of the " Mauretania " demonstrate this. Conversely, it is very often true that an ugly looking engineering product is a bad job. And it is to be expected that this should be so. For sound engineering is only possible by men or women who are enamoured of their work, and those who design and construct under these conditions naturally make their productions as good looking as possible.

Now, of course, it is absurd to desire to express one's individuality over the study of an electric switch or the rupturing capacity rating of an oil circuit breaker. But it is altogether different when one comes to deal with the shape of the containing case of a starter or the layout of a control switchboard. To standardise such things as these merely produces a drab uniformity with no counterbalancing advantage. It is related of the late Dr. Ferranti that when he designed the columns of his engines he used a shape which was not capable of being drawn by any known geometrical construction or combination of conic sections, and the draughtsman was obliged to resort to freehand drawing.

Engineers' Duty to Society.

The result was at least something distinctive to look at. Some engineers there are, of course, who despise this idea of bringing beauty into their work. Such men would standardise the appearance of all houses and put most of our architects out of work. Unfortunately, the fringes of many of our large towns bear devastating witness to the influences of men of such ideas, or rather lack of ideas, in recent years. The work of the engineer endures after him, sometimes even after his death ; therefore, it is a duty he owes to society and to posterity that it should be nice to look at, besides, of course, performing its engineering function. The standardisation of appearance offends against this principle. No motor car manufacturer in his senses would propose that all motor cars should look alike. On the contrary each manufacturer strives to attain a distinctive appearance. This, of course, in no way affects the question of standardisation in the motor industry as applied to materials and component parts. Similarly in electrical engineering we have standard wires, standard ratings, standard terminals, cable box fittings, and the like. But if we were to try to make the shape of all ironclad switches the same, or to build all control boards to look alike we should be applying standardisation where it was not wanted and stifling the artistic proclivities of the designer ; and, after all, the designer who has nothing of the artist in him is not likely to go very far.

As Sylvanus Thompson used to say at the beginning of his lectures on that subject : " Electric design is first an art and secondly a science." That was a very true saying.

OVERHEAD LINES.

Exhibits at the Association's Conversazione.

AT the Conversazione of the Overhead Lines' Association on February 26th the Central Electricity Board showed models of towers, posts and conductors. The British Insulated Cables Ltd. had aerial cable unions, one for copper and for steel-cored aluminium conductors, a pothead insulator and various conductor samples and accessories. Bullers, Ltd., had a part of an insulator chain with an oval saddle-shaped arc ring at the lower clamp end. The Electrical Transmission, Ltd., showed one pole of a remote-controlled 11 kV isolating link, and also an 11 kV fuse, with a photo showing a h.t. fuse breaking a short circuit of 30 000 kVA at the same voltage. The Croydon Cable Co. had a set of Pernax bird guards, P.B.J. overhead cables, sheets, tubes and suspenders. Le Bois Bakelisé (of 66, Victoria Street) showed how bakelised wood was being used for electrical purposes ; a cross arm with wood pins, standard wood pins for 20, 30 and 65 kV, an operating pole and linesmen's and switchboard safety devices. The Standard Switchgear had a bracketed and an underhung fuse, the latter with lock-in clips ; a surge limiter with a self-regulating variable resistance designed to extinguish the arc at the zero point of the alternating current ware ; also a horn gap arrestor with a dry, large capacity earthing resistance ; the above-mentioned apparatus being for 11 kV. A low tension arrestor and a low tension hand grip fuse were also of interest. Messrs. Estler Bros. had a most interesting exhibit, showing in operation the way in which glass in general and h.t. insulators in particular could be tested for internal strains with the aid of the Adam Hilger polarised light apparatus.

The demonstration showed the way in which annealed glass h.t. insulators could be examined for internal stresses.

Another exhibit of the same firm was a system of strip-on-edge steel gridwork and steps for the galleries of outdoor transformer stations, and for sub-station and boilerhouse work.

Mr. F. J. Down had a number of things used for overhead lines, such as screw stay anchors, for normal ground and for swamps ; various clamps and slack pullers and earth augurs.

Neon Potential Indicator.

The Edison-Swan Co. showed a new patent neon tube potential indicator for h.t. transmission lines ; it is designed with a spark gap on the h.t. side in series with the tube, which increases the sensitiveness ; a metal portion which may serve as a hood is connected to the earth side, thus increasing the capacity and the luminosity. It can be arranged to give an adjustable audible signal in lieu of luminosity. The insulated pole used contains no earth wire, so the device is safe in use. The same company had a telephone line protector made up of three or more electrodes of refractory conducting material enclosed in a gas-filled bulb. A heavy discharge raises the electrodes to incandescense, emitting sufficient electrons to form an arc with a negative volt-ampere characteristic, thus having a great ampere-carrying capacity. These tubes impose no load on the line and singing and speech are in no way affected.

The British Aluminium Co. had two sets of samples of aluminium conductors and accessories. Thos. Bolton showed sections of ante-corona copper cables with some tubular conductors to increase diameter without increasing weight.

The Steatite and Porcelain Co. had some suspension insulators for 132 kV circuits. Messrs. Johnson and Phillips showed, among other items, one of their expulsion type h.t. fuses ; and also a type of inclined bracket for shackle insulators for l.t. circuits, the suspension of the conductor being dependent on the binding.

Messrs. Venner showed a series of time switches for various purposes. In rural areas one must look to night storage heating circuits and such like with time switches to operate them to carry a material proportion of the burden of the high standing charges, which are inevitable where customers are scattered and the load density is low. Messrs. Griffith Bros. showed a series of illuminated micro-photographs of their special paints for outdoor steelwork.

Major Rich had a table showing some propaganda scrap pictures for children and a game of lotto which is being distributed by power companies in France to accustom children in schools to recognise electrical apparatus used in the home, the office and the farm ; also photos of bats-wing swinging arm towers used on some German grid lines.

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H.V. TESTING LABORATORY.

New Equipment at Ferguson, Pailin, Limited's Factory—Details of 500 000 V Testing Transformer—Artificial Rain Apparatus—Tanks for Insulator Tests.

FERGUSON, Pailin, Ltd., have added a 500 000 V Laboratory, designed for research and routine testing, to their plant. The two 150 000 V transformers, which have hitherto served for testing up to 300 000 V, will be retained for separate testing up to 150 000 V.

The laboratory covers a floor space of 90 feet by 55 feet and the height to the lowest member of the roof trusses is 33 feet.

The testing transformer is rated at 300 kVA 500 000/840 V 50 cycles and is of the conservator type with oil filled terminal bushing. A bakelite busbar, with internal tinfoil cylinder, is permanently connected to the transformer through a horizontal spiral choke coil situated immediately above the conservator tank at the top of the terminal bushing. A flexible testing lead can be connected to any of the three spheres, which interconnect the busbar sections.

The transformer is fed by a motor generator comprising a special 300 kVA sine wave alternator, induction motor and exciter. The alternator voltage is controlled by field regulation of the exciter, which is directly coupled to the end of the alternator shaft. The control desk is located on a control and observation gallery the platform of which is 18 feet above the floor of the laboratory.

The primary winding of the testing transformer consists of two windings which can be connected in series or parallel to give two ranges of voltage, i.e., 0/250 000 V and 0/500 000 V respectively. This arrangement enables the half range of voltage, i.e., 0 to 250 000 V, to be obtained over the same range of generator field excitation and incidentally gives half the value of voltage increment per step of the coarse regulator that obtains when testing on the full range of 0/500 000 V. The motor generator is placed underground

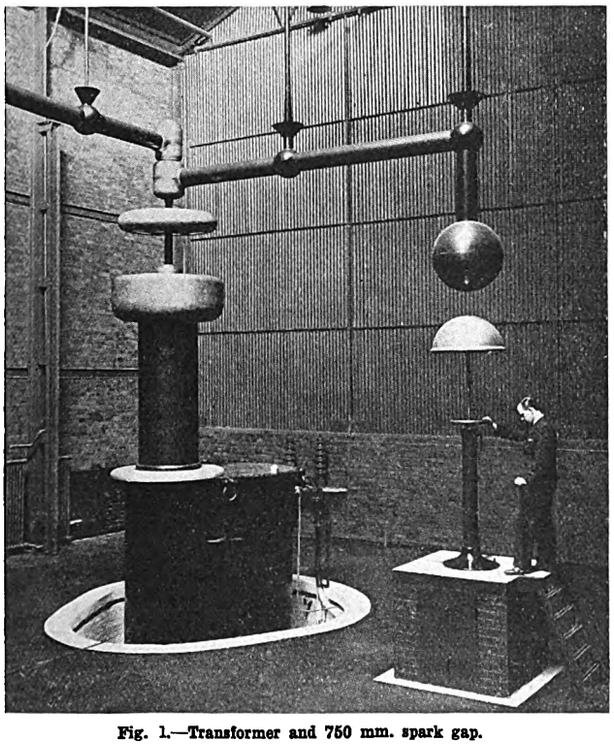

Fig. 1.—Transformer and 750 mm. spark gap.

away from the laboratory in order that it may not be heard during testing.

Four methods of measuring the test voltage are provided as follows :—

(1) Non-continuous indication by spark over of the 750 mm. sphere spark gap.

(2) Continuous indication by the 750 mm. sphere spark gap connected as an air condenser, in conjunction with a two-valve rectifier and moving coil permanent magnet d.c. instrument. This method gives crest voltage indication. The lower half of the sphere spark gap is in two portions which are insulated from each other. The upper portion of the hemisphere together with the upper 750 m.m. sphere forms an air condenser, the lower portion of the hemisphere being earthed and functioning as a "guard" ring. When

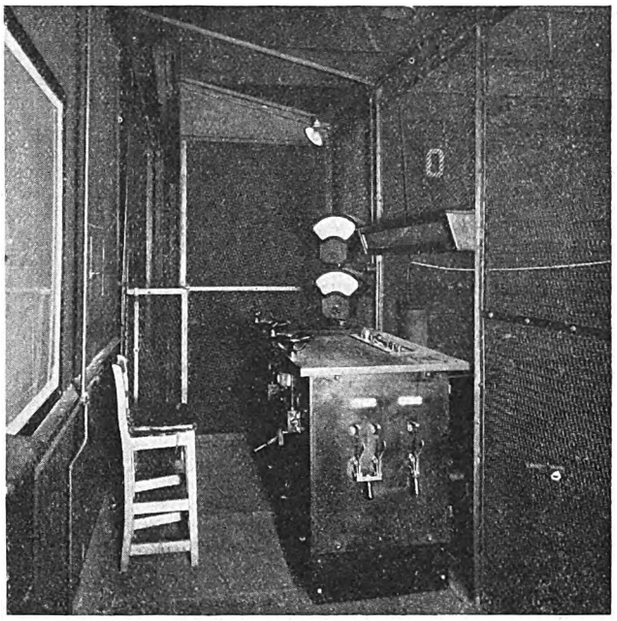

Fig. 2.—The control desk.

the gap is used for spark overs, the upper and lower portions of the hemisphere are connected together and earthed.

(3) Continuous indication by an illuminated dial voltmeter fed from a special voltmeter coil in the testing transformer.

(4) Continuous indication by a standard voltmeter connected across the primary terminals of the transformer.

A test tank, 9 ft. 6 in. diameter by 12 ft. deep has been installed for the testing of large high voltage bushings. The oil in the test tank can be heated by immersion heaters which are controlled automatically by a thermostat capable of being set to maintain the temperature constant at any value up to 100 deg. C. This tank stands in a pit eight feet deep.

A compressed air apparatus has been installed for the production of artificial rain. The spray tower is portable and adjustments can be made without interruption of the water spray of the height of jets and angle of spray. The spray can be rotated in a horizontal plane, for the purpose of measuring the rate of precipitation, and the distance between the tower and the apparatus under spray can be varied.

Temperature cycle tests on porcelain insulators are carried out in two portable tanks one of which is fitted with immersion heaters. A two-ton travelling electric block is used for handling bushings and porcelain insulators.

The main entrance to the laboratory is fitted with two sliding doors. A bogie track enables apparatus to be run into the laboratory from the erection bays. Alternatively, high voltage switchgear can be tested whilst in the erection bays by running out a test line through the main entrance. Direct access to the control gallery staircase is obtained by a small door. This door, along with the main doors and electric lifting block are interlocked with the control circuits so that the testing transformer cannot be energised unless all doors are closed and the block is at the end of the girder alongside the control gallery. The testing equipment can be operated in total darkness for corona tests. Two-way switches are provided in the immersion heater and lifting block circuits enabling these circuits to be connected to earth during testing.

The British Thomson-Houston Co., Ltd., supplied the transformer, motor generator, control desk and sphere spark gap; the latter was manufactured by Emile Haefely and Co., S.A. The testing busbar was supplied and erected by the Micanite and Insulators Co., Ltd.

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E.L.M.A. AND E.D.A. AT CHARING CROSS.

Good Lighting Exhibit Attracts Thousands Daily.

LAST week the Lighting Service Bureau of the E.L.M.A., in collaboration with the British Electrical Development Association, opened an attractive lighting exhibit in the form of a pavilion in the booking hall of Charing Cross Underground station—a very valuable site for small displays which draws the attention of about two thousand people daily. The lighting exhibit will remain on view until the end of March.

The pavilion itself is divided into three interiors with the addition of two built-in windows, and a good deal of exterior lighting is provided by various luminous features in the form of flashing opal cubes, lamp pylons, and other devices. The lounge has been designed entirely on architectural lighting lines and will be a revelation to the many thousands who will see this exhibit.

On the opposite side to the lounge, the demonstration room should exert considerable influence on the public mind to the benefit of the electrical industry. The three-colour cornice lighting, controlled by three photo-electric cells which can be operated by members of the public placing their hands over apertures in a front pedestal, is a very popular combination. Each beam of light interrupted in this manner brings on one colour of lighting in the cornice, and the combinations of colours obtained in this manner by the use of red, green and blue lamps produces remarkably pleasing effects. This section of the pavilion bears the legend : " Controlling Light with Light—The Electric Eye." In this room most of the lighting effects are novel. They include a system of indirect ceiling lighting, two colour lighting recesses, a mirror lighting demonstration, and one of the familiar Lighting Service Bureau lamp cabinets. The pedestal topped by a brightly illuminated bowl of goldfish is particularly effective.

The " House You Want Sign " recessed into one of the walls of the stand is good propaganda, designed by E.D.A.

The model all-electric kitchen, complete with washing machine, cooker, floor polisher, and other apparatus, flashes from good to bad lighting in conjunction with a telling electric sign, and the two window displays built into the pavilion are instructive. One of these windows shows the E.L.M.A. " Lady of Light " display in a new and improved form ; the other indicates the progress in light sources from the crude oil lamp to the latest electric bulb, and shows the improvement in efficiency on a basis of candle power per heat unit consumed.

Two external lighting features in the form of stainless steel pylons some 13 ft. 6 in. in height (lent by Messrs. Thomas Firth and Sons, Ltd.), serve to emphasise the modern tone which is noticeable throughout the whole exhibit.

(A view of one side of the pavilion will be found on page 343.)

PUSH BUTTON CONTROL.

AT the informal meeting of the Institution of Electrical Engineers, held on March 3rd (Mr. H. T. Young in the chair), Mr. J. J. Fisher opened a discussion on " Push-button Control." Mr. Fisher said that push button or automatic control could be applied to almost anything from opening garage doors by shining the headlights on to a photo-electric cell to the complete automatic control of a rotary sub-station.

Mr. J. R. Bedford said that British manufacturers always seemed to make control gear that required current flowing continuously to maintain contacts. It was, of course, quite a small current but there were conditions where it was quite unsuitable.

Mr. A. Morgan said that the gear indicated by Mr. Bedford was obtainable but the keynote of button control was not economy but convenience. Ease of control was a point which electrical engineers should stress persistently.

Mr. J. Eck pointed out that push button control eliminated many sources of trouble with motors—it prevented misuse of the starter and, by mounting the controller adjacent to the motor, it confined the circuit leads to short lengths, pilot leads being run only to the control points.

Mr. J. F. Shipley said that one of the defects of contactor gear as now designed was the great space it required—he thought the double-wound rotor would simplify the control gear considerably.

NEW G.E.C. SHOWROOMS AT BRISTOL.

Official Opening—Sir Hugo Hirst's Informal Visit.

IN our last issue we briefly recorded the opening, on March 5th, of the new showrooms and offices of the Bristol branch of the General Electric Company. The ceremony was performed by Alderman A. A. Sennington, who flashed an electric torch on a photo-cell, thereby actuating a master switch which controlled the illumination of the building.

The company then adjourned to the Grand Hotel for luncheon. Alderman Sennington proposed the toast of the General Electric Company, and spoke of the remarkable growth that had taken place since the inauguration of the G.E.C. in 1887. He recalled that Wine Street, Bristol, was first electrically lighted about 1882-84, and that Taunton was the first city in the country to have electric light in its streets. He said that few of the authorities in this country were anxious to place orders abroad, but they wanted some assurance that they were not dealing with a ring. He referred appreciatively to Sir Hugo Hirst's work in the development of the electrical industry.

Coming of Age of the Branch.

Mr. F. Winstanley, of the G.E.C. directorate, replying, said that it was a joy to every G.E.C. man to hear the name of Sir Hugo Hirst quoted, for he was one of those men who had visualised just what the possibilities of electricity meant to this country. The Bristol offices were the first sub-branch of the G.E.C. to be opened. That opening took place in 1909, so they were signalising their coming of age by the move into the new premises. The company now had 24 branches in the towns of this country and more than 24 in the Dominions. Its hundreds of acres of works gave regular employment to 24 000 British workers. He mentioned some of the large contracts recently obtained by the company, including erection of 132 000 V transmission lines for the Mid-East England section of the grid, the Manchester South-Altrincham Junction railway electrification, including the first standard (1 500 V) voltage train motors to be built in this country, and the installation of automatic telephone exchanges. The Thames Embankment lighting was carried out by the G.E.C., and Bristol was going to adopt a similar system.

Mr. W. E. Hobbs, the manager of the Cardiff branch, proposed the toast of " Our Guests, supported by Mr. W. L. Richards, manager of the Bristol branch. The toast was acknowledged by Mr. H. R. Beasant, of the City Tramways Department, and by Mr. W. B. Williams, the chairman of the Bristol area of the Electrical Contractors' Association.

In the afternoon a series of demonstrations was given in the new showrooms, interesting features being a comparison between rows of carbon filament, metal filament, gas filled, outside coated and the latest Pearl Osram lamps, with examples of good and bad lighting. The visitors were entertained to tea in the building. Sir Hugo and Lady Hirst, who are staying at Bath, arrived at the new premises quite unexpectedly, while the luncheon was in progress, and remained long enough to shake hands with some of the guests, who were delighted to see Sir Hugo Hirst about again after his severe illness.

The new offices at 26, Victoria Street, consist of four main floors, with a back extension on the ground floor and a large basement. The present building is expected to meet the needs of the branch for several years to come. It includes, on the ground floor, the wireless, light electrical machinery and illumination showrooms ; on the first floor there are the lighting fittings showroom, a model electric kitchen and the manager's office. The upper part of the building and the basement are required for stocks. (Pictures on page 343.)

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.

A meeting of the Paisley Association of Electrical Engineers was held in the Y.M.C.A. Board Room on February 25th, Mr. R. W. Dodson presiding. Mr. Alex. Thomson of the Paisley Post Office Engineering Department delivered a lecture on " Automatic Telephony." At the conclusion of the paper members visited the Paisley Automatic Exchange, when the lecturer and his staff demonstrated the equipment in actual operation.

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BOOK REVIEWS.

The Practical Electricians' Pocket Book, 1930. Edited by F. H. ROBINSON. (Odhams Press.) Pp. lxx+554. 2s. 6d. net.

This is the 32nd annual edition of a publication which has proved its utility by the length of its existence. New sections include "Testing and Fault Localisation" "Induction Motors—Synchronous and Asynchronous" and "Law of Contracts." Other sections have been revised where necessary and the central station data have been considerably expanded.

Telegraphy. by T. E. HERBERT, A.M.I.E.E. (Sir Isaac Pitman and Sons, Ltd., The Specialist's Series.) Pp. 1199. 20s. net.

The fifth edition of Mr. Herbert's well-known exposition of the telegraph system of the British Post Office, of which he is Assistant Superintending Engineer, includes in addition to its decriptive matter, a good deal of material not to be found in any one elementary textbook. The new lease of life given to the Wheatstone system by the Creed additions has been covered by detailed descriptions of the Creed receiver and column printer and Mr. R. P. Smith, of the Telegraph Section of the Engineer-in-Chief's Office, contributes a valuable chapter on the Baudot apparatus and its derivatives. "Start Stop" telegraphs voice frequency systems and simultaneous telegraphy and telephony are adequately covered, but we do not find any reference to the picture-telegraphy apparatus which is now being operated between Great Britain, Germany, Austria and Scandinavia.

Schaltanlage fur Drehstrom-Kraftwerke. By J. WALTJENZ. (Berlin: Julius Springer.) Pp. xvi+267. 39 marks.

The title of this work would lead one to expect it to deal with a somewhat restricted field, but the range of information covered is surprising.

The book is well bound and printed in clear type; the illustrations, both photographic and diagrammatic, are generally excellent, except that, though clearly drawn and printed, the latter are often too small, particularly some of the more complex ones. This is a fault frequently found in Continental technical books, as is also the lack of an index. On the credit side, however, we have tables of the algebraic and graphical symbols used in the book. The latter are particularly good (standard graphical symbols are used and they will cause the English reader no trouble, though in certain details they differ slightly from the usual British style).

The earlier sections deal with calculations of short circuit currents which are set out on the percentage basis. The whole section is clear and the tables of short cirucit factors and formulæ are very useful for reference. Perhaps the explanation of the "doubling effect" might have been expanded with advantage. Diagram 27, which illustrates this point, should certainly be larger or the information split up into two or three separate sketches—incidentally it appears that the draughtsman himself has tripped up at one point due to the very small scale.

The section on "reduction" of networks is quite good and throughout the book many handy formulæ and curves are given, but the limits of space render some of the theoretical portions a little bit dangerous, e.g., section 19 dealing with mechanical stresses is certainly inadequate.

Leaving the theoretical part of the book which fills roughly the first fifty pages, we find the next fifty pages or so given up to the discussion of principles and operation of protective systems, relays, etc. One cannot help remarking on the high state of development of what may be called graded and special purpose "relay" protection and the lack of use of pilot wires, which still do not seem to penetrate far beyond the "British sphere of influence."

The final two hundred pages deal chiefly with the construction and selection of equipment and are mostly descriptive. To review this would in effect be to review modern German practice, though English (Reyrolle) metal-clad gear is illustrated.

The book will probably be of more direct interest to purchasers than to makers of switchgear. The theoretical part is very valuable for reference, but should be supplemented by a sound knowledge of the physical phenomena concerned; the descriptive part is a useful summary of modern practice, particularly on the continent of Europe, and considering the limitations of space the whole work is to be commended.

W. F. C.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Future of the B.I. Fair.

[TO THE EDITOR.]

SIR,—With reference to the leading article in your issue of February 28th, it is our experience, as exhibitors at Birmingham and London, that London is by far the more attractive to buyers, both home and overseas. In spite of the special visits of associations, advertising, etc., diverting electrical people to Birmingham (and rightly so) we are more than satisfied with the results of our London stand.

There are not sufficient hotel accommodation and attractions at Birmingham to hold the overseas visitors. They pay a flying visit for a few hours, as if it were an irksome duty. The result is merely a hurried glance at stands and a rush for the London trains. At the London Fair they can spend comfortably several days without fatigue, and give individual stands maybe an hour or two—one needs this time to deal properly with customers' inquiries and orders. Overseas people have made repeated visits to our stand, and finally placed orders. What chance has a stand attendant to hold the interest of a man who has a train to catch?

February, in our opinion, as heating apparatus makers, is a perfectly good month, especially if there be a cold snap, to help buyers make decisions.—We are, etc.,

For GEORGE NOBBS, LTD.
GEO. NOBBS.

London.
March 6th.

High Power Arc Rectifiers.

[TO THE EDITOR.]

SIR,—Mr. J. C. Read in his paper on the above subject, recently read before the Rugby Engineering Society and abstracted in your issue of February 7th, lays proper stress on the striking technical progress made during the last few years with the steel cylinder arc rectifier. But he states that this type of converting plant "is not at present able to invade seriously the field of power and lighting plant at 400 to 500 V." In our opinion this hardly does justice to the position, for as far as Brown Boveri rectifiers are concerned, the last return we have (September, 1929) gives the following figures to the nearest 1 000 kW:—

Total output of steel cylinder rectifiers for 500 V or less	422 000 kW
Ditto between 500 and 1 000 V	378 000 kW
Ditto above 1 000 V	200 000 kW

Incidentally, the first rectifier equipment to be ordered from the Bruce Peebles Co. (licensees in Great Britain for our rectifiers) is a 1 500 kW unit at 550 V.

BRITISH BROWN-BOVERI, LTD.,
C. D. WALE, Secretary.

London.
March 10th.

Ship to Shore Telephone Charges.

[TO THE EDITOR.]

SIR,—In your editorial comment on ship-to-shore telephony in THE ELECTRICIAN, February 28th, referring to rates established for telephone connections with the s.s. "Majestic," you state that the minimum charge established by the Post Office is £4 10s., while the corresponding American fee for service inaugurated with the s.s. "Leviathan" is from £7 to £11, according to the telephonic zone occupied by the subscriber on land. These figures for the American charges are in error. The minimum American charge is $21, which is slightly less than the minimum English charge quoted above.

The American ship-to-shore charge varies from $7 to $11 per minute, according to the zone concerned, in place of varying from £7 to £11 for three minutes as he states.—I am, etc.,

H. E. SHREEVE,
Technical Representative in Europe,
American Telephone and Telegraph Co.
and Bell Telephone Laboratories, Inc.

London.
March 8th.

[*We regret that a misunderstanding on the part of a contributor should have caused us to make an inaccurate comparison of British and American "Ship to Shore" telephone charges.*—ED.]

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NEWS IN BRIEF.

The Manchester Radio Exhibition—Cheakamus Hydro-Electric Scheme—Conference of Electrical Women to be Held in London—Telephone Progress.

AT a meeting of the Institute of Fuel on Wednesday, Professor W. E. Gibbs read a paper entitled "Some Factors Affecting the Problem of Smoke Prevention." Dr. E. H. Lander was in the chair.

In order to celebrate the Royal Charter recently granted to it, the British Engineering Standards Association held a dinner at the Grocers' Hall, London, on March 6th, when the Duke of York was the guest of honour.

The twenty-second annual general meeting of the Institute of Metals was held in London on March 12th and 13th, when the retiring president, Dr. W. Rosenhain, F.R.S., inducted the incoming president, Dr. R. Seligman, into the chair.

Direct telephonic communication has been established between Bordeaux and Kovno (Lithuania).

Hull Electricity Committee is to erect workshops at Sculcoates power station, at a cost of £1 200.

The seventh annual radio show at the City Hall, Manchester, will be held from October 16th to 26th.

Vancouver City Council is proceeding with a proposal for the erection of a hydro-electric power plant on the Cheakamus River.

Walsall Corporation Electricity Committee has decided to appoint a showroom superintendent at a salary of £300 per annum.

An electric lighting installation is to be provided in Holy Trinity Church, Hawley, as a memorial to the late Mr. Lewis Kelsey.

Windsor Board of Guardians has postponed consideration of the question of the installation of electricity generating plant until after April 1st.

Plymouth Corporation Hospital Committee seeks sanction to borrow £2 200 for a new battery house and plant at the mental hospital.

LOOKING BACKWARD.

FIFTY years ago, THE ELECTRICIAN *of March 13th, 1880, contained a paper by Dr. C. W. Siemens, F.R.S., on the influence of electric light on vegetation, which foreshadowed the development of electro-horticulture, as the result of a series of experiments which he had carried out.*

Use of the telephone to measure the time of flight of small arm projectiles was successfully achieved by the U.S. Ordnance Department, two Blake transmitters, one placed near the rifle and the other in front of and close to the target, being employed.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of March 10th, 1905, the provision of a tube to the north-eastern suburbs of London was described as "urgently needed." A deputation was received by Mr. Gerald Balfour, then President of the Board of Trade, from local authorities whose districts would have been traversed by a proposed line from the City to Walthamstow and Cheshunt.*

Transmission at 57 600 V between Moutiérs and Lyon was recorded.

An electrically operated derrick with a jib 60 ft. long standing on a gantry 75 ft. high was used in building operations at Dundee. A 15 H.P. motor was used and the cost was given as five lifts for a penny.

A new cotton mill with 84 000 spindles, belonging to the Acme Spinning Co., at Pendlebury, was reported to be the first spinning mill in England to be entirely lighted and driven by electricity.

The application of electricity to the home was dealt with by Mr. W. F. T. Pinkney in a lecture, under the auspices of the E.D.A., to domestic science teachers from Northumberland and Durham at Carliol House, Newcastle, on March 8th.

A meeting of the Physical Society will be held to-day (March 14th) at the Imperial College of Science, South Kensington, at 5 p.m. The papers to be read are: "A Harmonic Analyser," by Mr. J. Harvey; "A Method of Comparing Small Magnetic Susceptibilities," by Mr. R. A. Fereday; and "The Masses of the Proton and Electron," by Mr. H. T. Flint.

A description of the British Thomson-Houston Co.'s apprentice training scheme appears in "Industrial Welfare and Personnel Management." No premiums are required, but new boys are subjected to trial periods of 12 months as office or utility boys, and six months in the apprentice department, after which their apprenticeship commences in the engineering shops or drawing office.

The annual conference of the Electrical Association for Women will this year be held in London, on May 15th and 16th. Preliminary arrangements include a luncheon on May 15th at the Park Lane Hotel, over which the president, Mrs. Wilfrid Ashley, will preside, and at which the Minister of Transport will be the principal speaker. A ball will be held on May 16th at the same hotel.

St. Pancras (London) Electricity Committee reports that the Council has approved the principle of utilising public street lamp standards for advertising purposes, subject to certain conditions. In view, however, of a suggestion that steps should be taken which would enable the borough councils to take uniform action with regard to such signs, the Committee has deferred consideration of the matter.

At the conference of the Federation of Engineering and Shipbuilding Trades at York, it was decided to recommend the executive committees of the affiliated unions to give notice to terminate the agreement with the employers regarding procedure for settling differences without stoppage of work. The conference is of opinion that the threatened lock-out of shipyard joiners at Belfast last autumn was an infringement of the agreement.

Hull Corporation Telephones Committee has asked the City Architect to prepare working drawings and invite tenders for the erection of the telephone exchange at Hedon.

The Post Office announced that telephone facilities would again be available between this country and the liner "Majestic" during her voyage which commenced on March 6th.

Barking Electricity Committee has decided that a scheme be prepared on the question of the supply of cookers and hire-purchase wiring terms for the consideration of a sub-committee.

It is stated that negotiations with the Power Securities Corporation for the supply of electricity to Dar-es-Salaam, the Central Railway and the Tanga District (Tanganyika Territory) have been practically completed.

Radio By-wire, Ltd., has applied to Leeds Corporation for permission to establish a wireless relay exchange in the city. A representative of the company is to discuss the proposal with the Highways Committee.

The number of telephones in use in Canada at the end of 1928 was 1 334 534, an increase of 6 per cent. during the year Canada's average of 13·82 is only exceeded by that of the U.S.A., which was 15·8 in 1927.

A proposal that school children should be taught the use of the telephone and the police telephone box has been adopted by Bradford Education Committee.

The number of telephones working in connection with the public telephone service in Great Britain and Northern Ireland at the end of 1929 was 1 848 468, an increase of 125 885 during the year. Of this total, London had 661 977, an increase of 67 726.

Mining students attended the Technical School, Mexborough, March 8th, to hear Mr. W. Maurice speak on "Modern Mine Lighting and Gas Detection." Mr. Maurice said coal mining was the worst lighted industry in the world. In Great Britain every modern mine was equipped with electric hand lamps of a type which experienced mine-lighting engineers regarded as obsolete. The average lighting value of the pre-war class of lamp was about half a candle power.

At a recent meeting of the Leeds and District Section of the Institute of Transport, Mr. R. H. Wilkinson, manager of Bradford tramways department, stated, in a paper, that the chief thing in favour of the tramcar to-day was tradition, although for the handling of heavy traffic and making frequent stops the bus could not compare with either the tramcar or trolley vehicle. The trolley bus had nearly all the advantages of a tramcar, and others in addition. It was the most silent vehicle in public service, and could be stopped as often as desired, on all kinds of gradients.

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PERSONAL.

MR. H. Jackson has been appointed electrical engineer and manager to Cardiff R.D.C.

Miss N. M. Pedler has been appointed temporary lady demonstrator and showroom assistant in the Fulham electricity department.

Leeds Electricity Committee has appointed Mr. S. F. Luckly as mechanical superintendent and Mr. R. J. Ure as electrical superintendent.

Mr. D. S. Richards, installation engineer of Newport electricity department, has been presented with a gold watch on the occasion of his leaving for York.

Estate of the gross value of £303 512, with net personalty £294 982, was left by the late Sir Robert Ashton Lister, chairman and founder of R. A. Lister and Co., Ltd., who died on December 6th last, aged 84 years.

Estate of the gross value of £63 335, with net personalty £24 623, was left by the late Lt.-Col. Montagu Cradock, a director of the Metropolitan-Vickers Electrical Co., Ltd., who died at the age of 70 years.

Mr. H. Mason Lloyd of Holywell has been offered the position of superintendent of the Chester electricity showrooms. Mr. G. P. Pierpoint of Scarborough, who had been previously recommended for the position, declined the appointment.

Mr. R. W. Steel, southern district mains assistant, Stoke-on-Trent, has resigned his position on appointment as assistant mains engineer to the Newcastle and District Electric Lighting Co., Ltd. The Electricity Committee has appointed Mr. F. R. Ward at present mains assistant, south eastern district, to succeed Mr. Steel.

Mr. J. M. Fay has been appointed a whole time member of the Irish Free State Electricity Supply Board. The remaining whole time members are Mr. A. F. Browne, chairman, and Dr. T. A. M'Laughlin, managing director. The part time membership is made up of Mr. J. J. Murphy, Dr. H. Kennedy, Mr. J. C. Foley, and Mr. P. J. Egan.

Lt.-Col. C. G. G. Crawley has been appointed Inspector of Wireless Telegraphy to the General Post Office in succession to Comdr. F. G. Loring, who recently retired after 20 years' service. Comdr. Loring has taken up a position with the International Marine Radio Co., Ltd., the subsidiary formed in Great Britain by the International Telephone and Telegraph Corporation of New York.

Mr. S. A. Russell, resident engineer at Barton (Manchester) power station, has been appointed to succeed the late Mr. T. Baxendale as power station engineer. Mr. Russell's place has been taken by Mr. W. E. Plowman, resident engineer of the Stuart Street station, and Mr. A. Williams, assistant engineer of the Barton power station, has been appointed resident engineer of Stuart Street station.

For the meeting of the British Association, to be held this year in Bristol from September 3rd to September 10th, under the presidency of Professor F. O. Bower, Glasgow, the following sectional presidents have been appointed :—Section A (Mathematical and Physical Sciences) : Dr. F. E. Smith, Director of Scientific Research, Admiralty. Section G (Engineering) Sir Ernest Moir, partner in S. Pearson and Son.

OVERSEAS TRADE.

Electrical Exports during February over £1 500 000 in Excess of Imports.

ACCORDING to the Board of Trade returns issued on Wednesday, United Kingdom exports of electrical goods, apparatus and machinery during February were valued at £1 655 364, as compared with £1 462 365 for the same month last year. For the two months of this year electrical exports were valued at £3 400 415, the total for the corresponding period of 1929 being £3 076 666. Electrical imports for the month were valued at £795 928, as compared with £508 816 for February of 1929, while for the two months, imports were £1 718 156, as against £1 106 911 for the same months of last year.

These figures show for the month an improvement in exports of £192 999 when compared with February, 1929, and for the two months the same comparison shows an advance of £323 749. On the import side February, 1929, showed an increase of £287 112 over February last year, while for the two months of this year the advance was £611 245 over the total for the corresponding period of last year.

Electrical exports during February last were, however, £859 436 in advance of similar imports, while two months, export trading showed a balance over imports of £1 682 259.

BUSINESS ITEMS.

THE HORSTMANN GEAR CO., LTD., Newbridge Works, Bath, announces the appointment of Mr. E. Glover Clark as north of England representative.

Mr. W. Kirtley, of 8, Beverley Terrace, Cullercoats, Northumberland has been appointed by WM. SAUNDERS AND CO., Falcon Electrical Works, Wednesbury, as representative for the North East Coast.

We have received an inquiry for the name of the makers of, or the agents for, a 2 kW fire sold under the name of "Furnace." The co-operation of any reader able to assist will be much appreciated.

The BENJAMIN ELECTRIC, LTD., announce that Mr. Towers, who represents them in Northumberland, Durham, Cumberland and Westmorland, has now changed his address to 5, Grosvenor Drive, Whitley Bay, Northumberland.

As manufacturers of petrol buses and electric trolley buses respectively, the ASSOCIATED EQUIPMENT CO., LTD., and the ENGLISH ELECTRIC CO., LTD., have arranged to collaborate in putting on the market a line of single-motor low-loading trolley omnibuses. These vehicles, which will shortly be put on test, will have as their basis the A.E.C. "Regal," "Regent" (four-wheel) and "Renown" (six-wheel) chassis. The line of vehicles will include single and double-deck types with the following wheelbases and seating capacities :—Model "661T," 50–52 seat double-decker (four-wheeled), wheelbase, 15 ft. 6½ in.; model "662T," 30–34 seat single-decker (four-wheeled), wheelbase 17 ft.; model "663T," 60 seat double-decker (six-wheeled), wheelbase, 16 ft. 6 in. The last-mentioned model can be supplied with a wheelbase of 18 ft. 7 in. In these new vehicles the Associated Equipment Co. will manufacture the chassis and components. The electrical equipment and the bus bodies will be manufactured by the English Electric Co.

THE CASE FOR INDIVIDUALISM.

Thirty-Second Luncheon of the Individualist Movement.

SIR ERNEST BENN was the speaker, and Sir Hugh Bell the chairman, at the thirty-second luncheon of the Individualist Movement, held on Wednesday at the Hotel Cecil, London.

The Chairman reminded the gathering that the original meeting of the Movement took place four years ago, when his rôle and that of the speaker were reversed, Sir Ernest on that occasion being in the chair and he (Sir Hugh Bell) deputed to launch their effort, which had so far been a flourishing enterprise. Unless a man helped himself, continued Sir Hugh, nobody else would help him to any good purpose. Nowadays, whenever there was any trouble, we ran to the Government. When he was a young man, that was the very last resort for help. The best they could say for government was that it was a necessary evil; let us have as little of it as we could.

Sir Ernest Benn claimed at the outset of his speech that the Individualist Movement had an effect for good upon thinking people better than that of any other movement within recent history.

The present position, as he saw it, was that we as a people had recently got hold of this new toy, government. Thirty millions of us were now fascinated by it and playing with it, and our only interest seemed to be to find out how much governing we could do.

The social reformers would never understand how much levelling down was done by legislative attempts to level up. While we were building motor cars to circumvent taxation, foreign manufacturers were building them to climb hills. Wherever one went in the world to-day, everybody seemed to think that we were down and out, and that doles and tariffs had done their deadly work on our character for independence and initiative.

In the meantime, he discerned a large element of hope in the position. The political education of our people advanced apace. We were getting over the politics that might be labelled "9d. for 4d.," and we should, largely as a result of the four years' work of the Individualists, in the near future be in a position to return to principles in politics—opposing principles, but principles about which we could argue. Nobody denied the basic soundness of the Individualist position, and their function was to keep the lamp of truth burning brightly above the clouds and fogs of political ignorance, content to know that now and again a few bright beams would break through for the benefit of the sufferers below.

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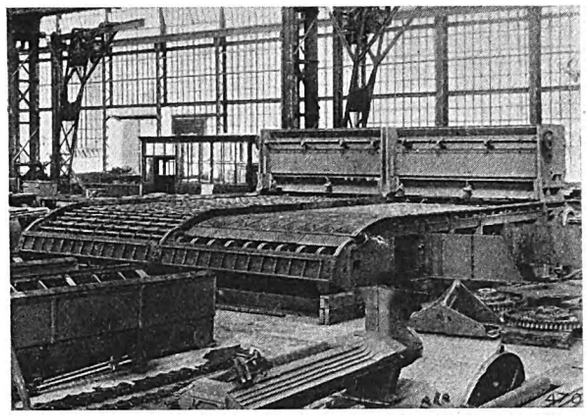
MECHANICAL STOKING.

Large Travelling Grate Units for the London Power Company.

THERE are now being completed at the Derby works of the UNDERFEED STOKER CO., LTD., two " Type L " stokers for the London Power Co., Ltd., which are to be installed at the Deptford East power station. Each of these stokers is



"Type L" stokers being constructed at the works of the Underfeed Stoker Co. at Derby, for the London Power Co.

31 ft. wide, corresponding to 700 sq. ft. of grate area for boilers of 200 000 lb. normal evaporation per hour, to operate also in conjunction with " Usco " multiple plate air heaters with an air supply of about 250 deg. F., the steam pressure being 525 lb. gauge with 700 deg. F. superheated steam temperature, constituting what are claimed to be the largest travelling grate stokers in the world. There are many new features of the " Underfeed Type L " stoker, including twin grates, for widths over 15 ft., but one of the most important claims is the solution of the problem of uniform distribution of the air supply to every point because of the width of the stoker. The forced draught fan discharges the air by way of the two main compartments, one at each side, direct into one very large simple windbox of ample height and capacity, while underneath the chain the active grate area is divided into a series of transverse compartments all opening at the bottom to the windbox, and each serving with air its own section of the grate surface above. Inside these compartments are a number of small shutters or dampers arranged in a row, and controlled in one section of the compartments by a common shaft projecting from the side of the setting and provided with a wheel control or handle.

In the above photograph, taken during construction in the shops, is seen in the foreground an " Underfeed Class B " stoker as used for " Lancashire " and other internally fired cylindrical boilers. This is of the " Underfeed " or " retort " type with a central trough, and a gear driven screw feed for the coal which " floods " over down each side of the sloping grate, made on the " louvre " principle with overlapping fire-bars and mechanical forced draught.

G.P.O. TELEPHONE CONTRACTS.

In the report of the Comptroller and Auditor-General on the appropriation accounts of the Government's revenue departments, it is stated that with regard to the supply of the equipment and plant of new telephone exchanges, the Post Office has mainly depended on five firms, with whom an agreement has been in force as to price since 1923. It was recognised at the outset that the manufacturing firms would incur abnormal initial expenses, which would be reflected in the prices charged, and substantial reductions were expected when these preliminary expenses should have been exhausted, or written off. In the opinion of the Postmaster-General, the reductions made in recent years have not been so great as should have been possible. A new scheme has been evolved in which the prices represent at the outset a reduction of 12½% for automatic and 10½% for manual equipment, compared with the former current schedule prices, and further reductions operate in succeeding years. The orders covered by the agreement are estimated to amount to at least £2 000 000 yearly, and it is anticipated that the value to the Post Office of the reductions secured will amount to not less than £1 750 000 during the period of the contract.

IN PARLIAMENT.

Derby Corporation's Trolley Vehicle Proposals Approved by Committee.

A SELECT Committee of the House of Commons had under consideration, last week, the Derby Corporation Bill, the provisions of which include authority to run railless trolley vehicles along any authorised tramway route in the borough and along routes in certain districts outside the borough. Mr. J. W. Horton, surveyor to Derbyshire County Council, said it was considered that the existing omnibus services were adequate. The poles for trolley vehicles would be dangerous to traffic on country roads. The Committee decided to grant the powers asked for within the borough and on six of the outside routes.

Newport Trolley Vehicles.

A Select Committee of the House of Commons, on Friday last, dealt with Newport Corporation's Bill, which includes powers to provide a railless trolley vehicle service. Mr. Wrottesley, K.C., for the Corporation, said that in order to facilitate traffic on the arterial road, for which they were also seeking powers, and which for part of its length would be constructed by widening an existing thoroughfare, the Corporation desired to remove the present tramway and run trolley vehicles. It was proposed to run those vehicles for a short distance outside the borough, and the Corporation asked for power to apply to the Ministry of Transport for a Provisional Order permitting them to run other trolley vehicle services outside the borough when they became necessary. The Committee decided to give powers to run trolley vehicles on the proposed route, but refused to permit the Corporation to seek extensions of the route by Provisional Order. The preamble of the Bill was found proved.

Replies to Questions in House of Commons.

An experiment with automatic traffic signals is to be made in Oxford Street, London.

The second part of the investigation of the Severn tidal power project has been put in hand, and the whole cost of this part of the inquiries is estimated at £17 000.

The sanction given in respect of one-third of the London Power Co.'s Battersea power station is proceeding. The question in dispute is whether any further sections of the station will be allowed to be erected.

As at present advised, the Minister of Transport is not satisfied that it would be desirable to compel electric tramway undertakers to equip cars with electric danger signs at the rear, to indicate when the brakes are applied.

The Electricity Commissioners are engaged in preparing a regional electricity supply scheme for East England, covering Norfolk and Suffolk, and expect to be in a position to transmit the scheme to the Central Board in a few weeks.

The estimated cost of lighting the National Gallery is £12 000, and of lighting the Tate Gallery £5 000. Experimental work will be necessary for the type of lighting to be adopted, and provision in next year's estimates has consequently been limited to work on one or two rooms.

The electrified lines on the amalgamated railways at December 31st, 1928, were: Southern Railway, 678 miles, equivalent to 16·3% of the total; London, Midland and Scottish Railway, 219 miles, equivalent to 1·6%; and London and North Eastern Railway, 120 miles, equivalent to 1%.

The Minister of Transport has received the report of his inspector upon the inquiry held on July 19th last on the Special Order promoted by the Dorking Electricity Supply Co., Ltd., relating to supplies of electricity in Dorking urban and Dorking and Reigate rural districts. He is not fully satisfied that the proposals of the Order as it stands are in the best interests of the development of the electricity supply in Dorking and neighbouring areas, and he has asked the Electricity Commissioners to discuss the position with the promoters and other parties concerned with a view to making further proposals.

The two directors of Imperial and International Communications whose appointments are subject to the approval of the Government are Sir Basil Blackett (chairman) and the Earl of Clarendon (who is resigning). Imperial and International Communications has made the following payments in respect of cables owned by or in which the Government has an interest: Imperial cables, £450 000, with interest from 1st April, 1929; Pacific cable, £466 486, with interest from 1st April, 1928 (part of the purchase consideration of £516 406); West Indian undertaking, £270 000, with interest from 1st April, 1929 (part of purchase consideration of £300 000).

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

DUNDEE CORPORATION.—Electric lighting installations in 84 houses. Further particulars from Mr. G. Baxter, director of housing, 91, Commercial Street, Dundee.

SHEFFIELD CORPORATION, March 14th.—Supply of tramway rails (section d) and copper bands (section e). Particulars from Mr. A. R. Fearnley, Tramways and Motors Department, Division Street, Sheffield.

HARROGATE CORPORATION, March 15th.—Supply of meter boards for one year. Forms of tender, etc., from Mr. N. McLean, borough electrical engineer, 33, Swan Road, Harrogate.

HARROGATE CORPORATION, March 15th.—Twelve months' supply of cables, joint boxes, joint-box compound, service meters and service cut-outs. Specifications, etc., from Mr. Neil McLean, borough electrical engineer, 33, Swan Road, Harrogate.

KEIGHLEY CORPORATION, March 15th.—Construction of l.t. overhead line. Specification, etc., from Mr. H. Webber, borough electrical engineer, Coney Lane, Keighley.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, March 17th.—Supply and laying of l.t. cables, etc. Specification, etc., from Mr. D. J. Keep, town clerk, Town Hall, Cambridge Road, Bethnal Green, E.2; deposit £2 2s.

BRADFORD CORPORATION, March 17th.—Supply of six double-deck, six-wheel, electric trolley vehicles. Specification from Mr. R. H. Wilkinson, general manager, Tramways Department, 11, Foster Square, Bradford.

COLCHESTER CORPORATION, March 17th.—Supply of about 11 miles of e.h.t. and one mile of l.t. underground cable of British manufacture. Specifications, etc., from the Borough Electrical Engineer.

LONDON COUNTY COUNCIL, March 17th.—Electric light wiring and fitting of block of dwellings known as Broxholme House, on Harwood Road site, Fulham, comprising about 425 wiring points. Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £1.

MANCHESTER CORPORATION, March 17th.—Twelve months' supply of incandescent lamps. Forms of tender, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

WEST LANCASHIRE RURAL DISTRICT COUNCIL, March 17th.—Electric lighting scheme for Hesketh, Rufford and Tarleton. Specifications from Mr. J. Scott, 358, Royal Liver Buildings, Liverpool; deposit £2 2s.

BELFAST CORPORATION, March 18th.—Supply of (1) 50 complete double deck top covered tramcars; or (2) 50 tramcar bodies; (3) 50 tramcar trucks, with wheels and axles; (4) 50 tramcar electrical equipments. Forms of tender, etc., from the General Manager, Tramways Department, Sandy Row, Belfast; deposit £2 2s.

INSCH (ABERDEENSHIRE), March 18th.—Electrical work in connection with alterations and additions to Benmohr, Insch. Schedules from Messrs. G. B. Mitchell and Son, 1, West Craibstone Street, Aberdeen.

LIVERPOOL CORPORATION, March 18th.—Installation of electric lifts, etc., at new abattoir, Stanley, Liverpool. Specification, etc., from the Land Steward and Surveyor, Municipal Buildings, Liverpool; deposit £3 3s.

CARDIFF CORPORATION, March 19th.—Supply of e.h.t. and l.t. paper insulated cable during 12 months. Specifications, etc., from the City Electrical Engineer, The Hayes, Cardiff. Only manufacturers on the King's National Roll are invited to tender.

METROPOLITAN ASYLUMS BOARD, March 19th.—(1) Installation of synchronised electric clocks at Joyce Green Hospital, Dartford; (2) installation of electric sewing machines at Southern Hospital, Dartford; (3) conversion of workshop power units to electricity at Darenth Training Colony. Specifications from the Office of the Board, Victoria Embankment, London, E.C.4; deposit £1 for each.

METROPOLITAN ASYLUMS BOARD, March 19th.—Installation of automatic telephones at Grove Fever Hospital, Tooting Graveney, London, S.W.17. Specifications from the Office of the Board, Victoria Embankment, E.C.4; deposit £1.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, March 19th.—Coal-handling plant at Ironbridge generating station. Specification (No. 8), etc., from Mr. E. F. Hetherington, Phœnix Buildings, Dudley Road, Wolverhampton.

NEATH RURAL DISTRICT COUNCIL, March 20th.—Supply of sundries in connection with Dulais Valley electricity scheme, etc. Tender form from Mr. D. M. Davies, Council Offices, Orchard Street, Neath.

SALFORD GUARDIANS, March 20th.—(1) Electric light installation, and (2) electric lifts, in infirmary and adjacent buildings.

THE floodlighting of Olympia, London, during the period of the British Industries Fair, carried out with specially designed G.E.C. floods and Osram lamps.

Specifications from Mr. W. Martin, 33, Arran Road, Catford, London, S.E.6, or from the Poor Law Offices, Eccles New Road, Salford; deposit £2 2s. in each case.

MANCHESTER CORPORATION, March 21st.—Six months' supply of electric cooking ranges. Specification (No. 267) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

BRADFORD CORPORATION, March 22nd.—Electric light installation at Semon House, Ilkley. Specifications, etc., from the City Architect, Town Hall, Bradford.

DALKEITH CORPORATION, March 22nd.—Electrical work in connection with erection of about 28 houses at Gibraltar Gardens. Schedules, etc., from Mr. Jas. L. M. Dougal, burgh surveyor, Dalkeith.

KENDAL CORPORATION, March 24th.—Supply and erection of electrically driven blower, electric lift for retort house and lathe with electric motor drive, at the gasworks. Specifications, etc., from the engineer and manager, Mr. T. Crowdy, Parkside Road, Kendal.

LONDON COUNTY COUNCIL, March 24th.—Supply and erection in Blackwall Tunnel of (1a) four electrically driven exhaust propeller fans, 8 ft. diameter, each with 15 B.H.P. motor; (1b) two centrifugal blowing-fan sets, each with 55 B.H.P. electric motor, and suction and delivery air ducts; and (2) girders, joists, platforms, etc. Specifications from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £5 in each case.

MORTLACH PARISH CHURCH, March 24th.—Electrical work in connection with alterations and additions to church. Schedules, etc., from Messrs. A. Marshall Mackenzie and Son, architects, 173A, Union Street, Aberdeen.

WEST HAM GUARDIANS, March 27th.—Laying of main and sub-main cables, and wiring work in various blocks at Central Home, Union Road, Leytonstone, London, E.11.

LIVERPOOL CORPORATION, March 28th.—Supply of 12 step down transformers. Specification, etc., from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, March 29th.—Six months' supply of electrical fittings, etc.

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Forms of tender from Mr. C. L. Addison-Smith, 19, Heriot Row, Edinburgh.

CENTRAL ELECTRICITY BOARD, March 31st.—Supply and erection of metering equipment required in the area of the North-West England and North Wales Electricity Scheme. Specification (N.W.E.-G.M. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CONGLETON CORPORATION, April 1st.—High tension and low tension switchgear, transformers, kiosks, h.t. cables, l.t. cables and l.t. overhead distribution. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

CENTRAL ELECTRICITY BOARD, April 7th.—Supply and erection of 66 kV and lower voltage transformers, in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.-G.T.1), from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

NEW ZEALAND POSTS AND TELEGRAPHS, March 18th.—Supply of ebonite mouthpieces (P. and T. 151/2 191.) (Reference B.X. 6 201.)

ANTWERP MUNICIPALITY, March 20th.—Supply and erection of a signalling and lighting installation for a swingbridge at Antwerp Docks (No. 198). (Reference B.X. 6 205.)

EGYPTIAN MINISTRY OF THE INTERIOR, March 20th.—Steel water tank, on steel tower, with piping and fittings; and electric water level indicator. (Reference A.X. 9 073.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, March 20th.—Supply of two 150 kVA motor alternator sets, for Durban workshops (tender No. 1 615). (Reference B.X. 6 115.)

IXELLES MUNICIPALITY, March 21st.—Supply of 845 V, 440 V and 220 V d.c. electricity meters. Cahier des Charges (fr. 6¾), from Service de l'Electricité, 20, Rue d'Alsace Lorraine, Ixelles, Belgium.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of dial parts (schedule C. 555). (Ref. B.X. 6 047.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 25th.—Supply of cordless telephone switchboards (schedule C. 566). (Reference B.X. 6 071.)

EGYPTIAN PORTS AND LIGHTHOUSES ADMINISTRATION, March 27th.—Supply and installation of electric cables in the Port of Alexandria. (Reference B.X. 6 199.)

JOHANNESBURG MUNICIPALITY, March 27th.—Supply of paper insulated, lead covered, double steel tape armoured and jute served cable (contract No. 348). (Reference B.X. 6 200.)

SOUTH INDIAN RAILWAY CO., LTD., March 28th.—Transformers for power, lighting and signalling in connection with Madras Improvements—Electrification. Specifications (10s.), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays, for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

NEW ZEALAND POSTS AND TELEGRAPHS, March 31st.—Supply of spare parts for B.P.O. dial No. 10. (Reference B.X. 6 097.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 22nd.—Supply of braided switchboard cable. (Reference B.X. 6 201.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, April 30th.—Supply and erection of h.t. overhead transmission lines in isolated basins of Upper Egypt. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1; £10 5s., not returnable.

VICTORIAN ELECTRICITY COMMISSION, May 5th.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000 V circuit (specification No. 30/19.) (Reference B.X. 6 226.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year, 1930-31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13th.—Supply of terminal strips (P. and T. 151/2 200.) (Reference B.X. 6 209.)

CHILEAN MINISTRY OF MARINE, May 15th.—Supply of 3 metric ton travelling electric crane and 4 metric ton stationary electric revolving crane. (Reference No. A.X. 9 186.)

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22nd.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc. (Reference A.X. 9 212.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of cable clamps, for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators; for Waitaki power scheme—section 53. (Reference B.X. 6 216).

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14th.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

Tenders Accepted.

YORK CORPORATION.—A. Reyrolle and Co., Ltd., supply of switchgear, £6 695. (Recommended.)

EASTBOURNE CORPORATION.—A. E. Perry and Son, wiring at East Dean and Friston, £1 1s. per point.

ESSEX COUNTY COUNCIL.—Marconiphone Co., Ltd., wireless installation at Black Notley Sanatorium, £475 5s.

CHELTENHAM CORPORATION.—Sharpe and Fisher, Ltd., and Siemens Electric Lamps and Supplies, Ltd., supply of electric light fittings for 12 months.

SALFORD CORPORATION.—Supply of cables for 12 months; Derby Cables, Ltd., £2 072 2s., and N. V. Nederlandsche Kabelfabrick, £9 327 15s. (Both recommended.)

METROPOLITAN ASYLUMS BOARD.—Alpha Manufacturing and Electrical Co., Ltd., electric lighting at Woolwich casual ward, £175, and at Lambeth casual ward, £162 10s. (Recommended.)

HULL CORPORATION.—G. Baigent and Co., two generator sets, £450; Equipment and Engineering Co., Ltd., insulators, £91; F. Smith and Co., bronze wire, £440 14s.; British Insulated Cables, Ltd., lead-in cable, £116 0s. 6d.

EASTBOURNE CORPORATION.—General Electric Co., Ltd., switchboard, £1 150, l.t. board, £280, six 1 000 kVA transformers, indoor type, £2 940, four 1 000 kVA transformers, outdoor type, £2 160; two 250 kVA, £520; two 500 kVA £750, and cable connections, £500. (Recommended.)

SHEFFIELD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., 18 pairs of tramcar traction motors, £355 per pair; A. G. Wild and Co., Ltd., 18 car sets of upholstered seating, £146 12s. per set; Maley and Taunton, Ltd., 18 car sets of control and braking equipment, £207 10s. per set; Cravens Railway Carriage and Wagon Co., Ltd., 18 tramcar trucks, £208 each.

MANCHESTER CORPORATION.—John Thompson Water-tube Boilers, Ltd., water tube boiler and accessories; Howden-Ljungstrom Preheaters, Ltd., air heater; Davidson and Co., Ltd., fans; Underfeed Stokers Co., Ltd., mechanical stokers; Lancashire Dynamo and Motor Co., electric motors; Brookhirst Switchgear, Ltd., starters; Ferguson, Pailin, Ltd., transformer neutral earthing resistance and switchgear; English Electric Co., Ltd., outdoor type sub-station kiosk. Ruston and Hornsby, Ltd., supply of oil engines and generators; and J. M. Henderson and Co., Ltd., supply of travelling cableways with electrical equipment at Haweswater works; A. London, electric lighting at Mansfield Street school; Seddon and Sons, electric lighting at New Moston school; John Adams, Ltd., electrical installations at extensions of Old Moat and Green End Municipal Schools.

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THE SOCIAL SIDE.

THE newly formed G.E.C. Rowing Club has distinguished itself in winning a number of river events recently. A rowing eight was turned out for the first time in the history of the G.E.C. on the Thames on February 15th, and competed successfully with St. Bride's Rowing Club, while on March 1st two fours proved equally successful.

Some 550 members of the staff of W. T. Henley's Telegraph Works Co., Ltd., and Henley's Tyre and Rubber Co., Ltd., and guests of the companies were present at the annual dinner and dance at the Wharncliffe Rooms, last Saturday. The company thoroughly enjoyed themselves. Numbers on the menu cards and on the toy balloons, for which a scramble took place later in the evening, entitled the fortunate possessors to prizes ranging from a tennis racket to a large Mickey Mouse doll. Mr. H. Savage, works manager at North Woolwich, who is retiring, after 40 years' service, in June, occupied the chair, and replied to the toast of "The Companies," proposed by Mr. A. H. M. Jacob. Mr. Jacob referred to the fact that the parent company had now been in existence for 50 years, and said that if the tyre company, which was only 12 years old, continued to progress as it had done so far, it would, when it reached the present age of the parent company, require a building larger than the Hotel Cecil.

The annual fancy dress carnival of the Igranic Electric Co., Ltd., was held on February 28th, at the Corn Exchange, Bedford, when a party of about 450 employees and guests, including a large contingent from the London office of the company attended. The costumes presented a riot of colour, and the judging, which was carried out by ballot, proved a difficult matter. Thanks to the generosity of the directors and the senior officials of the company, a large number of valuable prizes were awarded and one of the most striking events of the evening was the parade. The first three prizes for ladies were awarded to Miss L. Hettinger, whose costume represented Igranic wander-plugs; Miss C. L. Church, as an Eastern lady; and Miss F. McKillop, representing an Arcadian shepherdess. The three first prizes for gentlemen were awarded to Mr. H. Woods, as Sairy Gamp; Mr. F. Harrison, as the hunchback of Notre Dame; and Mr. Joe Taylor, as a Jack-in-the-Box. Mrs. A. H. Curtis, wife of the general manager, presented the prizes, and brief speeches were made by Mr. Curtis and Mr. A. H. Mackley.

CALLENDER'S HOSPITAL FUND.

The accounts of Callender's Hospital and Distress Fund for 1929 show receipts £1 418 2s., including £64 4s. 10d. balance at bank and cash in hand. The receipts included members' subscriptions, £860 11s. 4d.; death levies, £347 11s. 4d.; and £132 in donations by the company (£100) and directors and others. Gratuities to members amounted to £180 3s. 10d., death levy payments to 14 applicants £347 11s. 6d., and grants to hospitals, nursing associations, etc., £819 12s., and the total remaining in hand and at bank is £61 8s. 8d. Letters issued to members and their dependents for treatment at hospitals numbered 634, and letters for special nursing at home 25, while optical treatment was received by 122 members and their dependents, and 63 surgical appliances were supplied.

ELECTRICITY IN VICTORIA.

Satisfactory Report on the Development of the Yallourn Brown Coal Deposits.

IN the report of the State Electricity Commission of Victoria for the year ended June last the supply of electricity now available is compared with the conditions preceding the development of the Yallourn brown coal resources. The work at Yallourn began in February, 1921, and the first unit of generating plant there started working in June, 1924. The scheme had begun to pay its way after four years of operation, the figures for 1927-28 showing a small profit over all operations, on a total capital expenditure of over £11 000 000. Although the scheme may have been suggested and rendered possible by the immediate needs of the metropolis, rural supplies at once engaged the attention of the Commission. The first town to receive a supply of transmitted energy was Morwell, over the first section of the high-tension line which was to serve many towns in Gippsland concurrently with the availability of current from the main power station at the open cut. Supply to Colac and other western district towns was instituted in June, 1923, by means of the 44 000 V line which obtains its energy from the Geelong power station of the Melbourne Electric Supply Co. The outer suburban areas, the Yarra Valley and the Mornington Peninsula, were also in readiness to be served by Yallourn at this time, and plans were in course of preparation for the construction of the main north-eastern line, which was commenced in August, 1924, completed in January, 1926, and, pending the completion of the Sugarloaf-Rubicon hydro-electric scheme, received its energy from Yallourn, about 300 miles distant from the border towns which were served.

During the year the maximum load on the Commission's system rose from 84 000 kW to 91 000 kW, and the load factor from 49·05 to 50·3. The net energy sent out from the metropolitan terminal stations during the year increased from 325 000 000 units to approximately 356 000 000 kWh, and increases also took place in the cases of the various rural terminal and district supply stations. In the metropolitan area during the year, 555 500 000 kWh were generated. Total expenditure was £1 697 639, and the revenue £1 702 253. On electricity supply there was a profit for the year of £45 577, and on briquetting a loss of £25 705. The profit on both electricity supply and briquetting, however, is subject to annual adjustments, so that in the general profit and loss account the surplus is £4 614 over all operations.

At the Yallourn open-cut 1 660 698 tons of coal were excavated during the year. All of the coal won was excavated by the Ruston power shovel. Shortly after the close of the year a deep coal dredge commenced work on the south face of the open-cut. In 1931, when the extended briquetting factory and the first unit of 25 000 kW of new generating plant to be installed at Yallourn are in operation, 10 000 tons of coal a day will be required, rising to about 13 000 tons a day in 1934, when the full installation of 75 000 kW of new generating plant at Yallourn is due for completion. The maximum load on the Yallourn power station during the year was 62 500 kW, the station supplying 304 652 390 kWh of the total required by the system.

GROUP taken at the annual fancy dress carnival of the Igranic Electric Co., Ltd., on February 28th. Some 450 employees and friends attended, and a number of valuable prizes were awarded. See note on this page.

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ELECTRICITY SUPPLY.

Proposed Extensions at Birmingham and Manchester—Electrification in the Isle of Man—Derby and A.C. Supply—An Electrical Offensive in North Wales—The Lister Drive Station.

SHIPLEY Electricity Committee is seeking sanction to borrow £10 000 for new mains.

North Bedburn P.C. is to borrow £600 for the provision of electric street lighting in the village of Howden-le-Wear.

AN innovation at the Prescot works of British Insulated Cables Ltd. is a large showroom containing examples of the range of articles manufactured by the company. A lantern and cinema projector equipment are fitted so that slides or films may be shown. The windows on one side of the room have been filled in with large, hand-coloured photographic enlargements of the overhead line work of the Central Scotland Electricity Scheme and the Great Indian Peninsula Railway electrification contract.

St. Pancras (London) Electricity Committee is to lay an additional low tension feeder main at Highgate, at a cost of £2 680.

Barking Electricity Committee seeks sanction to borrow £18 527 in connection with the electricity supply to the Becontree Estate.

Birmingham Electricity Committee has obtained sanction to borrow £740 000 for sub-station buildings, equipment, mains and plant.

Derby Electricity Committee is to apply to the Electricity Commissioners for permission to change from d.c. to a.c., and to borrow £21 000.

Manchester Electricity Committee has obtained sanction to borrow £5 000 for buildings; £100 000 for mains, and £45 000 for sub-station equipment.

Bootle (Cumberland) R.D.C. has decided to assent to an application by the Cumberland Waste Heat Co. for a Special Order to supply electricity in the rural area.

Walsall Electricity Committee has decided to extend mains at Rushall at an estimated cost of £300 to supply 20 houses, to be erected by the Walsall R.D.C. in Winterley Lane.

A Bill is to be introduced in the Tynwald (Isle of Man) to authorise the laying of mains to supply electricity throughout the island. Douglas Corporation will supply the power in bulk.

Sleaford Housing Committee has decided to ask the Electrical Engineer to prepare a specification and estimate for electric light installations in houses, to be erected on the Grantham Road housing site.

Oxford Corporation has received a letter from the Oxford Electric Co. with respect to the proposed electric line to Wolvercote, stating that it has been decided to carry out the extension underground.

The Electricity Commissioners have sanctioned the borrowing by Croydon Corporation of £4 082 for switchgear. Mains extensions are to be carried out at a cost of £687; and street lighting is to be improved at a cost of £705.

Liverpool Corporation has received loan sanctions from the Electricity Commissioners in respect of £46 306 for new buildings, plant and cooling towers, and £4 000 for ash-handling plant and builders' work at the Lister Drive power station.

It has been reported to South Shields Electricity Committee that the Central Electricity Board holds out every prospect of being able to link up the South Shields and Sunderland undertakings under the Board's scheme by October, 1931. —The Electricity Committee seeks sanction for a further loan of £5 000 for the assisted wiring scheme.

The increased supply required in the Longton sewage works will necessitate the installation of transformers of larger capacity at the Hanford Bridge sub-station and at the sewage works, and it has been decided by the Stoke-on-Trent Electricity Committee that the necessary new transformers and switchgear be provided at an estimated cost of £400.

Ripon Electricity Committee has asked the Chairman, Town Clerk, Consulting Engineer and City Engineer to confer as to the possibility of adopting scales of charges, based on rateable value of domestic premises, plus a unit rate.—The Committee has asked the Electrical Engineer to prepare a scheme for the electrification of Ure Bank area with a view to extension to Wath and Melmerby at a later date if desired.

The Cornwall Power Co. has applied to Plymouth electricity department for terms for supplying electricity to the company. Consideration of the company's application has been deferred pending the decision of the Commissioners with respect to Plymouth Corporation's application for sanction to a loan for additional plant.—The chairman of the Electricity Committee and the Town Clerk are to negotiate *re* supply of current in the Tavistock district.

The Irish Free State Electricity Supply Board has concluded arrangements whereby it has secured the monopoly rights in electricity supply for Cork City and environs, including Cobh; agreed to buy the interests of the Galway Electric Co. for supply in that city and to supply the complete requirements of electricity by the Dublin United Tramway Co., and of Messrs. Henry Ford & Sons, Cork. These demands will secure an immediate market for approximately 43 000 000 kWh per annum.

Mr. J. N. Waite, city electrical engineer, has reported to Hull Electricity Committee that as a result of the extension of the assisted wiring scheme, there is an increasing demand for the use of prepayment meters, but that, in consequence of the heavy additional expense of such meters, together with the difficulties caused by their use, it is not desirable to extend their use, except in especial cases. The Committee has decided that where prepayment meters are in use, the additional charge of ½d. per kWh be continued, and that the supply of such meters shall be restricted as far as possible.

Invitations have been issued by the North Wales and South Cheshire Joint Electricity Authority to the mayors and chairmen of other local authorities, electrical engineers and others to attend a conference at Llandudno on March 21st to discuss the present and future position of the electricity supply in the area controlled by the authority. The authority controls an area of 4 400 square miles, from Holyhead in the west to Crewe in the east. The invitation to the conference is the result of an offer by the North Wales Power Co. of a reduced charge for current, conditional on the reduction being passed on to the consumer, and the object of the conference is to start a "big push" in the consumption of current. In connection with the conference, makers of electrical appliances have been invited to join in an exhibition, which will be open for two days.

On February 21st members of Harrogate Corporation and a number of guests, including Sir Harry Haward, deputy chairman of the Electricity Commission, inspected the Corporation's electrical plant, which has been extended and reorganised under the powers granted by the Harrogate Electricity (Extension) Order, 1929. The additions to the plant include a 10 000 kW, 11 000 V, three-phase steam turbo-alternator and two 50 000 lb. per hour water tube boilers. The extension Order authorised the purchase of the Knaresborough, Summerbridge and Pateley Bridge undertakings, and the change over of the Corporation's system from single phase to three phase. Amongst other new outlets for current is the bulk supply to Ripon, which was commenced last year. The total output has increased steadily from 1 000 000 kWh in 1904 to over 8 000 000 kWh in the last financial year.

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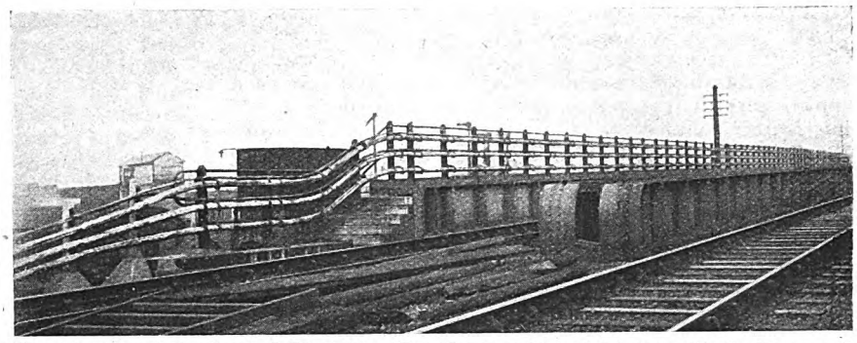
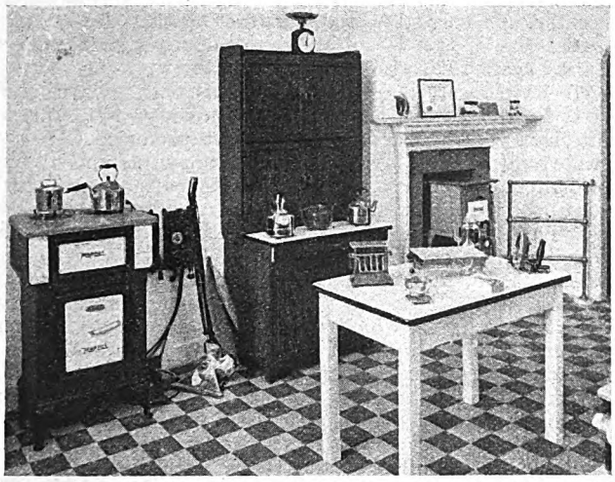
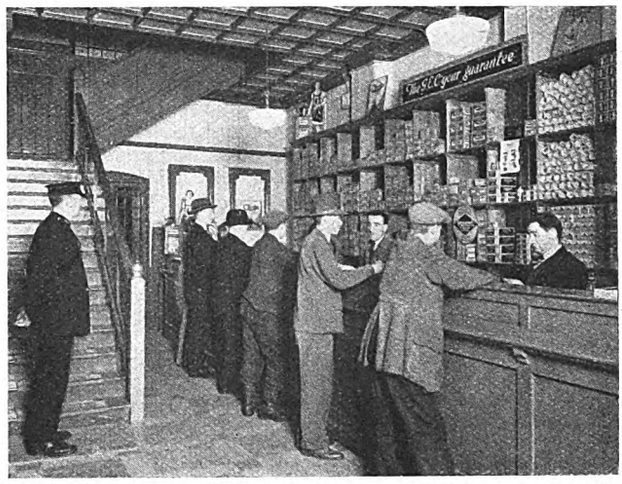
ELECTRICAL PICTURES OF THE WEEK.

Among the exhibits shown at the Nursing Exhibition, held at the Horticultural Hall, London, last week, was this novel electrical appliance which may be used as a cooker or radiator.

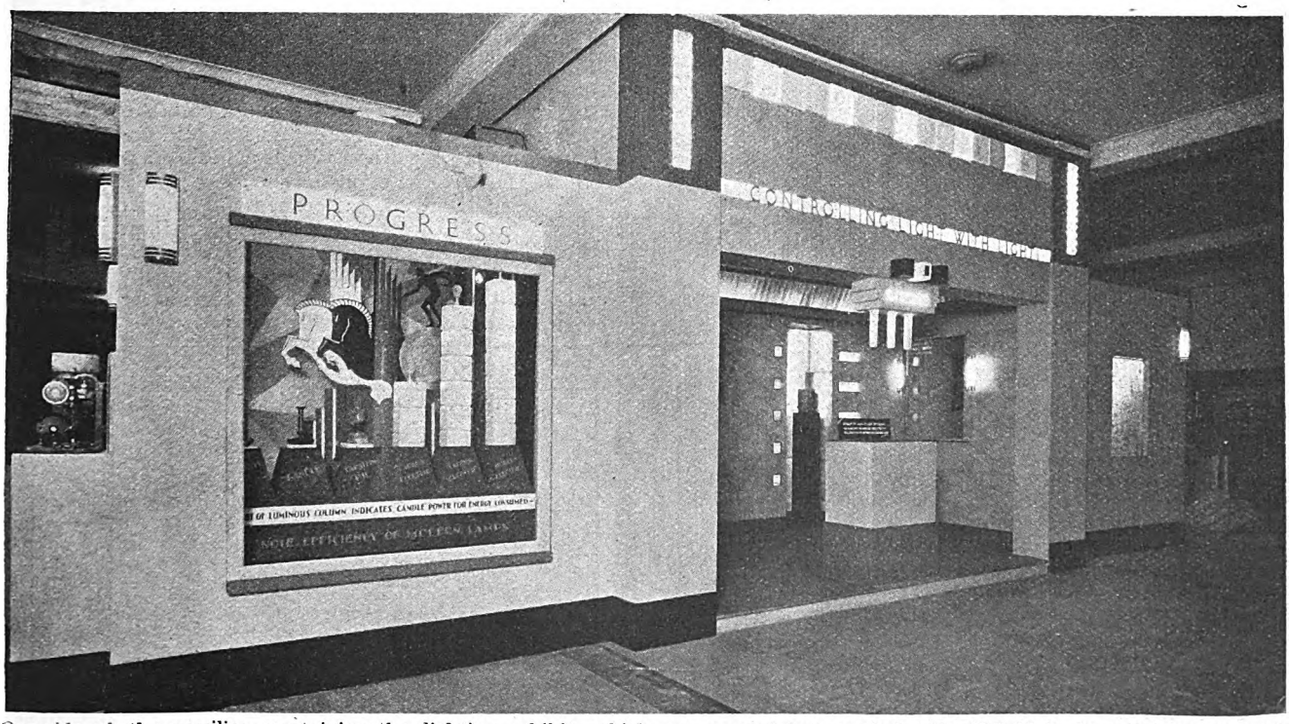


The schemes of the Central Electricity Board are quickly taking practical shape, and this picture of work recently carried out by British Insulated Cables Ltd. shows the method adopted for supporting cables across a railway bridge for linking up Willesden power stations of the London Power Co. and the North Metropolitan Electric Power Supply Co. The cables are 25 sq. in. three-core, 33 000 V.





Two views of the new showrooms of the Bristol branch of the General Electric Co., Ltd., which were opened last week. The electric kitchen, in the left-hand picture, is so arranged that demonstrations are possible under working conditions, while the trade counter at the new premises is provided with easily accessible bins containing items of stock most in current demand. See page 334.



One side of the pavilion, containing the lighting exhibit, which was opened last week by the E.L.M.A., in collaboration with the E.D.A., at the Charing Cross station of the London "Underground" Railway. The exhibit includes an all-electric kitchen and a new and improved form of the display entitled "Lady of Light." Other details of the pavilion are given on page 334.

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DIESEL ELECTRIC LOCOS.

Two New Equipments for the North-Western Indian Railway.

THE General Electric Co., Ltd., has recently completed the electrical equipment for two Diesel-electric locomotives for the North-Western Indian Railway.

Each locomotive weighs approximately 50 tons in working order and both are of the double bogie type. They are each equipped with a 350 B.H.P. Beardmore high-speed Diesel engine, direct-coupled to a single-bearing generator with overhung exciter. The generator supplies current to four traction motors mounted upon the bogie axles, control being effected by master controllers located in the driver's cabs at either end of the locomotive. The locomotives are designed to haul loads up to 100 tons at a maximum speed on the level of approximately 47 m.p.h., and at correspondingly less speeds on gradients up to 1 in 50. The engine is started by motoring the generator from a storage battery which floats across the exciter circuit and serves to provide a low tension supply for the lighting and the control circuits. The primary control of the locomotive speed is by remote control of the engine throttle, this being effected from the master controller at either end of the locomotive. The Diesel-electric power unit has self-regulating properties, the main generator being provided with a differential series field winding in addition to a shunt field winding, so arranged that the locomotive characteristics ensure that corresponding to the particular throttle position the locomotive accelerates automatically up to its balancing speed. The controls are very simply arranged, push buttons being provided both to start and to stop the engine, speed control being obtained as stated previously by the movement of an electrical controller which gives 5 running positions. The locomotives are designed for the Indian track gauge of 5 ft. 6 in., but the bogies of one locomotive are being modified to the standard British gauge of 4 ft. 8½ in. to enable a number of tests to be conducted on the locomotive before shipment. Illustrations of the locomotives are reproduced below.

FINSBURY OLD STUDENTS' ASSOCIATION

Annual General Meeting—Election of Officers for Coming Year.

THE annual general meeting of the Finsbury Technical College Old Students' Association was held in the Engineers' Club on February 24th, when it was decided to utilise the interest on the money of the Finsbury Defence Fund and the Thompson Memorial Fund for a prize to be given by the Physical and Optical Society to Apprentices to commemorate the name of S. P. Thompson and Finsbury. The annual dinner of the Association will be held at the Trocadero on March 29th. Any old students who have not received a notice are asked to communicate with the Hon. Secretary, F. R. C. Rouse, 15, Clifton Gardens, Golders Green, N.W. The following officers have been elected for the coming year :—PRESIDENT Mr. W. B. Esson ; VICE-PRESIDENTS : Messrs. E. W. Moss, H. F. Knight, H. D. Symons and E. G. Walker ; MEMBERS OF COUNCIL : Messrs. W. J. Jeffrey, W. G. Head (mechanical), H. P. Guy, H. W. Gregory (electrical), L. M. Clark, J. V. Eyre (chemical) ; HON. SECRETARY : Mr. F. R. C. Rouse. HON. TREASURER : Mr. W. B. Thompson ; HON. AUDITORS : F. B. Preston, A. J. Chapman.

TRADE PUBLICATIONS.

THE subject of water heating by means of "Inventum" appliances is the subject of new issue by Mr. ALAN WRIGHT, 117, Victoria Street, London, S.W.1.

Publication No. P.F. 65 describing "Helsby" wireless Condensers and replacing No. H. 115 has been issued by BRITISH INSULATED CABLES, LTD., Prescot, Lancs.

Pamphlet No. 255/1 dealing with horizontal oil immersed flameproof controllers has been published by MAVOR AND COULSON, LTD., 47, Broad Street, Glasgow, S.E.

A list of revised prices and terms for the "Sunco" general catalogue, list No. 600 has been published by the SUN ELECTRICAL CO., LTD., 118, Charing Cross Road, London, W.C. The new list, No. 516, brings the main catalogue up-to-date but does not contain details of new lines or alterations to existing lines.

G. A. HARVEY AND CO., LTD., Greenwich Metal Works, Woolwich, London, S.E.7, has recently produced a booklet which describes and illustrates a few of the many diverse types of rivetted and electrically welded work carried out by the company's steel plate constructional department. The reference is No. 472.

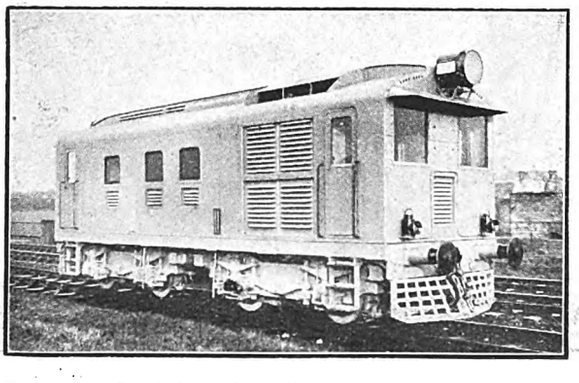
We have received from the WARDLE ENGINEERING CO., LTD., Elsinore Road, Old Trafford, Manchester, a copy of a new folder describing the "Maxheat" tubular electric radiator specially designed for the heating of offices, etc. Leaflet No. H 252 describing the company's tubular electric heating system has also been received.

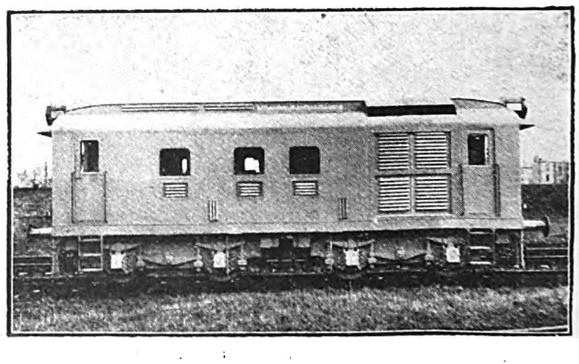
We have received from the NICKELOID ELECTROTYPE CO., LTD., Printer Street, London, E.C.4, a copy of the improved tint chart which this company has just produced. It shows a wide range of tints, is well protected from wear, and is arranged for hanging for quick reference whenever required. Such a chart should prove useful to advertisers and others who desire to arrive at some conclusion with respect to blocks most likely to suit their needs.

The MARCONIPHONE CO., LTD., 210, Tottenham Court Road, London, W.1, announces that the company's series of valve advertisements, in which attention is drawn to the many national services in which "Marconi" valves are used, has caused a considerable amount of favourable comment in the advertising world, and it is felt that their scheme of usefulness should be widened by bringing them to the attention of the local public. The result is a series of valve window bills, available to members of the trade, with the promise that fresh examples will be added from time to time.

"QUIPS."

Those who attend the many social functions attaching to the electrical industry will welcome the latest publication of Mr. H. Cecil Hunt, the author of "Howlers," for the many new business stories which it contains. The book, bearing the title of "Quips," claims to provide a suitable joke for every occasion and for every trade, and besides affording considerable amusement from the reader's point of view, will be found useful to those called upon to tell a joke new to the industry. The dinners, luncheons, and other social affairs of the electrical calling are probably greater in number than in any other industry. For this reason a new story quickly becomes a "chestnut," and a collection such as "Quips" should prove a valuable investment, for many of the stories are new, even to us who go to every gathering of note.





The two new Diesel electric locomotives which have been built for service on the North-Western Indian Railway. The electrical equipment was made by the General Electric Co., Ltd., and a description of the gear is given above.

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ELECTRIC TRACTION.

Single-Phase Locomotives for Rack and Adhesive Operation.

THE adoption of the single-phase system for the electrification of the rack railway from Viège to Zermatt in Switzerland constitutes a new development in the application of this traction system, as single-phase current had never been resorted to before for the operation of rack locomotives. At the outset, direct current at 2 000 or 3 000 V was favoured for the line in question, but, after further consideration, single-phase current at 10 500 V was decided upon, and an order was placed with the Oerlikon Company, as main contractors, for five locomotives. These locomotives, which are fully described in the Bulletin 102 just issued by Messrs. Oerlikon, Ltd., of 28/31, Essex Street, Strand, W.C.2, are for rack and adhesion operation; they are for a metre gauge track with maximum gradients of 1 : 50 on the adhesion sections and 1 : 8 on the rack sections, while the minimum radii of curves on these sections are 262 ft. and 368 ft. respectively. The locomotives are equipped with four motors, mounted on two bogies; the motors are arranged, as in the case of tramcars, with bracket bearings resting on the axles and casing supported by the end frames of bogies through the intermediary of springs. The equipment is further arranged for short-circuit breaking. The normal tractive effort is 19 000 lb. and the maximum tractive effort 30 800 lb. The locomotives weigh 48 tons and are capable of dealing with a total train load of 108 tons.

A new type of tramcar, designed by the manager, Mr. R. Horsfield, and built at the Leeds Corporation Kirkstall Road tramway depot, embodies many new features affording increased comfort to passengers. New mechanical features are air wheel and track brakes. It is proposed to build 150 cars of the new pattern.

London County Council Improvements Committee recommends that the Council's Charing Cross Bridge Bill shall include provisions authorising the execution of certain works at Waterloo, Charing Cross (Embankment), and Strand stations that have been proposed by the Underground Electric Railways Co.

METAL AND CHEMICAL PRICES.

TUESDAY, March 11th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 15 0	—	£1 0 0
Electro Wirebars	,,	£84 5 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	,,	11 ⅛d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛ l.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅜d.	—	—
Wire ,,	,,	10⅜d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£20 0 0	—	£1 5 0
Foreign or Colonial	,,	£18 10 0	—	£1 5 0
Tin—				
Ingot	per ton	£161 15 0	—	£6 0 0
Wire, basis	per lb.	2s. 2½d.	—	1d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£18 2 6	—	7s. 6d.
Mercury	per bottle	£23 0 0	—	—

Sulphur—Flowers, Ton £12 0 0; ,, Roll, ,, £10 10 0. *Copper Sulphate* .. Ton £25 to £25 10s. *Boric Acid* (Crystals) ,, £30 0 0. *Sulphuric Acid* (168° Tw.) Ton £6 15 0. *Sodium Chlorate*—Per lb., 2¾d. *Sodium Bichromate*—Per lb., 3⅝d.

Rubber—Para fine, 8¾d.; plantation, 1st latex, 7 ⅛d.

∴ **The metal prices are supplied by British Insulated Cables Ltd.**, and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

In spite of support given by producing interests at the end of last week, the market, according to James Forster and Co., again opened easier by 5s. per ton. Tuesday's market was steady and active, but on Wednesday prices threatened to fall again. Thursday's market opened flat and, with no official support, the price fell away rapidly a further 11s. 3d. per ton, followed by an average drop of 10s. Declarations of a considerable quantity of Mexican and American lead for early arrival created a Contango of 5s. per ton. The official American price was lowered on March 3rd to 6 cents, and again on the 6th to 5·85 cents per lb.

Closing prices on March 7th were £18 10s. for March, and £18 15s. for June, 30s. to 25s. per ton lower on the week.

WIRELESS NOTES.

Swiss "Regional" Broadcasting Plan—British Equipment Ordered.

SWITZERLAND is to have a "regional" broadcasting system, somewhat similar to that which is being instituted by the British Broadcasting Corporation, with three high-power stations—in the German, French, and Italian speaking sections of the country, respectively—and smaller relay stations where required in the principal towns. The most powerful of the new stations, a Marconi type "P.B." 60 kW broadcasting transmitter, has already been ordered from Marconi's Wireless Telegraph Co., Ltd., and is to be erected at Munster, about twelve miles to the north-west of Lucerne. This station will constitute the main "regional" station for German-speaking Switzerland, which is the largest of the three lingual sections of the country. While it is similar in design to the transmitters at the London "regional" broadcasting station at Brookman's Park, the Munster station will employ greater power, with 60 kW in the aerial, compared with London's 30-50 kW. It will thus be one of the most powerful stations in Europe, a condition rendered necessary, in spite of the comparatively limited area served, by the fact that Switzerland, with its valleys, high mountains, and curious screening effects, is one of the most difficult countries in the world for broadcasting. Studios in Berne, Zurich, and Basle will provide the programme for the Munster station, which will be allotted the wavelength of 459 metres. To provide for "crystal listeners" in the towns, Marconi broadcasting stations of ½ kW aerial power are to be erected at Berne and Basle. These stations are of special design, with crystal-controlled drive to ensure constancy of frequency. The new station at Berne will replace the present Marconi 1 kW "Q" broadcasting station, which was erected in 1925, and which will later be modernised and re-erected elsewhere to play a part in the "regional" plan. At Basle the new station will be the frontier town's first full-time broadcasting station, the broadcasting service having previously been carried out by the Marconi transmitter at the Basle aerodrome, which is primarily employed for wireless telephony with aircraft. The re-organisation of the Swiss broadcasting service on the "regional" basis is expected to be completed in 1931.

This is the second recent Continental broadcasting re-organisation in which assistance has been sought from the experience of the British Marconi Company, in September last year the company having received an order from Poland for high-power and relay stations designed to give crystal reception throughout the industrial and thickly-populated districts of that country.

APPROVAL OF SAFETY LAMPS.

Secretary of Mines Makes Further Order Respecting Electric Lamps.

THE Secretary for Mines announces that, on February 10th, he made an Order approving for use in all mines to which the 1911 Coal Mines Act applies the following types of safety lamps:—Electric lamps for general use: Davis-Derby cap, Derby 4 V, Davis-Derby portable floodlight, 8 V, Edison cap (model G), Aldwarke and Wolf alkaline 18 Ah and 22Ah. Electric lamps for use by officials or for special purposes only: Ceag gas detecting, No. 1 and No. 2, Derby officials', and "Wefco" hand torch (for auxiliary purposes). The Order also amends the schedules to previous safety lamp orders by substituting revised specifications, or amending the specifications, of certain types of safety lamps already approved. The Secretary for Mines announces that on February 11th he made an Order approving the Wolf alkaline 18 Ah miners' lamp with Gulliford firedamp indicator attachment for use in all mines to which the 1911 Act applies, subject to the conditions specified in the schedule to the Order. This lamp is the same as the Wolf alkaline 18 Ah miners' lamp except that it is fitted with a firedamp indicator. The indicator is designed so that a heated platinum wire may be connected in series with the lamp bulb by means of a switch; the presence of approximately 2½ % or more of firedamp in the air causes the platinum wire to fuse and the light to be extinguished.

Torquay Electricity Committee has received sanction to borrow £60 000 in respect of boiler extensions at the generating station.

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COMPANY NEWS.

Recovery of Cables and Wireless Stock—Ericsson's Increased Profit—Shropshire, Worcestershire and Staffordshire Co.'s Expansion—Reports and Dividends.

THE slump in Cables and Wireless issues has stopped, and the price of the "A" stock has recovered to about 60. American Telephone and Telegraph Stock has moved up a further five points to 250. Radio Corporation of America shares are over 53 and Hydro Electric Securities over 46. Marconi's International Marine Communication shares have eased from 45s. to 43s. 9d.

S. Alexander Roger, presiding at the meeting on March 4th of the Cable, Telephone and General Trust, Ltd., said the Trust's position showed steady and satisfactory improvement. Investments amounted to £1 172 784, an increase of £434 882. A valuation of the trust's investments for which a market quotation was available showed the current market value of these investments to be in excess of the figure shown in the balance-sheet, and in the case of investments where no market quotation was available the directors were of opinion that these investments were worth as much as, or more than, the figure appearing in the balance sheet. In association with the Automatic Telephone Manufacturing Co. and the International Automatic Telephone Co., and other important British interests, they had arrangements and agreements with the Associated Telephone and Telegraph Co. of U.S.A., whereby investments were made in telephone operating companies, long term credits arranged and manufacturing sales facilitated for the purpose of creating tied house investment, and financial and manufacturing business to be divided among appropriate associated companies. It would at once be grasped therefore that the company was an important link in an important chain of companies, covering the U.S.A., Great Britain and elsewhere.

Home manufacturing shares have again shown a little weakness, Associateds falling 1s. 6d. to 25s., while British Insulateds, Callender's and Enfields have all shed 1s. 3d. London Electric Railway stock has fallen a couple of points, and Underground Electric Railways ordinary shares are a shilling down at 22s. 6d.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	" " "C" Cum. Pref. ..	21/-	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	60/-	61/3	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	79½	80	81	77½
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	25/6*	26/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	35/-	35/7½	44/6	26/6
8	" " " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	44/4½	44/4½	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(*g*)	Electric Supp. Corp. Ord. ..	45/7½	45/7½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9*	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	87	87	92	80½
—	Hydro Electric Securities.. ..	46¾	44½	87	20
—	International Holdings	6½	4⅝	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/6	26/6	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	27/-*	27/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97*	99	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	38/9*	40/-	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
7	Mid. Counties E.S. Ord.	27/-*	28/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	32/6	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord..	23/9	23/9	30/3	19/3
10	N. Metro. Elec. Ord.	46/3*	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	11⅛	9⅛
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	26/-	26/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/-	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94½	94½	98⅛	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	57/6	58/9	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	91½	90½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	" " " 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	73	73	74½	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. .	69*	69	65½	52
4	" " 4% Perp. Deb. ..	76½	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½*	73½	79	42½
4	" " " " 4% Pf. Stk.	71*	72	77	68
4	" " " " 4% Deb. ..	76½	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " " 5% Deb. ..	70½	70½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	63*	65	81	54½
3½	" " " 3½% Pf. Stk. ..	60½*	62	76	60½
3½	" " " 3½% Deb. ..	67½	67½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	72½*	74½	81½	52½
4½	" " " 4½% 1st Pref. ..	78½*	80½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	86½	86½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	68	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
8	Underground Electric Rlys. Ord.	22/6*	23/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	3/9	5/-	16/-	3/-
4½	" " " 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	25/-	26/6	58/6	26/3
8	" " " 8% C.P.	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	73/9	75/-	99/4½	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153¾	120
15	Callender's Cable Ord.	71/3	72/6	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
12	Consolidated Signal Ord.	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6*	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	" " 7% C.P. ..	18/9	18/9	22/9	20/-
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	95/-	96/3	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb...	65½	65½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	17/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/6	28/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	46/3	81/3	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102½	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	120/-	120/-	136/10½	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	25/-	25	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	250	245	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk.	101½	101½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	21/10½	21/10½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	59½	56	90½	73½
—	"B" Ord. Stk.	28½	26	104	33
—	5½% Cum. Pref. Stk. ..	93*	96	99	90
3½	Eastern 3½% Pref. Stk.	63½	63½	70½	58½
4	" 4% Deb.	77	77	82½	73
4	Eastern Extension 4% Deb. Stk.	76	76	80½	73
22	Great Northern Telegraph (£10)	30½	30½	43½	26
—	International Teleph. & Teleg. ..	$72½	$71½	161½	48½
15	Marconi Int. Mar.	43/9	45/-	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	99½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	53½	49½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(*a*) 19$\frac{8}{11}$d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2$\frac{8}{11}$d. per share. (*h*) 88s. 2·136d. *Ex dividend.

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Directors' Reports, etc.

TELEPHONE RENTALS, LTD.—Intm. div. of 2½%, less tax, will be paid on March 31.

HURST, NELSON AND CO., LTD.—Intm. div. of 5%, less tax (agst. 7½% last year) is announced.

WARD AND GOLDSTONE, LTD.—Intm. div. of 3½% actual on ord. shs. (same as last year) is announced.

PENNSYLVANIA WATER AND POWER CO., LTD.—Qrtrly. div. of $\$\frac{3}{4}$ p. sh. on common stk., will be payable on Apl. 1.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—Fin. div. at rate of 11·2d. p. sh. is recommended; to sinkg. funds, £17 000; fwd. £21 800.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.—Div. of 7½%, tax free, is recommended, makg. 10% for year (same as last year).

WAYGOOD-OTIS, LTD.—Div. of 7½%, makg. 10% (same) for year is proposed. To res. for contingencies, £25 000, against £30 000; to pensions £6 000 (same); fwd. £17 631, against £15 570.

INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD.—Pft. for 1929, £135 849, agst. £130 823. Fin. div. 6¼%, less tax, on ord., makg. 10%, plus bonus 2½% (same). To res., £10 000. Fwd. £82 578, agst. £69 735.

AMERICAN AND FOREIGN POWER CO.—An offer of $50 000 000 100-year 5% debs. was made in New York last week at 90%, to yield 5·55%. A portion of the issue was withdrawn for offering in Europe.

CLYDE VALLEY ELECTRICAL POWER CO.—Fin. divs. of 5%, less tax, on ord. shs. issued prior to 1929, makg. 8%, less tax, for year 1929, and 8·9293d. p. sh., less tax, on new ord. shs. (at rate of 8% from due date of calls) are recommended.

BRITISH INSULATED CABLES LTD.—Fin. div. 10%, makg. 15% (same); to res. and depreciatn., £298 333; fwd. £280 000, agst. £250 089. A div. equalisatn. fund of £300 000 has been created out of specific provisns. previously made but no longer required.

AUTOMATIC TELEPHONE MFG. CO., LTD.—Pft. for 1929, after again charging £50 000 for depreciatn., £122 702, agst. £123 670. Fin. div. 6¼%, makg. 10% for year (same), with bonus of 2½% (same). To res. £19 500, agst. £35 000. Fwd. £118 285, agst. £93 482.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Directors recommend divs. of 7·2d. p. sh. on 6% cum. pref. shs., makg. 6% for year, 9·6d. p. sh. on 8% cum. 2nd pref. shs., makg. 8% for year, and 1s. p. sh. on ord. shs., makg. 10% (standard div.) for year, all less tax.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD.—Rev. for 1929, £179 036, agst. £171 863; pft. £73 909, agst. £73 416. To deb. stk. int. and sinkg. fund £15 000 (same); income tax, £4 000 (same); gen. res. and depreciatn., £30 000 (same); div. on ord. 4% (same); fwd., £8 357, agst. £6 204.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—Pfts. for 1929, £203 111, plus £36 689 brt. in. Intm. div. of 5% paid on Oct. 28, 1929, absorbed £59 636, directors, additional remuneratn. for 1928, £1 500. Fin. div. of 10% on ord. sh. cap. recommended for year 1929, makg. 15% for year. To gen. res., £41 986. Fwd. £17 405.

TELEVISION COMPANIES' AMALGAMATION.—The directors of Baird International Television, Ltd., and the Baird Television Development Co., Ltd., state that they have agreed upon a scheme for amalgamatn., full particulars of which will be sent to the shhldrs., with an explanatory circular, as soon as the necessary legal formalities have been completed.

TORQUAY TRAMWAYS CO., LTD.—Pft. for 1929, £80 380 agst. £34 521, includg. £50 500 net surplus on sale of 50% of hldg. of ord. shs. in Devon General Omnibus and Touring Co. Deductg. deb. int. and £6 600 transferred to sinkg. fund for debs., blce. is £73 780. To res. and renewals acct. £10 748, agst. £9 712, income-tax £4 000, agst. £4 400, depreciatn. £105, agst. £117, and sick pay and pensions, £185, agst. £192. Fin. div. of 5%, tax free, again makes 9%; fwd., £2 026, agst. £1 786.

ERICSSON TELEPHONES, LTD.—Net pft. for 1929, £64 087, agst. £31 011; plus £18 235 brt. in. To depreciatn., income tax, int. on debs. and directors' fees and sh. of pfts., £45 300, agst. £28 302. Div. 8%, tax free, agst. 5% less tax, on ord. shs.; to special res., £5 000, agst. nil; to gen. res. £20 000, agst. £5 000; fwd. £19 322, agst. £18 235. Rpt. states that an efficient and automatic totalisator equipmt. for use on racecourses has been evolved and substantl. contracts received from Racecourse Betting Control Board.

PINCHIN, JOHNSON AND CO., LTD.—Sales and pfts. for 1929 show satisfactory expansn. A majority interest in another important Australian undertakg. has been acquired, and arrangemts. were completed early in last year for consolidatn. of certain Continental interests. An extensn. of interest in the Italian undertakg. has also been acquired, which gives company effective control. Net pft. £462 349, plus £80 103 brt. in, after providg. for directors' fees. Carried to cap. res. during year £48 310. Further allocatn. to res. from pft. and loss, £20 000. Provisn. for income tax £80 816; pref. div. £26 000; fin. div. on ord. shares, 20%, less tax, makg. 30% (same); fwd. £84 446. No loss has been incurred by any of subsidiary companies.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Report for 1929 shows increase of $260 000 000 in company's own assets, and $400 000 000 in assets of associated Bell Telephone system. Total assets of the two organisatns. now exceed $4 228 000 000. There was an increase of 9·8% in operatg. rev. of Bell system, and the hldg. company's net income increased by $23 000 000 to $166 189 757, making earngs. equal $12.67 on average number of shs. outstandg., agst. $12.11. The Western Electric Co., a subsidiary which mftrs. telephone equipmt. and through another subsidiary, talkg. pictures, shows 67% increase in rev. Sales, $411 000 000, were largest in history of company. The telephone system as a whole will spend $700 000 000 this year for additns. and improvemts.

HASLAM AND NEWTON, LTD.—First rpt. covering period from Oct. 22, 1928, to Sept. 30, 1929, states that with exceptn. of Haslam works, all branches have exceeded estimated figures of prospectus. Owing to acute depressn. in ship-building and rayon industries and general depression in heavy general engineering trades, this departmnt., after makg. full provisn. for depreciatn., was unable to contribute to the pfts. Directors have developmts. in hand which are expected to provide the works with remunerative employmt. Accts. show pft. on tradg., includg. income from investmts., etc., £30 175. After charging interest on purchase money £1 472, depreciatn. £10 730, and £2 761 earned prior to incorporatn., net blce. is £13 289, plus £5 439 brt. fwd. Pref. div. absorbs £16 592 and intm. on ord. at 2½% p.a. £2 136.

SHROPSHIRE, WORCESTERSHIRE, AND STAFFORDSHIRE ELECTRIC POWER CO.—Net receipts for 1929, £369 109, agst. £303 950, administration and gen. exes., £33 368; rates, £33 368; directors' fees, £3 250; deb. and other int., £86 805; blce. on year's workg. £180 520, agst. £142 993. Directors recommend div. for year on 6% cum. pref. shs., div. of 8% for year on "A" ord. shs. (on acct. of which 4% has already been paid), and div. of 7½% for year on "B" ord. shs.; to res. appropriation acct., £57 895. Written off development expenditure, £4 047; to res., £60 000; fwd., £80 249. There are included in net rev. for 1929 some divs. payable by subsidiary companies on acct. of 1928, in additn. to those for 1929. Cap. expenditure during year, upon plant, machinery, trunk and distributg. mains, new sub-statns., etc., and acquisition of Hereford electricity undertakg., amtd. to £816 757. Approximately 120 miles of overhead and underground cables have been brt. into service during 1929, makg. total length at end of year about 640 miles, not includg. cables of Hereford undertakg. Total number of consumers supplied by company and subsidiary companies at Dec. 31, 1929, shows increase of 45%, and electricity sold increased by 17%.

Company Meetings.

LISBON ELECTRIC SUPPLY CO., LTD.—At the second general meeting, last week, Mr. J. Johnston (chairman) said they had completed their first trading period of 13 months to December 31st, 1929, and the directors were satisfied with the progress made. They hoped next year would put them on a dividend basis, and, in the meantime, were developing the area as fast as possible. The problem of generating electric power and its distribution at high voltage to various points was very simple, if looked upon as a single whole, and it was only in this way any progress could be made. He, speaking as the chairman of the company, thought the Government of Northern Ireland would be wise to ensure that the generation and distribution of electricity in that province developed along the lines adopted by England, Scotland and the Free State.

CABLE, TELEPHONE AND GENERAL TRUST, LTD.—Sir Alexander Roger, presiding at the meeting on March 4th, said the authorised capital was increased in July last from £550 000 to £710 000 by the creation of an additional 145 000 "A" preference and 15 000 ordinary shares. The whole of these were issued and also 217 6% cumulative preference shares, and they had issued since the close of the year a further 70 000 6% cumulative preference shares, with 20 000 ordinary

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shares, so that the subscribed capital was now £698 737. Income for the past year was £74 840, against £36 040. Net profit amounted to £35 909, compared with £26 202. After provision for preference and "A" preference dividends a dividend of 6%, less tax, was recommended on the ordinary shares, leaving £3 707 to carry forward, against £1 050 brought in.

CHISWICK ELECTRICITY SUPPLY CORPORATION, LTD.—Mr Harry Kahn, presiding at meeting last week, said the undertaking had made further progress during 1929. The number of consumers had increased by 364, and the total revenue by £7 197. He had reason to believe that the undertaking would continue to show expansion during the current year. Sale of current has increased by £6 857 and rental of meters and sundry receipts by £340. The balance carried to net revenue account was £46 951, which was £302 less than last year. The net result was that, with the balance brought forward, there was £25 578 available for distribution after deducting the interim dividend of 7½% actual paid on July 23rd, and this sum the directors recommended being appropriated as follows: Final dividend of 8½% actual (less tax), £12 750; refund to consumers for 1929, £9 000; forward, £3 828. The report and accounts were adopted.

Manufactnrer's Progress.

HASLAM AND NEWTON, LTD.—Mr. C. A. Newton, presiding at the meeting on Monday, said during the period under review the electrical side of the business had made a profit beyond the figures mentioned in the prospectus. During this period Derby Cables had been started. The factory was fully employed day and night, and he believed would be a source of considerable profit to the company. This came into full operation in January of this year only, so that the money invested, namely, £26 000, reflected adversely in the figures before the shareholders, but he was confident that it would help them in next year's results. During the year they had carried out some notable contracts, of which he might mention the complete electrication of the "R101," including the wireless generating equipment. They also carried out a contract in Berlin for the German Post Office long-distance wireless service.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—At the meeting on March 5th, the Earl of Bessborough (chairman) said they reduced their prices as from January 1st, 1929, but the revenue from the sale of current had increased to £729 053 for 1929, compared with £692 506 for 1928. Net profits were £186 721, against £181 206. The amount to be allocated to the special reserve fund for the ordinary shareholders for 1929 was £35 000. The board recommended payment of 6% for the year on the preference shares and a final dividend of 5% on the ordinary shares, making a total of 9% for the year. Sales of current amounted to 248 144 007 kWh, compared with 203 711 271. The load connected last year was 11 300 H.P., making a total connected load of approximately 75 000 H.P. The reduction in their charges had had the effect of bringing down the average price received for each kWh sold to 0·705d., compared with 0·816d. for 1928. This was the lowest average price received by any of the London companies. The all-in domestic tariff had been most successful and had resulted in their domestic consumers making a more extended use of electricity. The amount to be credited to the co-partners for 1929 was £4 145. This reduced the balance to £42 687. The report and accounts were adopted.

LONDON AND NORTH-EASTERN RAILWAY CO.—Mr. William Whitelaw, presiding at the meeting last Friday, said the board had given the closest consideration to the question of the electrication of their suburban lines in the old Great Eastern and Great Northern areas. As to the first, they had satisfied themselves that no scheme of electrication, which had at present come before them, would provide an adequate solution of the congestion which now undoubtedly existed. They had invited Messrs. Mott, Hay and Anderson to prepare a report as to the possibility and cost of providing a tube between Liverpool Street Station and Ilford. As regards the Great Northern suburban district, although the congestion was less severe, there are peculiar difficulties to be overcome. Any plan which was to solve the problem must provide satisfactory terminal accommodation in or near the City of London. In considering expenditure of the extent which would be involved in the electrification of their suburban lines, they were bound to take account of the scheme which had been adumbrated by the Minister of Transport in reference to the future organisation of London transport generally. The Minister had recognised this and ad intimated that at an appropriate moment he would invite the main line railway companies to enter into a discussion with him on the subject.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—At the meeting on March 5th, Mr. George Balfour, M.P. (chairman), said he thought the progress they had made justified their policy of rapid extension and absorption in the western area. They could measure the growth in the western area when he mentioned that in 1924 they sold 27 600 000 kWh, against 117 300 000 last year, and their receipts for the same years were £193 017 and £488 794 respectively. The constantly increasing amount payable in rates did much to stop the cheapening of the supply. For the Metropolitan and subsidiary companies they paid in 1924 about £27 000 in local rates. Last year they paid over £58 000, in addition to a sum included in the price of their bulk supply in respect of rates in the Willesden power station, making in all something like £78 000 for 1929. Their average price for electricity was exactly one-half the average price in 1924. The total output from sub-stations was 167 000 000 kWh, compared with 126 000 000 in the previous year. Additional connections amounting to 21 071 kW were made, the total connections were 172 640 kW and the maximum load was 64 370 kW. The number of consumers supplied by the Metropolitan Co. was 36 785 and by its subsidiary companies 19 083. The gross receipts from the sale of electricity amounted to £974 591, an increase of £113 363 over the previous year. Adding sundry receipts, the total was £1 019 502, or an increase of £117 749. The balance on revenue account of £348 201, with the balance from the previous year and interest on dividends from shares in subsidiary companies and other investments, brought out a total available of £494 736. Deducting from this sinking fund appropriations, interest and dividends on preference shares and other charges, including the allocation to depreciation and addition to the staff pension account, there remained a balance of £234 746, out of which an interim dividend on the ordinary shares amounting to £45 000 had already been paid. The directors recommended a further dividend be paid on the ordinary share capital at the rate of 14% per annum, making, with the interim dividend, a dividend of 10% for the year. The report was adopted and dividend approved.

The 1929 Frost.

CHARING CROSS ELECTRICITY SUPPLY CO., LTD.—Mr. W. F. Fladgate, presiding at the meeting on March 5th, said in addressing the shareholders last year he commented on the satisfactory result of the year's trading and pointed out that the company had made satisfactory progress in almost every direction, but he particularly called attention to the fact that that satisfactory result was to a considerable extent due to the very moderate price at which the London Power Co., consequent upon the reduction in cost, had been able to give them a supply to their stations. In speaking of this reduction he asked them to remember that they must not expect it to continue always at the same rate. He was glad that he took the precaution of giving this warning, because the one blot upon their working for 1929 was the increased price which they had had to pay for their supply. This increase had been caused by no fault of the Power Co. but simply was made up of a fixed charge for every kilowatt of maximum demand and a flat rate per unit for the energy supplied. In the early part of 1929 there was a period of very severe, cold weather and many fogs. The effect of this was to increase their maximum demand to a figure greatly in excess of that of the previous year, with the consequence that their proportion of fixed charges was far higher than in 1928, and hence the increase in cost to which he had referred. In the West End the units sold had increased by over 4 000 000, and in the City by over 6 000 000. The net revenue had, however, decreased in both areas, the decrease being caused by the increase in price for power and also to the decrease in charges to customers. During the past 10 years the kilowatts connected in the West End had increased by some 53%, and in the City some 56%, while the corresponding increase in units sold was 124% in the West End and 111% in the City. These figures showed a yearly increase of a little more than 10%. The amount of their dividend being fixed under the sliding scale, there was no necessity to trouble them with any details as to how this was arrived at beyond stating that they had sufficient income to pay their standard dividend at the fixed rate, and in the West End to transfer to reserve account No. 8 the shareholders' proportion of the consumers' benefit, amounting to £19 134, and in the City similarly to transfer £31 931. The report and accounts were adopted and the dividends approved.

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MUNICIPAL FINANCE.

Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1928–9 of the 224 undertakings included in the following table and in the tables which appeared in our issues of August 9th, September 13th, and November 1st, 1929, was £54 245 755. The gross profit on the year's working of the undertakings was £14 912 514, and the aggregate sales of electricity amounted to 5 034 074 989 kWh, while 73 undertakings out of the total number have contributed out of the year's profits or from reserve an aggregate of £452 302 to the relief of rates. In many cases the costs include items of a capital nature, and net profits have been reduced as the result of reduction of charges for current. As it is desired to make these tables as complete as possible, the Editor will be pleased to receive similar particulars of other municipal electricity undertakings.

Authority.	Total Revenue. £	Gross Profit. £	Net Profit (+) or deficit (−). £	(*a*) Working Costs per kWh sold.	Total Cost per kWh (inc. capital charges).	Electricity sold (kWh).	Increase (+) (or) Decrease (−) in kWh sold.	Maximum Simultaneous Load in kW.	(*h*) Load Factor.	Radiators and Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW	Contributed in Aid of Rates.
Aberdare U.D.C. ..	31 931	10 425	+ 1 661	2·230d.	3·180d.	2 313 140	− 123 810	1 150	28·00	—	—	—
Abertillery U.D.C. ..	11 391	4 129	+ 1 742	4·264d.	5·668d.	408 169	—	335	13·91	(No.) 63	(No.) 46	—
Accrington T.C.	82 882	41 808	+ 9 683	0·556d.	0·993d.	17 687 398	− 116 035	9 000	22·43	—	—	2 500
Aldershot T.C.	22 865	9 351	+ 2 686	2·670d.	3·985d.	1 216 100	+ 186 100	950	14·61	—	—	—
Ashton-under-Lyne T.C.	75 190	32 443	+ 6 835	0·803d.	(*d*)1·292d.	12 899 427	+ 456 885	6 239	23·60	3 375	5 779	700
Atherton U.D.C.	23 471	4 938	+ 1 312	0·780d.	0·929d.	5 824 060	− 440 744	—	—	—	—	—
(*f*) Ayrshire Elec. Bd. ..	234 678	133 303	+ 8 079	0·630d.	1·409d.	38 569 499	+ 1 256 965	20 400	21·68	—	—	—
Barking U.D.C.	34 231	9 997	+ 3 798	1·450d.	1·821d.	4 013 439	+ 572 750	1 944	23·29	—	—	—
Barnsley T.C.	6 841	38 292	+ 11 713	0·760d.	1·399d.	9 976 860	+ 787 161	3 853	29·83	—	—	—
Barnstaple T.C.	17 263	6 342	+ 1 930	3·140d.	4·522d.	766 415	+ 71 989	611	14·30	—	—	—
Basingstoke T.C. ..	24 769	13 109	+ 3 932	1·240d.	2·220d.	2 246 982	+ 69 701	1 185	21·59	—	—	—
Battersea (London) B.C.	180 876	93 455	+ 27 627	0·769d.	1·349d.	27 257 367	− 16 645	11 311	27·51	(*bc*) 9 383	See footnotes (*b*, *c*)	—
Beckenham U.D.C. ..	77 073	29 460	+ 6 410	1·300d.	2·040d.	5 129 855	+ 1 148 984	3 124	20·80	(*b*) 6 852	See footnote (*b*)	1 600
Bermondsey (London) B.C.	132 763	50 632	+ 3 412	1·250d.	1·968d.	15 763 089	—	6 690	26·90	—	—	—
Bethesda U.D.C. ..	2 017	1 125	+ 414	3·520d.	5·780d.	59 780	+ 20 739	56	14·04	—	—	—
Bridlington T.C. ..	30 967	16 543	+ 4 980	2·050d.	3·100d.	1 689 238	+ 157 628	1 149	16·78	—	—	—
Bromley T.C.	46 651	25 319	+ 7 275	1·728d.	—	2 965 790	+ 634 189	1 977	17·10	See footnote (*e*)	See footnote (*e*)	2 000
Burnley T.C.	101 158	40 288	+ 15 717	1·160d.	1·665d.	12 537 398	—	5 440	26·19	—	—	—
Buxton T.C.	20 589	11 232	+ 4 529	1·570d.	2·692d.	1 434 060	+ 228 475	1 061	15·52	—	—	—
Calne T.C.	982	449	+ 123	4·950d.	5·253d.	25 840	+ 2 233	29	10·17	—	—	—
Clitheroe T.C.	6 356	3 088	+ 242	1·430d.	2·820d.	510 166	+ 259 297	319	20·33	—	—	—
Colchester T.C.	50 728	23 546	+ 2 487	1·570d.	3·786d.	4 154 895	+ 1 109 311	2 800	16·94	—	—	—
Dartford U.D.C.	44 951	15 345	+ 9 428	0·904d.	1·171d.	7 639 736	+ 1 473 447	—	30·43	See footnote (*e*)	—	—
Dewsbury T.C.	39 936	13 668	+ 3 838	1·410d.	1·936d.	4 477 190	+ 305 139	2 357	21·79	—	—	—
Douglas T.C.	31 296	17 526	+ 1 067	1·840d.	4·035d.	1 799 355	+ 182 491	1 067	19·25	—	—	—
Ealing T.C.	93 450	37 026	+ 2 368	2·280d.	3·580d.	5 937 191	+ 1 122 546	4 092	17·43	—	—	—
East Ham T.C.	111 159	39 739	+ 8 524	1·491d.	2·143d.	11 493 340	+ 1 909 000	5 635	29·10	—	—	—
Ebbw Vale U.D.C. ..	16 633	3 618	+ 1 354	3·000d.	3·900d.	805 044	+ 4 162	620	14·80	See footnote (*e*)	See footnote (*e*)	—
Eccles T.C.	46 964	613 944	+ 8 298	0·930d.	1·230d.	7 798 787	+ 787 413	3 488	28·08	—	—	1 430
(*f*) Edinburgh C.C. ..	615 876	163 599	+ 51 172	0·963d.	1·170d.	112 722 006	+ 11 124 347	52 414	24·55	—	—	—
Epsom U.D.C.	27 998	9 444	+ 774	1·910d.	2·790d.	2 338 190	+ 627 598	1 341	19·00	3 811	918	—
Erith U.D.C.	89 985	27 645	+ 16 189	0·740d.	0·940d.	13 718 658	+ 1 045 150	4 750	32·97	—	—	—
Exeter C.C.	71 729	39 114	+ 8 765	1·310d.	2·529d.	5 975 699	+ 934 677	3 965	17·20	—	—	—
(*f*) Falkirk T.C.	39 790	14 273	+ 948	1·015d.	1·545d.	6 030 921	+ 488 322	3 200	22·00	See footnote (*e*)	See footnote (*e*)	(*g*) 4 186
Farnworth U.D.C. ..	20 119	6 282	(*m*) + 2 162	1·428d.	1·853d.	2 325 921	+ 720 934	1 600	16·59	—	—	—
Finchley U.D.C. ..	70 686	32 704	+ 8 312	1·390d.	2·282d.	6 566 089	+ 883 795	4 400	17·04	—	—	—
Fleetwood U.D.C. ..	29 391	15 638	+ 5 615	1·080d.	1·867d.	3 056 027	+ 549 049	1 608	21·70	—	—	—
Grange-over-Sands U.D.C.	4 465	643	− 187	2·730d.	3·974d.	160 160	—	104	17·58	—	—	—
Gravesend T.C.	73 314	42 597	(*h*) + 17 231	0·460d.	0·840d.	15 968 595	+ 2 090 590	6 200	29·00	—	—	—
Guisborough U.D.C. ..	2 568	1 201	+ 43	2·100d.	3·927d.	156 070	+ 27 769	118	15·10	—	—	—
Halifax T.C.	189 752	105 195	+ 32 584	0·650d.	1·156d.	31 081 590	+ 2 106 254	17 100	20·75	—	—	—
Hammersmith (Ldn.) B.C.	232 546	114 873	+ 39 502	0·850d.	1·398d.	33 006 952	+ 3 525 598	14 800	25·46	—	—	—
Harrogate T.C.	68 103	31 540	+ 17 344	0·965d.	(*n*)2·123d.	7 698 448	+ 1 041 323	4 194	25·20	—	—	3 390
Hastings T.C.	117 054	69 132	+ 24 092	0·830d.	1·612d.	13 828 042	+ 3 253 242	8 550	18·46	—	—	—
Heston and Isleworth U.D.C.	80 833	28 706	+ 11 226	1·480d.	2·000d.	7 983 423	+ 3 565 912	4 821	22·80	—	—	—
Heywood T.C.	22 777	6 747	+ 1 332	1·090d.	1·460d.	3 515 036	+ 175 385	1 701	23·59	—	—	—
Honley U.D.C.	7 102	2 645	+ 1 162	1·520d.	2·026d.	702 802	+ 85 541	288	27·98	—	—	—
Ilford T.C.	139 816	48 469	+ 9 553	1·250d.	1·787d.	17 444 592	+ 3 155 630	9 673	21·77	—	—	—
Ilkley U.D.C.	23 071	10 443	+ 1 484	1·830d.	3·126d.	1 658 421	+ 259 296	1 047	18·08	—	—	—
Inverness T.C.	23 993	12 621	+ 990	1·920d.	2·195d.	1 422 210	+ 157 939	1 069	15·19	—	—	—
Keighley T.C.	83 501	38 239	− 629	0·770d.	1·428d.	14 176 827	+ 387 845	8 010	22·04	—	—	—
Kingston-on-Thames T.C.	61 017	31 121	+ 5 209	1·480d.	2·764d.	4 841 248	+ 866 563	2 880	19·29	—	—	—
Leigh T.C.	48 587	18 547	+ 2 481	0·750d.	1·153d.	9 559 720	+ 1 104 809	4 770	22·76	—	—	—
Leyton T.C.	99 480	26 916	+ 3 992	1·450d.	1·963d.	11 996 476	+ 1 514 239	5 175	26·47	—	—	—
Londonderry T.C. ..	44 356	31 055	+ 7 752	1·010d.	2·770d.	5 172 721	− 47 273	2 100	22·06	See footnote (*e*)	See footnote (*e*)	6 252
Loughborough T.C. ..	51 369	23 957	+ 4 665	1·019d.	1·776d.	6 118 587	+ 415 324	3 690	18·93	—	—	—
Lowestoft T.C.	48 733	14 276	+ 2 315	8·866d.	3·886d.	2 815 573	− 55 257	2 083	15·43	—	—	—
Lurgan U.D.C.	4 286	1 876	+ 168	1·530d.	2·610d.	378 150	—	180	24·00	—	—	—
Luton T.C.	148 033	67 855	+ 26 145	0·520d.	3·216d.	37 138 291	+ 5 670 197	15 490	27·37	—	—	—
Millom U.D.C.	1 895	789	—	2·954d.	—	89 871	+ 36 775	56	19·20	26	—	—
Monmouth T.C.	3 316	1 299	+ 291	3·720d.	(*c*)6·500d.	130 158	+ 14 370	117	—	10	8	68
Morecambe & Heysham T.C.	37 243	18 211	+ 5 517	1·500d.	2·540d.	3 043 606	+ 1 240 350	1 320	26·30	(*b*) 3 197	See footnote (*b*)	—
Norwich C.C.	221 427	98 275	+ 26 879	0·839d.	1·415d.	29 888 666	+ 3 742 673	—	—	20 676	—	—
Port Talbot T.C.	6 254	3 368	− 878	3·098d.	7·654d.	223 632	+ 46 679	310	8·23	28	66	878
Plymouth T.C.	159 288	71 580	+ 6 872	1·075d.	1·893d.	19 607 045	+ 2 042 930	10 173	22·00	See footnote (*e*)	See footnote (*e*)	—
Preston T.C.	249 042	124 730	+ 18 653	0·416d.	0·858d.	62 421 057	+ 24 144 733	21 660	38·52	—	—	—
Reigate T.C.	34 294	19 793	+ 2 053	1·690d.	3·730d.	2 045 494	+ 324 649	1 359	22·50	—	—	—
Risca U.D.C.	4 664	1 810	+ 131	3·400d.	4·400d.	154 765	+ 34 835	132	17·02	84	—	—
Seaham Harbour U.D.C.	7 154	3 600	+ 1 427	2·180d.	3·660d.	309 673	+ 154 647	242	17·33	36	180	—
Shoreditch (London) B.C.	170 477	81 064	+ 14 484	0·964d.	1·720d.	21 229 551	+ 2 458 054	13 239	18·30	—	—	—
Southwark (London) B.C.	72 524	30 041	+ 16 594	1·840d.	2·422d.	5 544 363	—	4 003	15·81	—	—	—
Stafford T.C.	50 719	27 161	+ 2 213	0·649d.	1·474d.	7 894 758	+ 85 587	4 291	21·00	—	—	2 000
Stepney (London) B.C. ..	355 848	189 994	+ 47 593	0·528d.	0·987d.	71 312 995	+ 15 891 822	34 750	23·43	—	—	—
Sunderland T.C.	63 134	34 547	+ 3 846	0·350d.	1·200d.	32 133 049	+ 502 735	13 000	28·22	—	—	—
Taunton T.C.	29 931	11 842	+ 5 086	1·296d.	1·706d.	2 979 051	+ 674 777	1 682	23·90	—	—	900
Tiverton T.C.	4 366	2 499	+ 2 275	3·388d.	3·794d.	132 268	+ 29 233	148	10·20	40	—	—
Tynemouth T.C.	64 304	(*o*) 39 323	+ 12 856	1·203d.	1·736d.	8 212 704	+ 536 606	—	—	—	—	—
Woolwich (London) B.C.	255 932	104 527	+ 11 210	0·516d.	(*l*)0·924d.	55 149 344	+ 11 694 677	21 700	29·01	(*k*)16 458	(*i*) 920	—

(*a*) Usually includes management, repairs and maintenance, rates and taxes and special charges. (*b*) Including other domestic electrical appliances. (*c*) Approximate. (*d*) Includes £2 432 capital expenditure disallowed from sanction. (*e*) Not available. (*f*) Year ended May, 1929. (*g*) Under assessment. (*h*) Subject to income tax. (*i*) Irons on hire only. (*k*) Cookers on hire only. (*l*) Includes special expenses £4 846 and capital expenditure £4 000 met out of revenue. (*m*) After provision of £433 for new meters. (*n*) Including expenditure of a capital nature and contributions to borough fund and reserve fund amounting to £17 344. (*o*) After provision for working expenses and £12 190 for special supply (not through Corporation mains, public lighting, contracts, etc.).

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

APPLE, Mr., 87, Tottenham Court Road, W., electrical factor. £16 13s. 4d. January 29th.

BROWN, G. E., Boot Stores, Little Sudden, Birkenhead, wireless dealer. £13 0s. 11d. January 17th.

CASTELLINA AND CO. (1929), LTD., 9, Hallam Street, Great Portland Street, electrical dealers. £25 12s. 3d. February 4th.

DUCKWORTH, Mr., 318, Platt Lane, Manchester, wireless dealer. £14 4s. February 1st.

EDWARDS, Mr. W., 6, Swan Street, Liverpool, wireless dealer. £30 10s. 11d. January 15th.

NEWMAN, Mr. N., 217, Park Lane, Tottenham, electrical engineer (trading as N. NEWMAN AND CO.). £29 19s. 10d. February 3rd.

RIVER RADIO WORKS, River Lane, Petersham, Richmond, radio apparatus manufacturers. £77 13s. 4d. November 4th.

STEGGALL, Mr. C., 52, Cambridge Street, Aylesbury, wireless dealer. £14 4s. 1d. January 29th.

Bill of Sale.

SINCLAIR, Horace John Carew, known as Horace CAREW, 129, Fleetwood Road, Dollis Hill, trading as CAREW AND KEEBLE, 46, Kingsway, W.C., electrical goods importer. Dated February 24th; filed February 25th. £100.

Deeds of Arrangement.

KING, Ralph, Electric Shop, High Street, Solihull, wireless and electrical apparatus dealer and electrical engineer. Dated February 28th, filed March 7th. Trustee, S. H. Hossell (the younger) 48, Corporation Street, Birmingham. Liabilities unsecured, £647; assets, less secured claims, £540.

THOMPSON, Cyril William, and TURNER, Sidney, trading at 182, Bebington Road, Lower Bebington, as C. W. THOMPSON AND CO., wireless and electrical engineers. Dated February 25th, filed March 4th. Trustee, J. Airy, 8, Victoria Street, Liverpool. Secured creditors, £1 531. Liabilities unsecured, £961; assets, less secured claims, £396.

Receiverships.

ALWAY AND HUDSON, LTD.—W. M. Lowick, C.A., of 16, Bridge Street, Bristol, was appointed receiver and manager on March 1st, 1930, under powers contained in debentures dated July 18th and August 26th, 1929.

CASTELLINA CO. (1926), LTD.—E. F. Wilkinson, A.C.A., of 6, Queen Street, E.C.4, was appointed receiver and manager on February 25th, 1930, under powers contained in debenture dated July 18th, 1929.

RADIELLE CO., LTD.—F. J. Parsons, C.A., of 2, Austin Friars, E.C.2, was appointed receiver on January 31, 1930, under powers contained in instrument dated November 19th, 1927.

YOUNG (C. F.), LTD. S. F. Aspell, F.C.A., of 3, Welford Road, Leicester, was appointed Receiver and Manager on February 24th, 1930, under powers contained in debentures dated October 26th, 1923.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ELECTROCORD, LTD., Leeds.—Registered February 26th, mortgage for £2 664 and further advances, to Halifax Building Society; charged on hereditaments in Holbeck. *Nil. February 22nd, 1929.

EMAREE, LTD., London, S.W., wireless merchants.—Registered February 21st, £2,000 debentures; general charge. *Nil. December 31st, 1929.

HALL (T.) AND CO., LTD., Cheam, electricians.—Registered February 26th, £600 mortgage and £620 2nd mortgage (sec. 81, 1929 Act), to W. R. B. St. J. Gates, Arcolla, Warren Road, Guildford, and E. E. Taylor, Central House, Finsbury Square, E.C.; charged on King's Hall Café, 44, Malden Lane, Cheam.

KALISKY (S.) (ALDGATE), LTD., London, E., wireless merchants.—Registered February 17th, charge to Bank; charged on a mortgage on 72, Brideoak Street, Cheetham. *£4,000. December 31st, 1928.

LEWIS (JOHN) (WIRELESS), LTD., Weymouth.—Registered February 24th, mortgage to Bank; charged on 4, Spa Road, Radipole, etc. *Nil. March 21st, 1929.

Satisfactions.

BRITTAIN (J. V.) AND CO., LTD., Stoke-on-Trent, electricians.—Satisfaction registered February 21st, £300, registered October 18th, 1927.

LANGHAM RADIO, LTD., London, W.C.—Satisfaction registered February 21st, all moneys, etc., registered November 27th, 1929.

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER CO., LTD.—Satisfaction registered February 28th, £700, part of amount registered June 30th, 1927.

Private Meetings, etc.

[Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.]

NORTH SURREY ELECTRICAL FACTORS, LTD., George Street, Croydon, Surrey. The statutory meeting of the creditors in this voluntary liquidation was held recently at the Greyhound Hotel, 19, High Street, Croydon, Surrey. Mr. C. F. Turner, one of the directors of the company, occupied the chair, and reported that the liabilities were £2 480, all due to the trade. The assets consisted of book debts £1 320, valued at £900; and stock £450, expected to produce £350; making a total of £1 250. It was reported that the company was registered in August, 1928, and the issued capital was £600, all of which was fully paid. For a time the company was able to trade successfully, but then difficulty was experienced in the collection of accounts. Finally creditors began to press, and a writ was issued. It was then decided that liquidation should take place. A resolution was passed in favour of the voluntary liquidation being continued with Mr. W. A. J. Osborne, of Corfield and Cripwell, accountants and auditors, Balfour House, Finsbury Pavement, E.C., as liquidator, together with a committee consisting of the chairman and the representatives of the Hackbridge Cable Co., Ltd., the Weinbau Electric Co., and Poppleton Appleby and Hawkins. It was stated that the business premises had been closed, and that the liquidator would consult with the committee as to the realisation of the stock and the collection of the book debts. The following are creditors:—Acme Electric Wire Co., Shardlow, £55; Bellina and Co., Enfield, £57; Bernard and Co., London, £30; Berrys Electric (1928), Ltd., London, £25; Falk Stadelman and Co., London, £30; General Accessories Co., Ltd., London, £194; Grothe and Co., Ltd., Cologne, £38; Hackbridge Cable Co., Hackbridge, £220; Kersono Manufacturing Co., Birmingham, £75; Metallic Seamless Tube Co., Birmingham, £22; Morley, T. B., and Co., Ltd., Hull, £25; Nico Light Co., London, £42; Parsons, C. H., Ltd., Birmingham, £35; Perfecta Seamless Steel Co., Birmingham, £77; Phillips Lamps, Ltd., London, £89; Randon, Ltd., A., London, £356; Sanders, W., and Co., Wednesbury, £115; Steam Electrical Co., London, £72; Turfity, C. G. F., London, £74; Vandam and Co., Ltd., London, £53; Weinbaum Incandescent and Electric Co., London, £110; Wootton, H. A., and Co., Ltd., London, £35.

London Gazette, etc.

Companies Winding-up Voluntarily.

ALMONDSBURY AND DISTRICT ELECTRIC SUPPLY CO., LTD, Meeting of creditors at the offices of F. J. Ackland and Co., Sun Buildings, Clare Street, Bristol, on Thursday, March 20th, at. 5.30 p.m. All trade creditors have been, or will be, paid in full, the liquidation being in consequence of the sale of the company's assets and undertaking.

BURGOYNE WIRELESS CO., LTD. By reason of its liabilities, March 3rd. J. J. Baker, chartered accountant, Eldon Street House, Eldon Street, E.C.2, appointed as liquidator.

ELECTRIC SWEEPERS, LTD. By special resolution March 4th. Sir J. D. A. A. Makgill, Baronet, of 53, Seymour Street, London, appointed as liquidator.

Partnerships Dissolved.

DEVONSHIRE RADIO SERVICE (Leonard Victor COOK and Percy Edward LEWIS-NORTH), 47, Mount Pleasant, London, W.C.1, radio manufacturers, by mutual consent as from January 7th, 1930.

PREMIER ELECTRICAL SUPPLIES CO. (Harold TAYLOR, Kenneth Bradford JOIST, and Nixon ROBINSON), electrical factors, 6, Millergate, Bradford, by mutual consent as from January 31st, 1930.

UNION ELECTRIC CO. (Harry Neville KAYE and Hans Christian SHOT), electrical engineers and contractors, Falcon House, 61, Eagle Street, High Holborn, London, W.C.1, by mutual consent as from February 20th, 1930. Debts received and paid by H. N. Kaye who continues the business.

ASSOCIATED GAS AND ELECTRIC SYSTEM.—Gross earngs. and other income for 1929, $91 480 596, increase $49 317 046. Net earngs. $45 755 674, increase $26 585 037. Pfd. divs. and int. $10 271 235; blce. $35 484 439. After provisn. for other int. charges, replacemt. renewals and depreciatn., blce. for divs. and surplus is $16 645 984, increase $10 150 392.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

321 759 L. E. Ryall. Thermionic amplifiers. (11/9/28.)
321 766 S. S. Stolp. Electrically operated track switches. (21/9/28.)
321 771 C. E. G. Bailey and Gramophone Co., Ltd. High-frequency amplifiers. (27/9/28.)
321 776 Siemens Bros. and Co., Ltd., and F. J.'Gee. Thermostatically controlled protective devices for electrical apparatus. (1/10/28.)
321 781 English Electric Co., Ltd., and F. D. H. Bremner. Electric traction control systems. (3/10/28.)
301 418 Maschinenfabrik Oerlikon. Electric signalling systems. (29/11/27.)
299 707 Dr. S. Loewe and Dr. E. Roemhild. Multiple thermionic valves. (29/10/27.)
307 738 Conduit Electrical Manufacturing Corporation. High tension switchgear installations in switch houses. (12/3/28.)
321 830 J. McCallum. Insulation of electric cables and conductors. (17/11/28.)
321 831 P. L. Harlow and Associated Electrical Industries, Ltd. Starting apparatus for induction electrical motors. (20/11/28.)
321 845 Benjamin Electric, Ltd., and G. Campbell. Shade or globe holders and galleries. (28/11/28.)
309 532 G. Hezez and Soc. L'Appareillage Electrique de la Seine. Electric switches. (12/4/28.)
321 853 J. A. Kuyser and Associated Electrical Industries, Ltd. Ventilation of dynamo electric machines. (6/12/28.)
302 320 British Thomson-Houston Co., Ltd. Toasters. (14/12/27.)
302 584 Telefunken Ges. fur Drahtlose Telegraphie. Piezo-electric devices. (17/12/27.)
321 862 J. S. Ericsson. Electric lighting systems for the headlights of motor vehicles. (17/12/28.)
321 869 Lodge-Cottrell, Ltd. (Metallges. Akt.-Ges.) Collecting electrodes for use in the electrical precipitation of suspended particles from gaseous fluids. (27/12/28.)
321 874 Macintosh Cable Co., Ltd., and J. A. Smith. Means for holding electric conductors, cables, and the like in position. (1/1/29.)
303 908 W. Fantl. Illuminating devices. (12/1/28.)
321 888 Curtis Manufacturing Co., Ltd., and F. C. Curtis. Electric resistances, rheostats, and dimmers. (30/1/29.)
305 583 Forges et Ateliers de Constructions Electriques de Jeumont. Electrical braking systems for vehicles equipped with more than two electric motors. (7/2/28.)
306 100 Elektrizitats-Akt.-Ges. Hydrawerk. Electric condensers. (15/2/28.)
307 294 Accumulatoren-Fabrik Akt.-Ges. Sealing cover for the cells of lead accumulators. (2/3/28.)
309 573 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Process of manufacturing incandescent bodies. (13/4/28.)
308 277 British Thomson-Houston Co., Ltd. Electrical transmission of pictures. (20/3/28.)
310 523 Naamlooze Vennootschap Philips' Gloeilampenafbrieken. Electric incandescent lamps. (27/4/28.)
321 665 Standard Telephones and Cables, Ltd. (Western Electric Co. Inc.). Thermionic cathodes. (13/6/28.)
321 666 A. Zajdler. Electrical advertising apparatus. (14/8/28.)
321 466 A. H. Marks and P. Russell [legal representatives of E. C. R. Marks (deceased)]. (Automatische Fernsprech-Anlagen-Bau-Ges.). Apparatus for effecting graphic recording accompanying electrical impulse transmission. (18/9/28.)
321 947 Standard Telephones and Cables, Ltd., E. Kaempf and D. P. Dalzell. Electric communication cables. (22/5/28.)
321 963 H. Hibbert. Electrically-circuited direction-indicators of the illuminated type for motor vehicles and the like. (23/5/28.)
321 914 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Coating metallic or non-metallic bodies with chromium. (9/7/28.)
321 915 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes. (13/7/28.)
321 949 Ceag, Ltd., G. L. Harris and T. Knoyle. Electric safety lamps, particularly miners' hand-lamps. (14/7/28.)
321 935 D. N. Sharma. Systems and apparatus relating to television picture transmission, telekinematography, and the like. (9/8/28.)
310 458 S. Westberg. Baking a highly-refractory lining in metallurgical furnaces, especially induction furnaces, crucibles, and the like. (26/4/28.)
296 003 J. L. Matabon and C. M. Foucault. Apparatus for starting synchronous dynamo-electric machines. (22/8/27.)
296 091 Akt.-Ges Brown, Boveri, et Cie. Electromagnets with rotary armatures. (25/8/27.)
321 956 Standard Telephones and Cables, Ltd. (G. Deakin). Metering arrangement for telephone systems. (22/8/28.)
321 957 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Methods of producing magnetic materials. (22/8/28.)
296 304 Associated Telephone and Telegraph Co. Telephone systems. (27/8/27.)
321 979 A. Compare. Combined portable wireless-set and gramophone. (23/8/28.)
321 983 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic and semi-automatic telephone exchange systems. (23/8/28.)
321 984 W. Loffler. Driving electromotor for talking machines. (23/8/28.)
321 985 Automatic Telephone Manufacturing Co., Ltd., S. R. Smith and J. E. Ostline. Automatic switches for use in telephone or like systems. (23/8/28.)
321 990 W. E. Beatty (Bell Telephone Laboratories, Inc.). Telegraph receiving systems. (24/8/28.)
321 996 E. Y. Walsh. Rheostats of the grid type. (28/8/28.)
312 660 Frigidaire Corporation. Refrigerating systems and methods of manufacturing and transporting the same. (30/5/28.)
296 446 British Thomson-Houston Co., Ltd. Electric transformers. (2/9/27.)
322 010 Igranic Electric Co., Ltd. (Pacent Electric Co., Inc.). Electrical connecting-devices. (4/9/28.)
322 011 British Thomson-Houston Co., Ltd. (Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston). System for regulating the speed of asynchronous motors. (5/9/28.)
322 015 H. V. Higgitt and Eastern Telegraph Co., Ltd. Electrical relays. (7/9/28.)
301 724 M. Paul and Dr. P. Wangemann. Apparatus for reproducing mechanical movements by electrical means. (3/12/27.)
322 018 A. J. Thompson. Shock-absorbers for use with electric lamps. (11/9/28.)
322 019 British Thomson-Houston Co., Ltd., and H. C. Heath. Electric circuit-breakers. (13/9/28.)
312 032 Ateliers de Constructions Electriques de Charleroi. Cascade-connected electrical groups. (12/5/28.)
322 025 Graham Amplion, Ltd., and W. J. Rickets. Systems for the electrical transmission of photographs and the like and for television. (17/9/28.)
297 390 Telefonaktiebolaget L. M. Ericsson. Microtelephones. (20/9/27.)
297 467 International General Electric Co., Inc. Means for cooling of dynamo-electric machines. (23/9/27.)
322 033 S. G. Brown. Recording and reproduction of sound. (21/9/28.)
317 458 Western Union Telegraph Co. Multiplex type-printing telegraphs. (18/8/28.)
298 231 Naamlooze Vennootschap Machinerieen en Apparaten Fabrieken. Electrical resistances. (7/10/27.)
322 041 J. Fowler and Co. (Leeds), Ltd., and C. H. Fowler. Ploughing-engines for use in the cable system of land cultivation. (2/10/28.)
298 239 International General Electric Co., Inc. Electric realys. (6/10/27.)
322 048 G. Redmayne. Galvanic batteries and the like. (13/10/28.)
322 050 Relay Automatic Telephone Co., Ltd., and T. M. Inman. Fire-alarm systems in conjunction with telephone-exchange systems. (16/10/28.)
322 055 Santon, Ltd., and H. C. Sanders. Tanks wherein water is heated electrically. (23/10/28.)
299 475 Electroacustic Ges. Directive transmission or reception of sound or other wave energy. (27/10/27.)
299 725 Metallges, Akt.-Ges. Obtaining smooth and dense electrolytic metallic deposits. (27/10/27.)
300 276 Associated Electrical Industries, Ltd. Protective devices for electrical apparatus. (10/11/27.)
322 081 Gramophone Co., Ltd., and C. O. Browne. Circuits embodying iron-cored transformers. (16/11/28.)
305 015 Soc. Anon des Etablissments Ducellier. Brush-holders for dynamo-electric machines. (28/1/28.)
322 089 E. M. Payne, A. H. Johnson and Gramophone Co., Ltd. Induction disc motors. (24/11/28.)
304 304 Soc. Anon. Le Carbone. Connections for electric resistances. (20/1/28.)
322 094 G. E. Whitehead. Coupling-up or isolating switchgear. (28/11/28.)
322 095 H. K. Ramsden and Associated Electrical Industries, Ltd. Electric circuit-interrupters. (28/11/28.)
301 473 Associated Electrical Industries, Ltd. Control systems for elevators, hoists, and the like. (30/11/27.)
322 107 British Thomson-Houston Co., Ltd., and J. C. Read. Electric transformers. (4/12/28.)
318 216 Marion Steam Shovel Co. Electric motor field control. (31/8/28.)
301 929 Dr. A. Esau and C. Lorenz Akt.-Ges. Apparatus for influencing substances by means of high-frequency electric energy. (8/12/27.)
301 930 Dr. A. Esau and C. Lorenz Akt.-Ges. Apparatus for influencing substances by means of high-frequency electric energy. (8/12/27.)
304 309 Hazeltine Corporation. Wheatstone-bridge filter for suppressing disturbances in thermionic-valve current-supply circuits. (20/1/28.)
303 476 British Thomson-Houston Co., Ltd. Photo-electric cells. (4/1/28.)
303 118 Schiele and Bruchsaler Industriewerke Akt.-Ges. Electrothermal release device for electric switches. (28/12/27.)
303 872 A. Tasquin and R. Delfosse [née Foy]. System of electric signalling for automatically insuring safety in railroad traffic. (11/1/28.)
304 609 Telephones Le Las. Mine lamps. (20/1/28.)
322 129 General Electric Co., Ltd., and E. L. Randall. Lantern or lamp for use on trains and vehicles. (22/1/29.)
305 135 G. Somajni. Control systems for electric motors. (31/1/28.)
307 014 Landis et Gyr Soc. Anon. Time switch. (1/3/28.)
307 879 Siemens-Elektro-Osmose Ges. Apparatus for the electro-osmotic separation from solutions of anodic or cathodic travelling particles. (15/3/28.)
307 794 E. Reisz. Processes for the manufacture of membranes for electrostatic loud-speakers. (13/3/28.)
321 994 Siemens Bros. and Co., Ltd., and G. F. Dutton. Transmitters for telephone systems and the like. (24/8/28.)
321 930 J. L. Baird and Television, Ltd. Electric discharge lamps for television receivers. (20/6/28.)
321 961 J. L. Baird and Television, Ltd. Television apparatus and the like. (20/6/28.)
312 273 General Electric Co., Ltd. Electric lamps. (23/5/28.)
322 156 R. O. Kapp and C. G. Carrothers. Protective arrangements for electric power lines or the like. (9/11/28.)

Applications for Patents.

November 6th.

33 832 Siemens-Schuckertwerke Akt. Ges. Electric protective devices. (7/11/28, Germany.)
33 843 Siemens-Schuckertwerke Akt. Ges. Plug and socket coupling. (8/4/29, Germany.)
33 872 Siemens-Schuckertwerke Akt. Ges. Electric distribution systems. (7/11/28, Germany.)
33 856 Standard Telephones and Cables, Ltd. Switching mechanisms for telephone systems.
33 853 Standard Telephones and Cables, Ltd. (N. C. Tournier). Thermostats for piezo-electric devices.
33 635 Standard Telephones and Cables, Ltd. (Western Electric Co.). Voltage regulation in intermittently closed circuit.
33 852 Standard Telephones and Cables, Ltd. (L. J. J. Schreiber). Keyboards for telephone systems, etc.
33 706 A. L. Taylor. Apparatus for charging h.t. batteries, etc.
33 870 Telefunken Ges. fur Drahtlose Telegraphie. Heating filaments of thermionic valves. (8/11/28, Germany.)
33 871 Telefunken Ges. fur Drahtlose Telegraphie. Frequency multipliers, etc. (10/11/28, Germany.)
33 826 Westinghouse Electric and Manufacturing Co. Light sensitive devices. (6/11/28, U.S.)

November 7th.

34 010 C. S. Agate and W. H. Connell. Electric condensers.
33 995 Associated Electrical Industries, Ltd. Electric switches. (12/11/28, U.S.)
34 039 Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. Electric totalisators.
34 003 J. B. Baker. Electric time switches.
33 986 D. A. Christian and D. P. Long. Automatic telephone systems.
33 974 A. M. Codd. Alternating current apparatus.
33 997 Electrical Research Products, Inc. Acoustic horns. (24/11/28, U.S.)
33 950 General Electric Co., Ltd. Luminous electric discharge tubes. (21/1/29, Germany.)
33 951 General Electric Co., Ltd. Luminous electric discharge tubes. (17/6/29, Germany.)
33 952 General Electric Co., Ltd. Luminous electric discharge tubes. (11/7/29. Germany.)
33 953 General Electric Co., Ltd. Luminous electric discharge tubes. (12/7/29, Germany.)
33 955 General Electric Co., Ltd., and C. W. Stopford. Cord grips for electric coupli ngs.
34 025 H. C. Holmes, J. A. A. Taylor and A. Warwick. Line distributing systems for electrical signals.
34 016 A. Imhof. Lead-in insulators. (15/11/28, Germany.)
33 884 J. Lawn. Electric switches.
33 940 I. E. McCabe. Electric mercury tube switches.
33 920 L. Rottenburg. Tuning scales for wireless apparatus.
34 041 W. L. W. Schallrenter. Electro gas-discharge vessels.
34 042 Siemens-Schuckertwerke Akt. Ges. Arrangement for release of a.c. switches. (9/11/28, Germany.)
34 044 Siemens-Schuckertwerke Akt. Ges. Fastening device for overhead wires. (8/11/28, Germany.)
33 929, 33 930 Standard Telephones and Cables, Ltd. W. Hatton, C. de Vriendt and E. J. Rousseau. Automatic telephone systems. (18/3/29.)
34 021 Telefonaktiebolaget L. M. Ericsson. Elimination of distortion in telephone lines. (9/11/28, Sweden.)

November 8th.

34 204 A. Berger. Electromagnetic apparatus.
34 122 British Thomson-Houston Co., Ltd. Electric regulating systems. (10/11/28, U.S.)
34 200 R. T. Clarke and S. A. Smith. Driving electrical machinery.

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34 128 H. Donelis. Safety arrangement for electric circuits.
34 206 R. Gottfried. Electrical measuring instruments.
34 146 G. W. Johnson (Proctor and Schwartz Electric Co.). Cooking utensils.
34 088 A. D. Jones and S. J. Smith. Amplifying electrical impulses of audible frequency.
34 155 W. Korn. Electrical coding and de-coding devices. (8/11/28, Germany.)
34 190 Locomotive Booster Co. Electric locomotives. (12/4/29, U.S.)
34 205 Maschinenfabrik Oerlikon. Electric motor vehicles. (9/11/28, Switzerland.)
34 151 H. J. Osborn and A. Wright. Controlling electric circuits.
34 047 A. Page. Portable electric lamp stands, etc.
34 150 Soc. de Paris et du Rhône. Electric machines for starting and lighting motor vehicles. (12/11/28, France.)
34 198 Soc. Française Radio-Electriques. Modulating devices. (16/11/28, France.)
34 159 Telefunken Ges. fur Drahtlose Telegraphie. Means for checking amplification of amplifiers. (10/11/28, Germany.)
24 103 W. W. Triggs (Oesterreichische Brown-Boveri-Werke Akt. Ges.). Measuring instruments.
34 211 H. Wade (Felten and Guilleaume Fabrik Elektrischer Kabel Stahl und Kupferwerke Akt. Ges.). Electric cables.
24 202 J. W. Whiteside. Transmitting photographs by wire, etc.

November 9th.

34 275 J. L. Baird and Television, Ltd. Television systems, etc.
34 263 British Automatic Totalisator, Ltd., and R. Wallace. Luminous signs, etc.
34 259 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Mercury arc rectifiers.
34 221 H. B. Jackson. Electric heating elements.
34 285 A. Kupeczek and Measurement, Ltd. Electricity meters, etc.
34 278 J. H. W. Lewis. Electric switches.
34 296 Siemens and Halske Akt. Ges. Telephone systems. (10/11/28, Germany.)

November 11th.

34 391 Allgemeine Elektricitats-Ges. Alternating current meters. (13/11/28, Germany.)
34 435 Automatic Telephone Manufacturing Co., Ltd., and R. N. Saxby. Ticket issuing machines for electric totalisators.
34 413 Corning Glass Works. Electric insulators. (24/11/28, U.S.)
34 345 E. M. Eden and General Electric Co., Ltd. Electrostatic telephone transmitters.
34 415 Electroacoustic Ges. Determining direction of wave energy in space. (6/12/28, Germany.)
34 401 Elin Akt.-Ges. fur Elektrische Industrie.—Regulating poles for electric machines. (16/11/28, Austria.)
34 344 General Electric Co., Ltd. Loud speakers, etc.
34 346 General Electric Co., Ltd. Incandescent lamps. (13/11/28, Germany.)
34 369 A. C. Johnson. Control apparatus for electrical installations.
34 313 T. Johnson. Electrodeposition of metals.
44 431 N. V. Philips Gloeilampenfabrieken. Magnet systems for converting electrical into mechanical energy. (13/11/28, Holland.)
34 345 D. A. Oliver. Electrostatic telephone transmitters.
34 428 Siemens-Schuckertwerke A.G. Regulating voltage over long lines. (12/11/28, Germany.)
34 375 C. de Witt. Poles for electric power transmission lines, etc.

November 12th.

34 491 Akt.-Ges. Brown, Boveri et Cie. Choking coils. (24/12/28, Germany.)
34 533 V. Bansch. Production of insulating paper.
34 450 N. M. Bell and A. Bell and Co., Ltd. Electric fires.
34 558 R. Bosch Akt.-Ges. Switch control means for vehicle lamps. (12/11/28, Germany.)
34 572, 34 573 W. F. Boyd and London Electric Wire Co. and Smiths, Ltd. Wave traps for wireless receiving apparatus.
34 559 E. J. Buckingham. Electrical ignition devices.
34 566 A. Gozzano and Soc. Anon. Accumulatori Dr. Scaini. Electric rectifiers (13/11/28, Italy.)
34 508 S. Hector. Radio receiving sets.
34 511 T. J. Juby and E. Rowe. Rotary switch.
34 575 L. Koros. Arrangement for keeping constant terminal voltage of current sources. (12/11/28, Hungary.)
34 560 Laudis et Gyr Soc. Anon. Induction electricity meters. (9/1/29, Switzerland.)
34 462 S. Larris. Burglar and fire alarm.
34 479 M. Loridau. Electric massage instrument.
34 455 L. McMichael, Ltd., and E. J. Pound. Tuning systems for wireless apparatus, etc.
34 519 Maschinenfabrik Oerlikon. Electric motor vehicles. (24/11/28, Switzerland.)
34 462 V. E. Newman. Burglar and fire alarm.
34 567 P. J. Packman and Plessey Co., Ltd. Totalisators, etc. (29/10/28.)
34 439 F. J. Pearce, G. H. Scholes and G. H. Scholes and Co., Ltd. Plug and socket couplings, etc.
34 508 Phonoradio, Ltd. Radio receiving sets.
34 540, 34 541 J. E. Pollak (Ganz Fele Villamossagi Reszvenytarsasag). Apparatus for regulating voltage in a.c. distribution systems (1/6/28.)
34 545 W. W. Smith. Loud speaking telephones.
34 528 T. R. Scott and Standard Telephones and Cables, Ltd. Method of insulating h.t. cables.
34 436 A. M. Taylor. Transformers.
34 471 R. Wenning. Electrically-heated boilers.

November 13th.

34 722 Allgemeine Elektricitats Ges. Light sensitive cells. (17/11/28, Germany.)
34 636 C. P. Allinson. Electromechanical sound reproducing devices.
34 700, 34 702 Automatic Telephone Manufacturing Co., Ltd., and J. Smith. Telephone transmission systems.
34 701 Automatic Telephone Manufacturing Co., Ltd., F. T. Belas, and J. W. McClew. Electric totalisators.
34 703 Automatic Telephone Manufacturing Co., Ltd., and R. Taylor. Telephone systems.
34 640 R. J. Berry, L. G. Freeth, T. S. Skillman and Standard Telephones and Cables, Ltd. Automatic telephone systems.
34 727 British Electric Pari-Mutuel, Ltd., and P. L. Packman. Totalisators.
34 649 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Dynamo-electric machines.
34 650 British Thomson-Houston Co., Ltd. Winding for electric machines. (14/11/28, U.S.)
34 651 British Thomson-Houston Co., Ltd. Conductive shields and screens. (24/11/28, U.S.)
34 652 British Thomson-Houston Co., Ltd. Tuned electrical circuits. (13/11/28, U.S.)
34 709 S. G. Brown. Battery eliminators for radio receivers.
34 690 Electroflo Meters, Ltd., and J. F. Wright. Rotary selective switches for pyrometers, etc.
34 656 F. Fandi. Electrical switch.
34 625 Felten and Guilliaume Carlswerk A.G. Pressure protecting coverings for submarine cables. (1/12/28, Germany.)
34 675 D. C. Gall and H. Tinsley. Electrical testing and measuring instruments.
34 608 B. K. Green. Electric batteries.
34 643 L. B. Haigh, Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic telephone systems, etc.
34 605, 34 606 J. Salomon. Electric motors.
34 704 W. Schmidt. Apparatus for filling battery cell with electrolyte. (12/6/29, Germany.)
34 707 Siemens and Halske Akt.-Ges. Line protective relays. (29/11/28, Germany.)
34 641 Standard Telephones and Cables, Ltd. (J. Dorgelo). Toll telephone systems.
34 642 Standard Telephones and Cables, Ltd. (J. P. Verlooy). Toll telephone systems.
34 723 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valves (19/11/28, Germany.)
34 724 Telefunken Ges. fur Drahtlose Telegraphie. Reflectors for short Hertzian waves. (22/11/28, Germany.)
34 725 Telefunken Ges. fur Drahtlose Telegraphie. Radio signalling systems. (17/12/28, Germany.)
34 697 Telephone Manufacturing Co., Ltd. Timing devices.
34 698 Telephone Manufacturing Co., Ltd., and A. Wootton. Electric switching irons, etc.
34 730 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Submarine cables.

November 14th.

34 788 A. Allan and A. Reyrolle and Co., Ltd. Electric switchgear.
34 832 Associated Electrical Industries, Ltd. Recording meters. (14/11/28, U.S.)
34 874 H. C. Atkins and Gramophone Co., Ltd. Thermionic valve systems.
34 803 A. Avis. Electric cables.
34 875 G. B. Baker. Electron emitting cathodes for electric discharge devices.
34 811 A. G. Barrow and Jackson Boilers, Ltd. Electric urns, etc.
34 836 H. Bernstein. Means for disinfecting telephone instruments.
34 751 H. Bold. Electrically operated timepieces.

COMING EVENTS.

Friday, March 14th (To-day).

Birmingham Electric Club.—Grosvenor Room, Grand Hotel. Annual dinner. 7 *p.m.*

Ex-British Westinghouse Association.—Hotel Cecil, Strand, London. Re-Union Dinner.

Institute of Metals (Sheffield Local Section).—Non-Ferrous Section of the Applied Science Department of the University, St. George's Square. Paper by Mr. A. Glynne Lobley on "Electric Heat-Treatment Furnaces." 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Paper by Mr. W. A. Sallis on "An Outline of Siemens No. 50 Telephone Switching Equipment." 7.30 *p.m.*

Saturday, March 15th.

Incorporated Society of British Advertisers (Engineering Section).—Hotel Cecil, Strand, London. Luncheon meeting. Address by Mr. G. E. Rowland on "Optimism—An Asset in National Salesmanship." 12.40 for 1 *p.m.*

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

Monday, March 17th.

Electrical Association for Women (Bristol and District Branch).—Annual general meeting, followed by a lecture on "Electricity in Architectural, Furnishing and Lighting Design," by Mr. G. S. Francis.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "High-Tension Substation Control Gear." (Opened by Captain P. P. Eckersley.) 7 *p.m.*

Institution of Electrical Engineers (Mersey and North Wales-Liverpool Centre).—University, Brownlow Street. Paper by Mr. H. H. Harrison on "Machine Telegraph Systems." 7 *p.m.*

Sheffield Illumination Society.—Paper by Mr. E. Selwood on "Surveying." 8.15 *p.m.*

Tuesday, March 18th.

Institution of Electrical Engineers (North-Western Centre).—17, Albert Square, Manchester. Paper by Mr. H. W. Taylor on "Voltage Control of Large Alternators." 7 *p.m.*

Association of Supervising Electrical Engineers.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. A. M. Browne on "Mercury Arc Rectifiers." 7.15 *p.m.*

Institution of Electrical Engineers (Students' Section).—Heriot-Watt College, Chambers Street, Edinburgh. Paper by Mr. L. B. Torond on "Cooling of Oil-Immersed Power Transformers." 7.15 *p.m.*

Electrical Association for Women (Bristol and District Branch).—Fortt's Restaurant, Queen's Road. Dance. 8 *p.m.*—1 *a.m.*

Wednesday, March 19th.

Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place. Victoria Embankment, London. Paper by Dr. A. Ekstrom on "Comparative Cost of Overhead and Underground Transmission Lines." 5.30 *p.m.*

Electrical Development Association (N.W. Area).—Demonstration Bureau 4, Fountain Street, Manchester. Short talk, followed by display of E.D.A. films. 6.30 *p.m.*

Institute of Wireless Technology.—Engineers' Club, Coventry Street, London. Paper by Mr. W. M. Crook on "Modern Reproducers for Record and Radio." 7.30 *p.m.*

Thursday, March 20th.

Association of Ex-Siemens' Men.—Gatti's Restaurant, King William Street, Strand, London. Annual dinner.

Institution of Electrical Engineers.—Institution, Victoria Embankment, London. Ordinary meeting. Paper by Dr. Bernard Leggett on "The Medical and Surgical Applications of Electricity." 6 *p.m.*

Institution of Electrical Engineers (Hampshire Sub-Centre).—University College, Southampton. Short paper to be read and discussed. 7.30 *p.m.*

Institution of Electrical Engineers (Irish Centre).—Physical Laboratory, Trinity College, Dublin. Paper by Mr. W. J. Girvan on "The Practical Application of the Principles Underlying the Equitable and Profitable Sale of Electrical Energy." 7.45 *p.m.*

Friday, March 21st.

British Electrical Development Association.—Savoy Hotel, Strand, London. Luncheon, 1 *p.m.*; followed by annual general meeting. 3 *p.m.*

Batti-Wallahs' Society.—Hotel Cecil, Strand, London. Annual dinner and dance. 7 *p.m.* for 7.30 *p.m.*

Institution of Electrical Engineers (North-Eastern Students' Section).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. J. Bennet and O. A. Chrisp on "A Survey of Switch and Control Arrangements with Examples of Modern Practice." 7.15 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference. 7.30 *p.m.*

Saturday, March 22nd.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Visit to the Post Office (London) Railway, Mount Pleasant. 4 *p.m.*

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Vol. CIV.—No. 2703. Friday, March 21, 1930. [Registered at the General Post Office.] Sixpence

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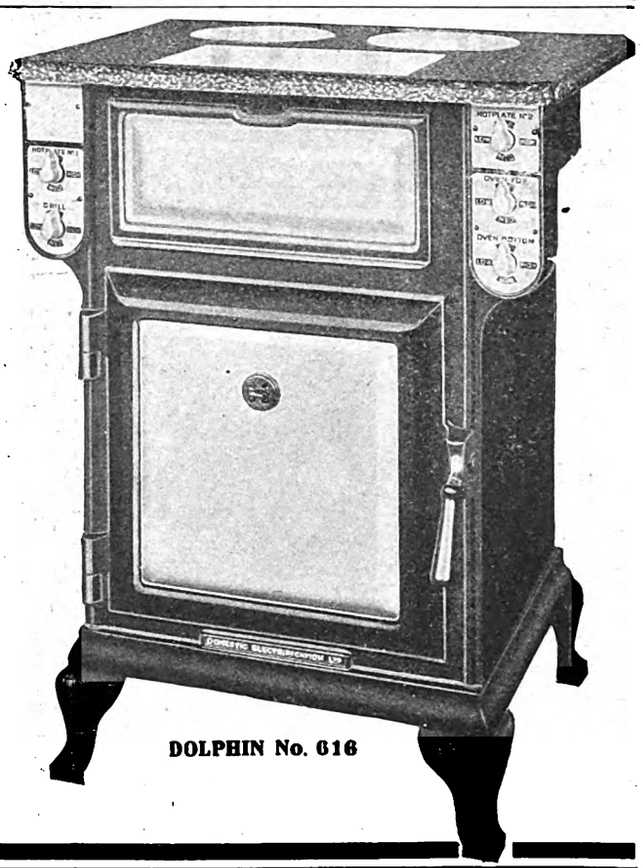

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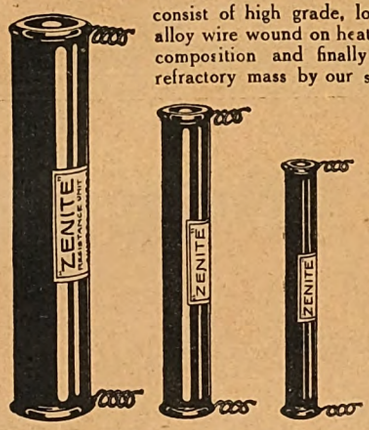

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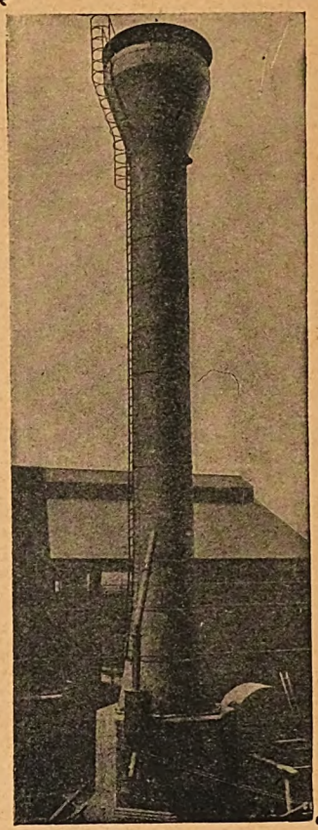

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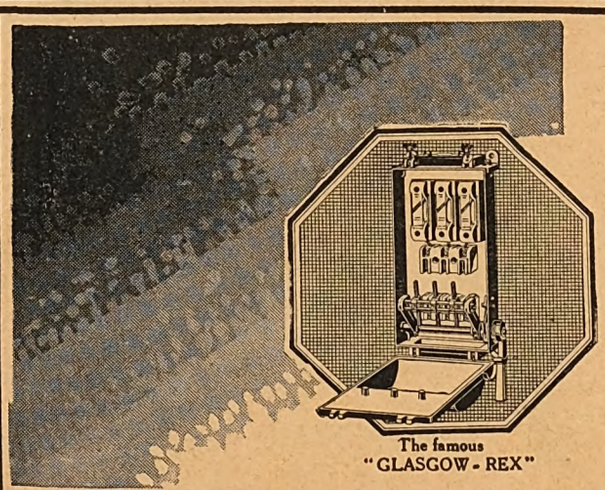

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The Economic Crisis.

TAKING a wide survey of existing economic conditions, it is difficult to be optimistic as to the prospects of an early and general return of activity in world trade. The sharp fall in commodity prices which has taken place since the collapse of the American boom last October has affected all countries producing foodstuffs and raw materials and must lead to a considerable curtailment of their purchasing power for some time. Among the countries most severely hit by the slump in the values of their principal exports are many of Great Britain's most valuable Oversea markets. Australia, which, after India, takes more British manufactured goods than any other country, is particularly badly hit. The discount of 3½% on Australian cable transfers is, in effect, an additional import duty of 3½% over and above the already high and recently much stiffened Commonwealth tariff. In the case of New Zealand the discount is 2½%. The Argentine exchange is showing great weakness and the harvesting of a record maize crop in South Africa cannot, in present circumstances, be regarded with unqualified satisfaction in view of the effect it has had on the price.

How far will the decline in purchasing power in our Oversea markets react on exports of electrical manufactures? So far the effect has hardly been felt, but, as Mr. QUIGLEY pointed out in the thoughtful survey of prospects contributed by him to our issue of February 28th, it is difficult to be optimistic about the immediate future of any branch of the export trade. It can be said perhaps that the electrical manufacturing industry will suffer less than most other branches of engineering because, in the endeavour to reduce production and transport costs, there will be a tendency to instal the most up-to-date equipment wherever capital is available for the purpose. Unfortunately in many directions the severity of the depression will prevent such expenditure. Competition from other manufacturing countries must also become more severe. Since prices in most export markets are already cut to or below the lowest level at which they return any profit, the proportion of total production which any electrical manufacturing country can afford to export without seriously disturbing its financial equilibrium is likely to dwindle rather than increase. Last year British electrical manufacturers exported about 25% of their total output. It may be difficult under the conditions that seem likely to prevail for some time to come, to maintain both this percentage and the present far from excessive net overall remuneration of the industry. One satisfactory feature at the moment is the success with which British electrical manufacturers are competing for business in Europe, at prices which are said to allow of reasonable profits being made.

Meanwhile imports of foreign electrical manufactures by Great Britain are, as Sir HUGO HIRST has pointed out in a recent letter to "The Times," showing a marked rise. Sir HUGO regards this as a sign that foreign manufacturers are capturing much of the new business in the domestic market which has been stimulated by the national electrification programme. He suggests that the policy followed by the Central Electricity Board of placing its contracts with British firms requires supplementing in order to secure the home market for British manufacturers of electrical appliances presumably by a duty on foreign-made goods. Whatever opinion may be held as to the merits or drawbacks of a protective tariff it would seem to be unwise for British manufacturers to look for salvation in that direction. At the last general election some 14 000 000 votes were cast for the parties which stood for free trade against 8 500 000 for a party which is by no means solidly in favour of safeguarding or protection. Even if a gradual change in sentiment is taking place such movements in this country are very slow and are apt to be checked by a trade revival before they have time to effect a change of national policy. It would therefore be taking grave risks to count on a change of fiscal policy, and, in the hope of such an event, to neglect any possible means of reducing production and marketing costs.

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Current Topics.

Broadcasting and Ship Wavelengths.

CAPTAIN ECKERSLEY in the course of a Faraday lecture under the auspices of the Scottish Centre of the I.E.E. at Edinburgh, and also at the annual dinner of the Birmingham Electric Club—an institution which again lived up to its position as the pioneer electric club of the country—referred to the unsuitability of the wave band allotted to broadcasting. If ships are using the wavelengths that would best suit broadcasting, and vice versa, the sensible plan would, at first sight, seem to be to arrange for an exchange at the Madrid Conference in 1932. But the number of transmitters ashore and afloat is so great that any proposal of the kind would inevitably meet with much opposition from both interests. Use of the 600–900 m. wave band by ship stations may cramp broadcasting activities to some extent, but the authorities will take a lot of convincing that the advantages of such an exchange would justify the disturbance that would be caused. At the same time it is important to take a long view in such matters and not to shackle ourselves irrevocably to present policy if by courageous action now we may secure substantial future gains in flexibility.

Supply Voltage Variations.

USERS and prospective users of mains radio sets in certain districts complain that the variations of voltage in their house supply are much in excess of the statutory limit of $2\frac{1}{2}\%$ on either side of the nominal supply voltage. Many of these complaints probably originate from new districts where houses are connected to a dead end cable, those at the far end having to take what the intermediate consumers have left in the way of pressure. Even where the main in a road is linked up at both ends with the distribution network there is, in some areas, a notable brightening of the lamps about 10.30 p.m., and it is probable that where this is noticeable the increase in pressure concerned is well in excess of 10%. Apart from any grievance which the consumer may have in respect of defective illumination in the earlier part of the evening, the matter is of considerable importance to manufacturers of mains wireless receiving sets, because although these are tolerant of voltage variations up to about 5%, larger fluctuations cause trouble. This means complaints from actual purchasers and also deters prospective buyers who may have noted palpable changes in the brilliance of their electric lamps, and fear the possible effects on the performance of a mains radio set. Persistent complaint, accompanied if necessary by a threat to instal a voltmeter, will in time lead to action on the part of supply undertakings, but this hardly meets the needs of the case from the manufacturers' standpoint.

Prevention of Casualties.

IT is satisfactory to learn that about 300 000 copies of "The House You Want" have been bought from E.D.A. for distribution to supply authorities and electrical contractors, and that a further 200 000 are to be available for this purpose. This is all to the good. At the same time we feel, and we note that the "Electrical Contractor and Retailer" for March holds a similar opinion, that, in addition to pressing the advantages of electricity upon the householder, the time has come for a much more comprehensive programme of electrical education which will begin in the proper place—the primary schools. It is impossible to make domestic electrical apparatus absolutely foolproof under all conceivable circumstances. Unless people are taught young that certain forms of ignorance and stupidity may entail most unpleasant results to them personally, we shall have much more bad publicity of the kind provided by the man who recently probed about with a pair of scissors amongst the wires of a lead to an earthed electric iron without troubling to switch off the current, and the child who held an earthed table toaster in one hand and poked a fork into the heating element with the other. We referred to this need of simple electrical education some weeks ago apropos of an American boy who electrocuted himself by allowing his metal kite string to touch an overhead h.t. conductor. "The Electrical Contractor and Retailer" appears to think that the electrical industry should undertake an educational campaign of this kind. It could certainly do so with advantage in the case of adults by seeing that each purchaser of electrical apparatus received adequate warning as to certain things that he or she would be well advised to refrain from doing, but we feel that the State should see to it that such action by the industry will be superfluous when the present generation of children reaches the status of users of electrical apparatus.

Two Special Features.

THIS week we print the first part of another challenging article by Mr. T. C. GILBERT on the vexed question of earthing of electrical apparatus. Previous communications from Mr. GILBERT have aroused a good deal of discussion, and his return to the lists in full vigour will doubtless cause those who hold different views to look to their pliers. Our contributor makes out a strong case for his contention that earthing is incapable of giving reasonable security in a great many cases. We shall, of course, be willing to give publicity to the opposite view, but we would ask any advocates of earthing who may wish to reply to await the publication of the concluding portion of Mr. GILBERT'S article (which will appear in next week's issue) before doing so. Another feature in this week's issue which will, we believe, prove useful to contractors, is Mr. BOND'S first article on the "Electrical Equipment of Cinema Theatres." This is an important and developing branch, and Mr. BOND'S experience qualifies him to give valuable advice as to procedure and layouts.

"Nine Till Six."

IT is so very seldom that a true picture of business life is to be seen upon the stage that we feel it almost a duty to make a reference to "Nine Till Six," now being played at the Apollo Theatre, London. Theatrical notices are not part of the regular function of the trade and commercial journalist, but if any responsible business man or woman wants to enjoy from the stalls, or the gallery, a couple of hours of life as it really is, they will see it in "Nine Till Six." Miss LOUISE HAMPTON'S representation of the daily life of one engaged in the practical affairs of the world is so true as to be something exceptional. The authors, AIMEE and PHILIP STUART, must surely have enjoyed an insight into the atmosphere of business which is given to all too few of our successful dramatists.

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BILLINGHAM STEAM AND POWER PLANT.

Description of the Generating Station of Synthetic Ammonia and Nitrates, Ltd.—Largest High Pressure Pulverised Fuel Boiler Plant in the World—Unique High Pressure Turbines—Automatic Frequency Control.

AT the Institution of Electrical Engineers on March 13th, a paper by Mr. H. A. Humphrey, M.I.E.E., Mr. D. M. Buist, M.I.E.E. and Mr. J. W. Bansall, A.M.I.E.E., was read describing the Steam and Electric Power Plant of Imperial Chemical Industries, Ltd., at Billingham-on-Tees. This is a large pulverised fuel, high pressure, high temperature, industrial power plant erected to supply steam and electricity to the factory of Synthetic Ammonia and Nitrates, Ltd. at Billingham. The following special features are described in the paper from which this abstract is taken:—

(1) A maximum pressure of 800 lb. per sq. in. gauge and a maximum temperature of 856 deg. F.
(2) The world's largest high pressure pulverised fuel boiler plant, containing special constructional features for the high pressure and temperature.
(3) An unusually large distillation plant.
(4) A 7-stage feed heating system, with feed pumps specially designed for high pressure and temperature
(5) High pressure pass out turbines of unique design.
(6) The first system of its kind of automatic frequency control, automatic steam pressure control, and automatic feed pump regulation, together with automatic synchronising.
(7) Unusual layout features for the accommodation of pipework and cables.

The conditions differ essentially from those relating to a public electricity supply station. The extension programme of Synthetic Ammonia and Nitrates, Ltd., at Billingham, called for 6 930 tonnes* of steam per day delivered for process purposes, and 37 500 kW distributed as electrical energy to the works. The quantity of steam in the first item is approximately double the amount of steam required to generate the electrical energy of the second item, and so the boiler plant capacity is three times that of a purely electric power station.

Then again, the load factor of a chemical works approaches closely to 100 per cent. and continuity of supply is of the utmost importance. The power plant, therefore, must have sufficient stand-by plant and means of bringing such plant rapidly into operation, whilst, further, the layout, methods of control, size of units, etc., must all be considered on the lines of "safety first."

In designing a plant for an annual output as great as that of the largest electricity station in the country, great attention must be paid to all possibilities for securing economy in generating costs. The balance has to be struck between simplicity and reliability on the one side, and maximum attainable economy on the other. Unproved designs involving apparatus of an experimental nature had to be avoided, and the consulting engineer had to steer his way through some rather conflicting considerations in order to obtain the best commercial results.

Another matter influencing design was the existence of a large powdered fuel fired boiler plant and also the fact that a contract for a bulk supply at 11 000 V 40 periods, from the adjacent North Tees power station continues until 1941.

(*a*) *Boiler Plant.*—The existing boiler plant provides the steam used in the factory at 290 lb. absolute† and 653 deg. F., and the necessity of paralleling with these conditions made their adoption for the new plant almost imperative. The first problem, therefore, was how best to raise steam at some higher pressure, so that after some of its energy had been converted to electrical energy it could be passed on as steam to process. Calculations showed that if steam were raised at such a pressure that it entered the primary turbines at 645 lb. per sq. in. and 833 deg. F. its expansion down to 290 lb. would provide steam at 653 deg. F., these being the steam conditions of the existing boiler plant. To gain the economy due to high velocity of flow in the superheater tubes, a large resistance pressure drop had to be faced, and the normal working pressure at the boilers therefore became 715 lb. and was finally fixed at 815 lb. as a maximum.

In view of the fact that 856 deg. F. was considered to be the highest safe temperature for ordinary steel superheaters, and that such high temperatures have a greater influence on economy than super-high pressures, any temptation to adopt still higher pressures was readily rejected. Especially was such a decision made easy because a pressure of 1 200 lb. per sq. in., for example, would have entailed reheating the steam after expansion, in order to reach existing boiler plant conditions, and the small additional economy was not worth the added complication and expense thus involved. Further, we have yet to learn a great deal about creep stresses at 856 deg. F., and such stresses are proportional to pressure.

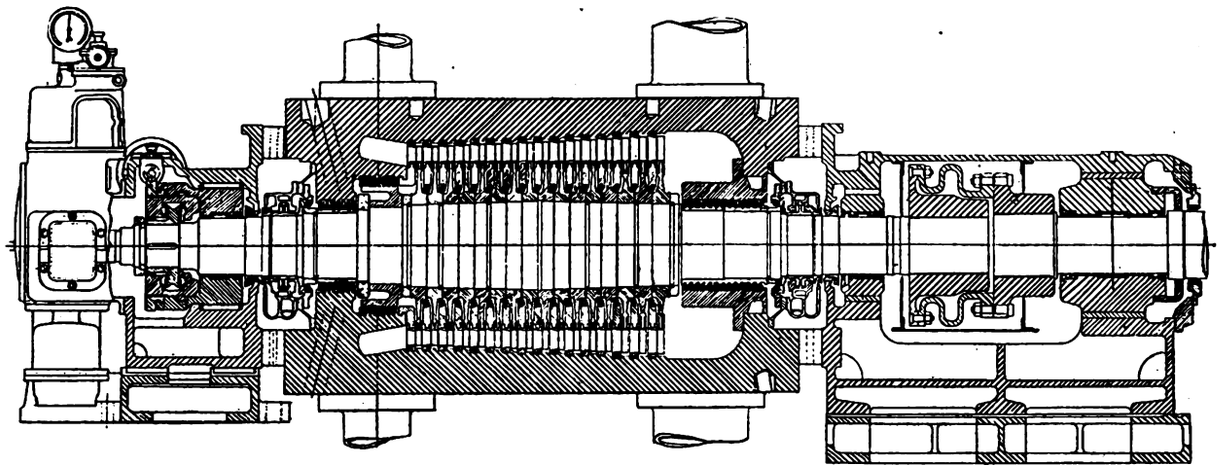

Fig. 1.—Sectional arrangement of high-pressure turbine.

Only 60% of the steam would be condensed and returned from process, and so 2 512 tonnes per day of raw water, obtained from Billingham Beck, had to be distilled and the distillate added to the "make-up" feed. This involved the erection of an unusually large distillation plant, with its attendant de-aerators.

(*b*) *Turbo-Alternators.*—Careful consideration of the possible degree of economy to be obtained by progressive feed heating led to the adoption of separate feed heating turbines from which the steam is bled to heat the feed water. Here, again, a commercial maximum economy, rather than a theoretical maximum, was aimed at, and no attempt was made to bleed the primary turbines. These unusual pieces of apparatus were advisedly kept simple and comparatively small, and the consulting engineer insisted, in the interests of flexibility, on their being mechanically independent of other units.

By passing all the steam required as such, plus that required for conversion to electrical energy, through two primary turbines, 23 800 kW would be obtained, so that two units of 12 500 kW each would provide the working units and one was to be added as a spare. A correspond-

* One tonne = 1 000 kg = 2 204 lb.

† Except where otherwise stated, all subsequent pressures mentioned in this paper are absolute pressures.

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ing set of feed heating turbines would give 9 500 kW output for two units working, and these were fixed at 6 000 kW each on the generator side.

Lastly, condensing sets had to be provided because the proportion of steam energy to electrical energy distributed to the works was liable to vary, and condensing sets were necessary to meet such variation within the required limits and to make up the balance of the electrical output. One working condensing set to produce 10 200 kW would meet the then known conditions, another machine being kept as spare. These were made capable of 12 500 kW each in view of unknown requirements, and provision was made for a third set, should this be required in the future. The steam to be raised by the new boilers was found to be 11 700 tonnes per day, and the electrical energy required was augmented to 43 500 kW in order to cover all the internal requirements of the plant plus the outside load.

(*c*) *Costs.*—The directors of Imperial Chemical Industries, Ltd. have reserved from publication all questions of cost; the estimated cost of electric energy at the busbars of the station

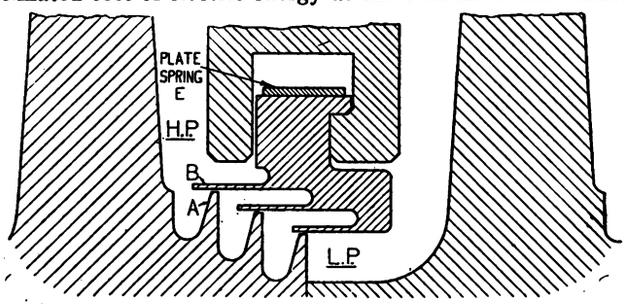

Fig. 2.—Labyrinth packing.

is well below the unit cost of any electric generating station in the world depending on coal as fuel. This is due to the use of high pressure and high temperature steam, to the use of primary turbines passing a greater quantity of steam than would be available in an ordinary central station, to the low cost of coal in the locality, to the high load factor, to the abundant supply of cooling water, and to the many economies which have been introduced into the designs.

(*d*) *Erection.*—The station was erected in record time. Tenders were invited in December 1927, contracts were placed in February 1928, excavations were commenced in May 1928, and by February 1929 the station was erected with sufficient plant to commence operation and give an external supply to the factory.

(*e*) *Layout.*—The general layout of the power plant was the subject of quick decisions, made even before contracts were placed and adhered to during the subsequent settlement of details with the main contractors. In reviewing the layout now that the plant is built, no radical improvement therein can be suggested. The governing decisions were:—

(1) To dispose the plant so that the flow from boilers to high pressure turbines, thence to the feed heating and the distillation plants and finally back to the boilers, constituted a simple ring with a tee-off to the condensing sets and one to the factory for process purposes.

(2) To make the distillation and feed heating bays duplicates in height, width and design of the turbine and switch bays respectively.

(3) To keep all large sets in one bay under a 40 ton crane.

(4) To place the feed heating sets with all heaters and pumps in one bay, under a 20 ton crane, this bay to adjoin the distillation bay and both bays to be next to the boiler plant.

(5) To place the condensing sets at that end of the plant where the 48 in. circulating water inlet and outlet pipes could most conveniently and cheaply be brought into the building.

(6) To include a separate bay for the accommodation of high-pressure steam receivers, de-superheaters, reducing valves, all interconnecting pipework and valves (in short a control centre, analogous to an electrical control room) for all high pressure and low pressure steam distribution.

(7) To provide on the electrical side, as on the steam side, a separate bay in the switch house for all cables, consisting of a vertical gallery fed from the basement and feeding two horizontal steel floored races under the main switchgear and under the control room respectively.

(8) To place the majority of the generating plant next to the switch house for convenience and economy of heavy cable runs.

(9) To place the switch house external to the main buildings to facilitate exit of the large number of feeders; and, for the same reason, to place the main switchgear on a level with the cable bridges.

The thermal efficiency and the effect of feed heating and increased pressure and temperature upon thermal efficiency are shown in Tables I and II.

The high pressure turbines are of single cylinder type and have 16 stages. A sectional view of one of them is given in Fig. 1. The cylinder and the two steam chests are of forged steel and their manufacture required the exercise of extreme care on the part of the makers. Fig. 2 illustrates the labyrinth packing between the diaphragms. The latter consists of a number of projections "A" cut on the boss of the diaphragms. These projections almost touch a number of projections, "B," on the packing piece "C," which fits into a slot. The clearance space behind "C" is taken up by the spring "E." This device is also one for regulating the clearance and this is accomplished by virtue of the shape taken by the projections during expansion, the diaphragm projections lengthening while the packing-piece projections assume the shape shown in Fig. 2. The clearance is thus always preserved. One of these packings is placed between each diaphragm, and eight are placed together at the exhaust end of the turbine.

The use of increased steam pressure, particularly in the case of large units, has resulted in radical changes in gland design. The disadvantage of some earlier types of labyrinth glands was that, in the event of rubbing of the faces, the resultant heating, with distortion of the faces, caused wear and decreased the gland efficiency.

The glands employed at both high pressure and low pressure ends of the turbines are so designed that, if rubbing should occur, the resulting distortion of the parts in contact causes the clearance to be increased automatically.

The glands at the high pressure ends are of a special axial clearance type, illustrated in Fig. 3. The projections "A" were made solid with the sleeve keyed to the main shaft, similar projections being cut on the packing piece "B" fitted into the turbine casing. A clearance is thus always maintained, since the projections on expanding tend to curve outwards from the clearance space, which tends therefore to become larger instead of smaller. This design enables a very large number of throttling joints to be provided in a given gland length, while the fitting of an adjustable thrust block of the Michell type permits the gland clearance to be most accurately adjusted to a working minimum while the set is in operation.

The control apparatus is the first installation of its kind applied to power station control.

The pressure control impulses are obtained by the rotation of a drum which is divided circumferentially into four segments, each of which generates impulses at a constant rate depending upon which of the four segments is in operation. The selection of drum segments is effected by means of a device responsive to steam pressure, provided with contact making segments corresponding to those on the drum. The result of this interaction is that impulses are generated with a frequency which increases, the further the steam pressure deviates from its normal value.

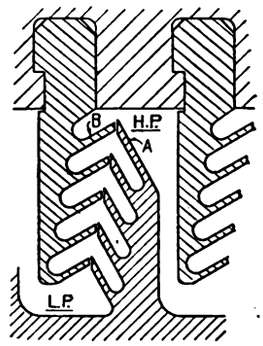

Fig. 3.—High-pressure gland.

Discrimination between pressures above and pressures below normal is obtained by means of a contact making pressure regulator of a standard type. The function of this regulator is duplicated on the pressure responsive device operating in conjunction with the drum, so that, if either apparatus becomes faulty, control is immediately cut off before misoperation can result. The adjustment of the actual length of the impulses themselves is carried out by means of two time-lag relays which are so connected that the failure of one of them can at the worst only effect cessation of control and so enable the operator to put a stand-by set of apparatus into commission. The automatic frequency control scheme marks an important stage in the development of this type of control in this country, and the paper gives a brief description of it as an interesting comparison with the recently evolved American schemes, some of which have now been applied to the control of power stations.* The most

* R. Brandt: "Automatic Frequency Control," "Electrical World," February 23rd, 1929; J. U. Benziger and J. T. Johnson, "Automatic Frequency Control at Mitchell Dam," ibid., June 29th, 1929, and H. A. McCrea: "Automatic Control of Frequency and Load." "General Electric Review," 1929, vol. 32, p. 309.

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TABLE I.—Thermal Efficiency.

	Boiler plant		Power plant	
Power supplied	Heat power in coal	409 500 kW	Steam power to turbo-alternators	59 150 kW
Power available	Power in steam to plants and turbo-alternators	141 700 kW	Electrical power at station busbars	41 300 kW
Efficiency of conversion	Boiler plant efficiency $\left(=\frac{141\,700}{409\,500}\right)$	34·6 per cent.	Power plant efficiency $\left(=\frac{41\,300}{59\,150}\right)$	70 per cent.
Overall efficiency	Overall thermal efficiency of power station $=\frac{34{\cdot}6\times 70}{100}=24{\cdot}2$ per cent.			

TABLE II.—Effect of Feed Heating and Increased Pressure and Temperature upon Thermal Efficiency.

Steam conditions at turbine inlet		Theoretical steam power available	Heat in coal converted into available steam energy	Heat in coal converted into electrical power with an efficiency of conversion from steam to electricity of 70 per cent.	Remarks	Gain in efficiency over steam generation at 290 lb./sq. in. abs. and 653° F. with no feed heating.
lb./sq. in. abs. (kg/cm.)	°F. (°C.)	kW	per cent.	per cent.		Per cent.
290 (20·4)	653 (345)	113 600	27·7	19·39	No feed heating	—
290 (20·4)	653 (345)	118 400	29·0	20·30	Single-stage feed heating to 176° F. (80° C.)	4·7
645 (45·3)	833 (446)	128 100	31·3	21·91	No feed heating	13·0
645 (45·3)	833 (446)	141 700	34·6	24·22	Seven-stage feed heating to 401° F. (205° C.)	24·9

important consideration from the point of view of continuity of supply of both steam and electricity from the power station is that of reliability of the electrical supply for driving the auxiliaries. Various methods of obtaining a duplicate supply were considered and it was ultimately decided to utilize the existing 11 000 V supply from the adjacent North Tees power station. The chief difficulty arising in the utilisation of this source lay in running the two supply systems in parallel, this being essential in order to avoid even a momentary interruption of supply to the auxiliaries in case of failure of the normal supply. Bearing in mind this consideration and having regard to the fact that nearly all the essential boiler house auxiliaries require speed variation, the situation has been met by permanently connecting one 2 000 kW motor convertor to a third or "transfer" busbar on the auxiliary

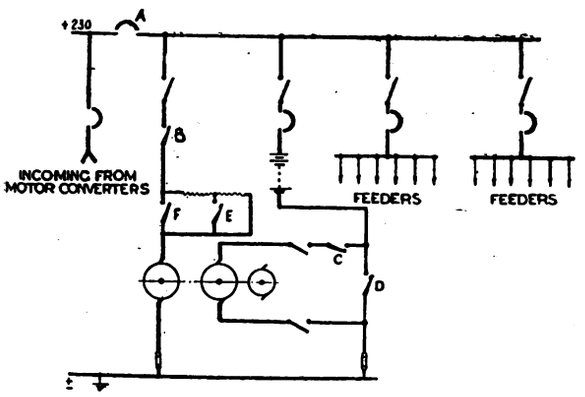

Fig. 4.—Battery booster control scheme.

A=reverse-current circuit-breaker. B=booster motor contactor. C=booster contactor. D=booster short-circuiting contactor. E=first motor-starting contactor. F=second motor-starting contactor.

e.h.t. switchgear which is supplied from a 11 000/6 600 V transformer. The transformer is situated in one of the substations of the existing 11 000 V network and is connected to the "transfer" busbar by a suitably protected 2 000 kVA interconnector. This motor convertor is paralleled on the d.c. side with the remaining convertor fed from the "normal" auxiliary e.h.t. busbar and remains "floating" on the Newcastle Electricity Supply Co.'s mains, i.e., its field is adjusted so that it is running light. In the event of a failure of the power station supply the normally loaded convertor automatically shuts down and the one running from the public supply immediately takes over the load.

The control of the battery and booster represents a divergence from normal practice in certain respects. In the first place it was found to be possible to dispense altogether with the usual buffer resistance by suitably designing the various control circuits. In order to appreciate how this could be done it is sufficient to remember that no danger exists in momentarily short-circuiting the booster during the running-up period before the field circuit is energised. On the other hand, there is no disadvantage in open-circuiting the battery circuit altogether while the booster bars are in parallel with the main d.c. supply or, in other words, when the line contactor is closed. By adopting such a procedure the heavy current which would otherwise circulate through the booster armature when short-circuited, with a residual field current still flowing, would cause damage and necessitate the provision of the buffer resistance, the use of which this scheme avoids. (Fig. 4).

A further interesting feature relates to the automatic change-over from the hand control of the booster excitation to the automatic control if trouble develops on the main d.c. system while the battery is being charged. The system has given every satisfaction since it was installed.

Discussion.

Mr. C. H. Merz suggested that it would have been economically more advantageous to have designed the plant required for steam process work as a separate plant—obtaining from it as much or as little electricity as might be—and to have taken the electricity required from the grid.

Mr. W. M. Selvey said that the outstanding feature of the steam plant was the superheater. In Detroit there was an experimental superheater working at 1 000 lb., and they were prepared in America to go to higher superheat temperatures without increasing pressures. Mr. Humphrey, however, had decided to go half-way, and the ingenuity shown in the construction of his superheater was to be very strongly commended. Another advance was that in the steam economiser it had been made possible to do away with the baffles, and with pulverised fuel, that was a great point.

Mr. T. R. Warren said that the adoption of automatic frequency control enabled governing to be coarsened without fear of incurring frequency fluctuations during times of changing load, and its application to the control of large systems offered material advantages.

Mr. H. W. Clothier said that it was significant that complete automatic control had been chosen. The crux of these automatic systems was the use of simple reliable relays making infallible contact-making connections which gave a clean reproduction of the corresponding manual operation. Hand control involved a great amount of human responsibility and worry particularly at times of emergency, and the schemes tried by the authors, with the addition of necessary pilot wires, contained all the elements for centro-visory, load sharing and automatic frequency control, for example, in a distribution system such as the British Grid where all the generating plant would be kept in step within narrow limits.

Mr. H. Risset said that removal of dust from boiler flue gases by water spray or water film had been adopted at Billingham; it was the first installation here and was the most promising. It gave a dust efficiency of 90 % easily, but it had the disadvantage of requiring a considerable quantity of water.

The main contractors for the boiler and power plants at Billingham were:—Boilers: International Combustion, Ltd.; pumps and motors, Mather and Platt, Ltd.; generating plant, Metropolitan-Vickers Electrical Co.; switchgear, A. Reyrolle and Co.; distillation plant, Vickers, Armstrong, Ltd.

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ELECTRICAL EQUIPMENT OF CINEMA THEATRES.

How Trouble, Time and Expense can be Saved—Value of Early Consultation with Electrical Contractors—Load and Decorative Requirements—Subdivision of Installation Work.

By CLEMENT D. BOND.

(Mr. C. D. Bond is the amusement engineering specialist for Messrs. W. J. Furse and Co., Ltd., Nottingham, the well-known firm of electrical engineers and lift manufacturers, who specialise in electrical equipment and lifts for theatres, cinemas, race tracks, skating rinks and dance halls.)

THE remarkable growth of the electrical industry has taken place practically within a lifetime, and no section has developed more rapidly or extensively than that appertaining to the amusement world. The reason for this is that "entertainment" to be entertainment, must be new. The old British idea of "What was good enough for father is good enough for me," falls to the ground. Every installation in the amusement world must be "different"; it is useless to put forward a standard scheme to every customer. Each theatre or cinema owner wants something better than his competitor. The result has been one improvement after another, until today we get the super cinema, with its wonderful lighting effects, taking anything up to 500 A for lighting and 400 A for power, as compared with a tenth of this load twenty years ago.

Before dealing with the electrical equipment itself, I would like to say a few words, on behalf of the engineering contractor, to the architect, consulting engineer, owner, or whoever is responsible for this section of the construction of a new cinema. I feel sure that if notice is taken, considerable trouble, time and expense can be saved. The easiest way of doing this is to confine my remarks to a few golden rules.

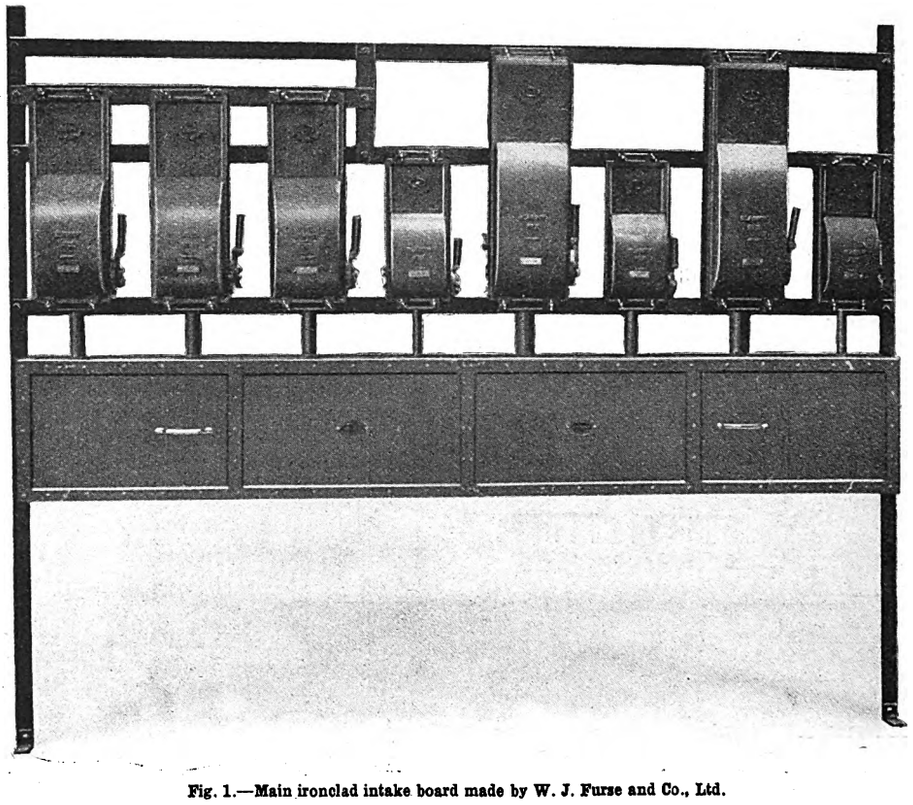

Fig. 1.—Main ironclad intake board made by W. J. Furse and Co., Ltd.

(1) Give your work to firms who have had the necessary experience.

(2) Consult, if possible, the electrical contractor for the work when the scheme is in the sketch plan stage. If you do this, modifications can frequently be made in the building to suit the engineers' requirements before they are submitted to the Council. This will save the re-making of plans and getting them approved at a later date.

(3) Allow the engineer plenty of space for his gear, especially in the intake, battery, motor generator, biograph, non-synchronous dimmer and switch rooms. If you are providing a stage, be sure that the roof is at least six feet above the proscenium bridge to allow for the accommodation and staying of battens.

(4) Just as you place the whole of the building with your building contractor, so in the same manner place the whole of the ordering of the electrical equipment with your electrical contractor. In this way, if you have chosen the right firm, you will be sure of obtaining the right material for the work required, and will have placed the responsibility for its satisfactory working under one head.

(5) Place your order for the electrical installation before the steelwork is completed. The electrical contractor has a great deal of organising to do before he begins his work. It does not cost anything to place your order early, but it makes it much easier for your contractor.

(6) Design your electrical layout and scheme before you start your building, and, with the exception of slight modifications, adhere to it. Alterations cost money, and greatly upset the smooth working of the job.

Now for the electrical equipment itself. Before beginning to get out an electrical scheme for a cinema, be sure to consult the supply authorities, watch committee, and fire chief, as on their requirements generally depends the whole layout. The following information is essential:

(1) Type of supply for both lighting and power.

(2) Regulation with regard to balancing.

(3) Position of intake.

(4) Alternative supply instead of using gas or stand-by battery.

(5) Regulations *re* motors, both from the point of view of electrical supply and fire requirements.

(6) Regulations with regard to dimmers and bio room, more with regard to fire than anything else.

(7) The question of tariff should be cleared up.

When the above points are agreed, the scheme should be prepared. In order to illustrate the way in which this should be done, I think the easiest method will be to describe the designing of the layout of one of the largest cinemas in the country with which I am dealing at the present moment.

It has been arranged for the Corporation to bring into the building at the intake room a three-wire 460/230 V d.c. supply, which has as far as possible to be balanced. This supply will be split up by the Corporation into 460 V and 230 V power, and two 230 V feeders for lighting. From the outlet side of the meters the electrical contractor will commence his work.

The question of tariff was discussed and an arrangement has been made for the Corporation to charge the cinema proprietors a fixed low figure per kW of maximum demand, plus a standard charge of varying with the price of coal at the time being. Some such arrangement can generally be arrived at when a load of 750 to 1 600 A is being considered.

Another difficulty which has arisen is that about six cafés and garages in the cinema have been sub-let to an outside firm who will pay for the electricity consumed by them. In order to take advantage of the maximum bulk rate, arrangements are being made to sub-meter all such supplies,

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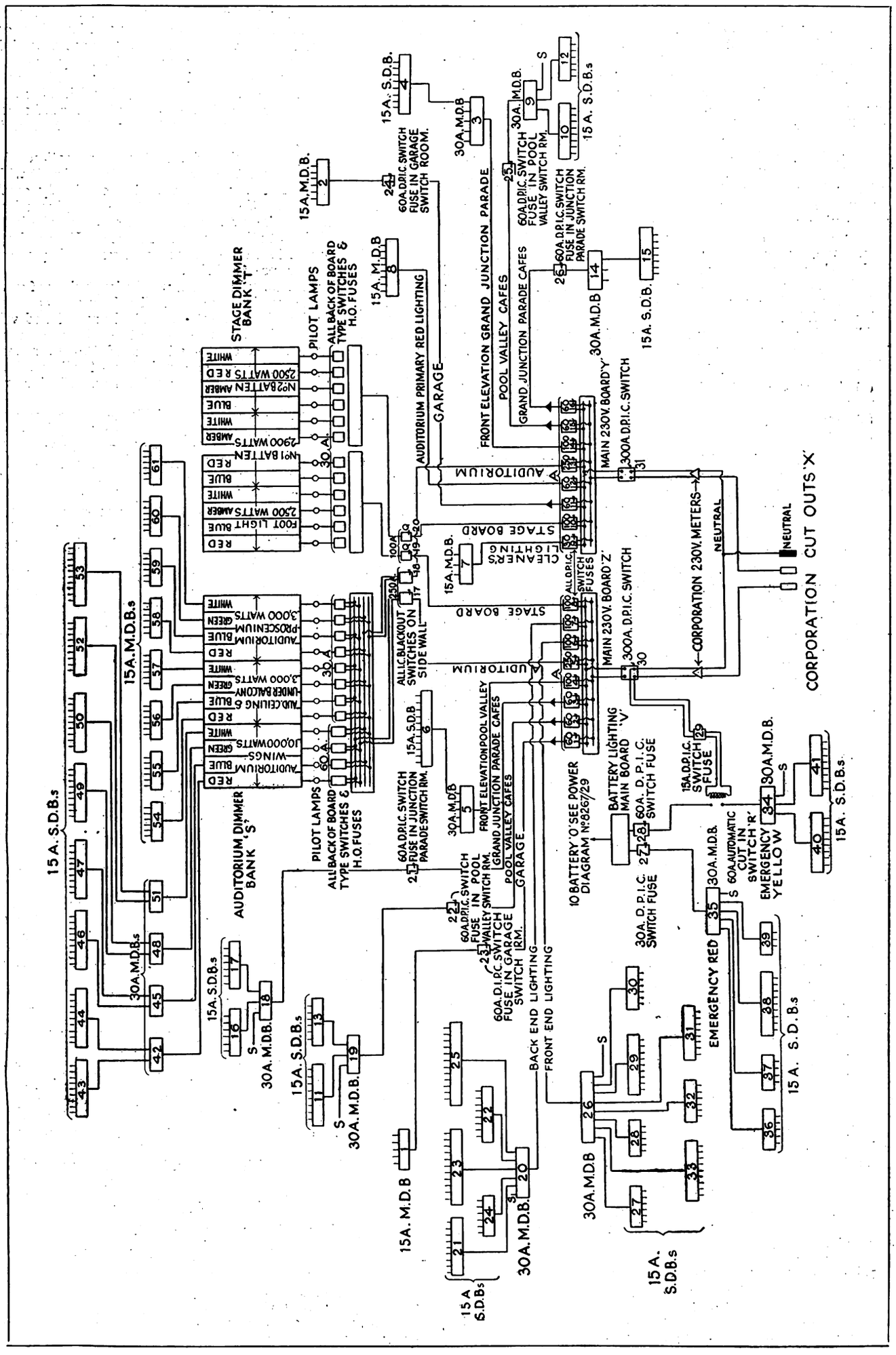

Fig. 2.—ARRANGEMENT OF MAIN LIGHTING DISTRIBUTION CIRCUITS.

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both for power and lighting, and the café owners will pay an agreed sum per unit to the cinema owners. The installation will be so laid out that if the Corporation wish at any future time to make the sub-tenants direct consumers, it can easily be done by using existing circuits as Corporation mains.

Having definitely arranged for the supply, the next question was to decide the various points throughout, both for power and lighting. Consultations were held with the architect to obtain schedule of load for the various power plant such as plenum, lifts, and so on throughout the house, and with both the architect and the decorative artist as to effect required with regard to lighting. When this information was obtained the various points were marked on the plan, and a schedule got out giving point numbers, number of switches, watts per fitting, total watts and type of fitting. This having been done, the various sub-circuits could be designed right back to the main distribution boards. These were then grouped together and the various circuits decided on for the main switch loads. Reference to the single line diagrams will explain this more fully.

All local authorities require a secondary supply lighting to be used in every cinema. There are three alternatives to obtain this end, namely :—

(1) A separate electrical supply from a different generating station.
(2) Gas.
(3) Battery.

The first is seldom obtainable outside the metropolis, but is by far the most economical and satisfactory. The second is crude, antiquated and dirty. The third is the best alternative to number one, and is usually employed.

Emergency Circuit.

In the cinema being described, it has been decided to instal a battery charged through battery charging board by its own separate motor generator. This battery will be of 300 Ah capacity, the total load on the secondary police lighting being about 25 A. Provision is, however, being made to wire all the passages, entrances, etc., on what is termed a secondary emergency circuit. Under normal conditions, none of these lights will be on, but, in the event of failure of the Corporation, an automatic cut-in switch will come into action, bringing them all on at once and again switching them off when the Corporation comes on again. Of course, this circuit will be master controlled by main switch and fuse. The total load on this circuit will be about 50 A, so the battery will be amply capable of dealing with this increased load for an hour, in which time, if the Corporation breakdown is severe, the audience can be got out without panic.

It has been arranged to split up the electrical work of the cinema into five sections, namely :—

(1) Lighting, which will be sub-divided into general and primary from the Corporation supply, and secondary and emergency from the battery.
(2) Power.
(3) Motor generator.
(4) Projectors.
(5) Telephones.

The lighting is split up as stated above, and will again be sub-divided into the auditorium lighting, stage end lighting, front of house lighting, front elevation lighting, cleaners' lighting and special sub-let lighting through private meters.

The general contracting work will be carried out to the following specification : The whole installation will be made to comply not only with the I.E.E. regulations, but also those of all competent authorities and fire insurance companies concerned, with special reference to places of amusement.

The system of wiring will be on the draw-in system, in screwed barrel, and will be suitable in all respects for the stated voltages. The conduit will be welded heavy-gauge black-enamelled steel barrel ; vertical and incline runs will be drained at the lowest points. Conduits will be concealed below the surface of the walls and ceilings and under floors as far as possible. All conduits will be run in symmetrical lines parallel to each other and to the lines of the building where exposed to view, and will generally follow the lines capable of being readily located.

No conduit less than $\frac{3}{4}$ in. external diameter will be used on the installation. Where conduit is run outside, this will be galvanized and painted with bitumastic paint. No conductor will be drawn into the conduit until the conduit system is complete, and great care will be taken to prevent plaster or any other foreign substance getting into it. The conduit system will be fitted with draw-in boxes not less than $2\frac{1}{2}$ in. diameter, placed in such a position that they are accessible to enable the wires to be drawn in and out at any time. Not more than two sets will be made in a conduit run without a box. All right-angle bends, however, will be made with a box. The boxes behind surface switches will be of the semi-recessed pattern, and boxes behind sunk switches will be of the adjustable grid pattern.

The continuity of each light and power section of the conduits will be such that the resistance of any circuit will not exceed 2 Ω, and the whole will be efficiently earthed. Where the wires leave the conduit at sharp edge, brass bushes will be fitted. Special attention will be given to the importance of rigid fixing of all conduits and boxes. Where they are not buried or run in the roof space and voids, they must be firmly secured by clips or saddles.

All conduits, boxes, cables, etc., will be kept clear of gas and other pipes. The sectional area of all cables and conductors throughout the installation not particularly mentioned will be of such a size that the current density in no instance exceeds 1 000 A per sq. in. All cables will be of C.M.A. manufacture, 600 megohm grade. The polarity of all conductors will be distinguished by different colouring. No joints will be used throughout the system.

All distribution boards will be of Home Office pattern, in cast iron cases. The front of the boards will be fitted with doors on substantial hinges and secured by wing-nut fastenings, suitably drilled to take both incoming and outgoing conduits. All wall sockets will be of the iron-cased pattern, and the plugs metal sheathed and fitted with cab-tyre glands.

All branch local switches will be of the semi-recessed pattern mounted on $\frac{3}{4}$ in. conduit metal outlet boxes with dollies earthed. Where sub-switches are grouped for loading greater than 500 W, these will be of the rotary pattern.

The whole of the main switch gear will be ironclad and situated in one central position in the intake room. The main switches will be circuit breakers, and will form part of the main switchboard controls. (Fig. 1.)

The main switchboards themselves will be six in number, namely :—

One 460 V power board.
Two 230 V power boards.
Two 230 V lighting boards.
One 100 V battery lighting board.

Each will have its own main switch, referred to above, and its own busbar chamber. They will be prepared for screwed tube, prepared for both incoming and outgoing conduits. Reference to the single-line diagrams will show how the various parts of the house will be split up. From the various switches on these boards the various circuits will be run to the main distribution boards, sub-distribution boards and the various lighting and power points. Of course, certain modifications may have to be made to the single-line diagrams, but these will be kept to a minimum.

All the switchgear has been designed to carry considerably more than the stated loads, with the exception of the main circuit breakers. The approximate loads will be 500 A for lighting and 350 A for power.

(*The second article in this series will appear in our issue dated April 18th.*)

PORT OF BEIRA POWER STATION.

THERE has recently been completed a Diesel-driven power station to supply current for the lighting of the port area and the working of electric cranes and capstans on the wharves at Beira, Portuguese East Africa. The installation consists of two 6-cylinder 4-stroke Diesel engines developing 330 H.P. at 250 r.p.m., and capable of 10 per cent. overload for two hours, direct coupled to 220 kW 500 V compound wound multiple pole generators with static balancer. The generators were made by the British Thomson-Houston Company, Rugby, who also supplied the switchboards and balancer. The Lancashire Dynamo and Motor Company supplied a reversible booster, and the Tudor Accumulator Company supplied a battery of 900 Ah capacity at 450 V. The contractors for the supply and erection of the power station were Mirrlees, Bickerton and Day, of Stockport, and the specifications were drawn up by Messrs. C. S. Meik and Halcrow. Mr. A. Goodwin, who was for 14 years in the service of the Salisbury (Southern Rhodesia) Municipality, has been appointed engineer in charge of the station, which is being operated by the Rhodesia Railways, Ltd., on behalf of Beira Works, Ltd.

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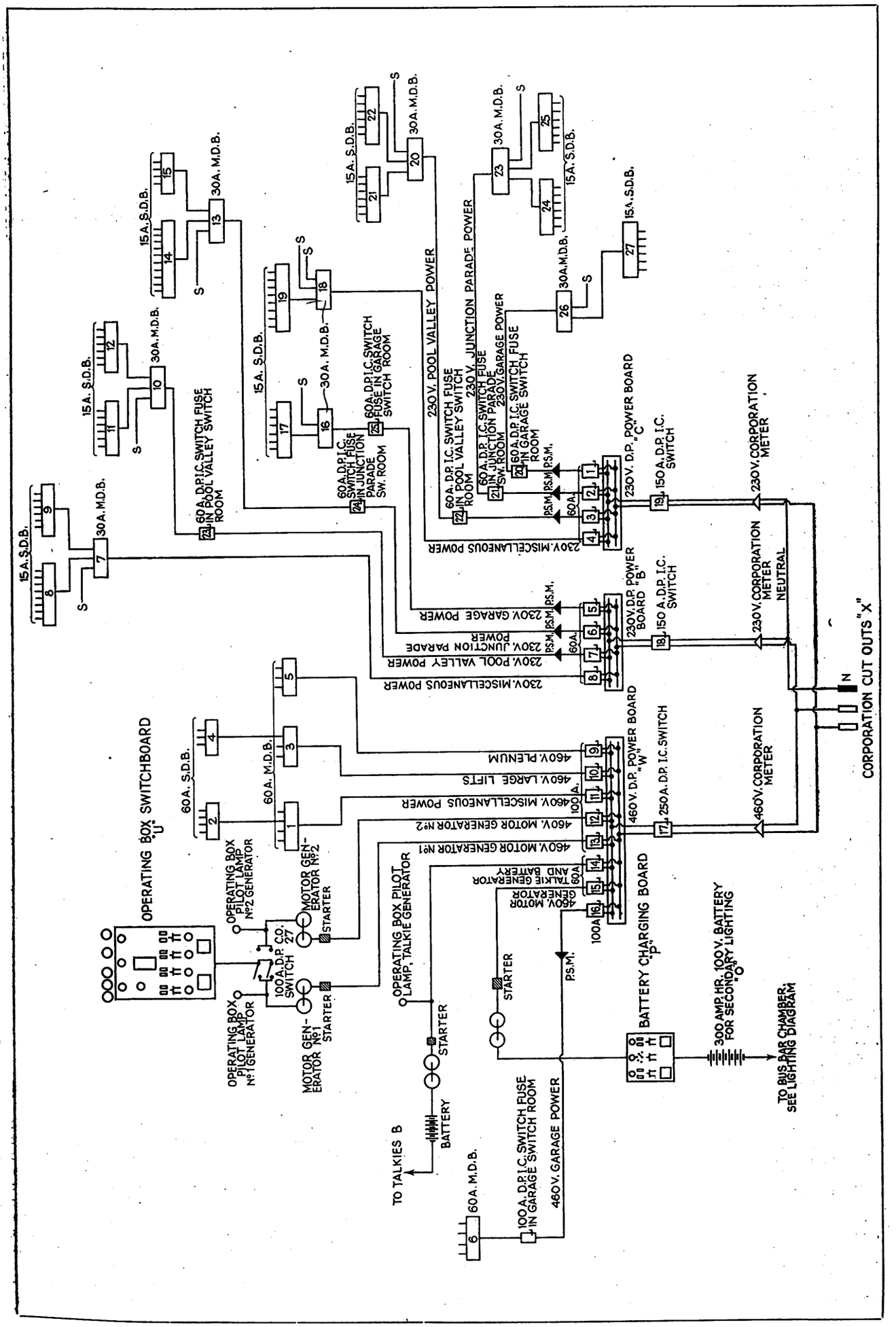

Fig. 3.—ARRANGEMENT OF MAIN POWER DISTRIBUTION CIRCUITS.

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GROWTH OF ELECTRIC COOKING—I.

Pioneer Efforts—Electrically Cooked Banquet of 1895—Heating by Lamps—Early Types of Ovens—Great Progress since 1920.

By HILDA L. DOVER, B.Sc.(London).

BETWEEN 30 and 40 years ago, the late Prof. W. E. Ayrton, F.R.S., frizzled a little piece of fat by the aid of an electric current during a lecture given at the Royal Institution of Great Britain, and so became one of the pioneers of electric cooking. At the Crystal Palace Exhibition in 1891, a demonstration in electric cooking was given, and in 1895, a banquet was served to the Lord Mayor of London at the Cannon Street Hotel, which had been cooked by electricity. It is interesting to note in passing that in 1890, the Carpenter Electric Heating Corporation began to manufacture appliances for domestic purposes.

In the early days, the ordinary carbon filament lamp—which supplied more heat than light—was used as a source of heat. The lamp was fixed to a stand so that a vessel of water with a recess in the bottom could be placed above the lamp. It was not until the beginning of the present century that coils of resistance wire, packed in powders of various compositions, were used to any great extent. A further advance of some importance was made by fixing the wire in close proximity to the heating suface by means of asbestos powder mixed with silicate of soda. This arrangement had to be abandoned because of the low insulation resistance.

By 1905 the most important types of ovens employed either hot plates of special design or metallo-ceramic bars or wires wound on porcelain tubes to dissipate the heat. One of the most experienced women demonstrators of to-day recalls the use of a black metallic box fitted over a hotplate with a second inverted hot plate on the top. Up to 1908, most of the cooking appliances were made for pressures of 200 to 230 V, but about this time, Mr. John Roberts, of Durban, advocated the return to low pressures for cooking purposes, both for reasons of safety and convenience. The ever present problem of rapid boiling has stimulated the manufacture of utensils with flexible cords. Several of these in a kitchen were impracticable. As vessels must be heated by placing them in contact with hot plates, the latter must be designed to heat as rapidly as possible and to prevent radiation of heat in any direction other than where the heat is required. In view of the recent production of the Revo Super Speed Boiling Plate, a stove described by Mr. John Roberts ("Journ. I.E.E.," Vol. 42, p. 367) may be of interest. This stove was made of sheet iron, and the top was fitted with 4 hotplates, 2 large and 2 small. The body is taken up on the right hand side by the oven, and a compartment on the left holds the reducing transformer. The transformer is fed by distribution mains (800 V). It is so arranged that 7, 12½, or 20 V can be applied to the heating elements. The elements are securely fixed to the under side of the hot plates and to the lining of the oven. From 1909 to the beginning of the War—with the almost universal adoption of the metallic filament lamp and the consequent drop in the revenue per consumer, whilst the cost of the service and meter remained the same—the electrical industry began to take electric cooking more seriously. Investigations were carried out, and food cooked electrically was found to be much more palatable, but it was difficult to persuade the consumer that electric cooking was not more expensive than the other methods of cooking when taking into account the resulting food values and the saving of nervous energy. To-day, 50 per cent. of the population of Great Britain can have electrical energy at 1d. or less per unit, so without the consideration of any other advantages, this should prove attractive to the consumer.

Twenty Years Ago.

To show the marvellous advance in the construction of modern electric cookers, a brief description of a lagged, or black, cooker used 20 years ago may be given. The oven was fitted with open resistance coils loaded to 1 600 W. The coils soon failed, but while they lasted it seemed impossible to eradicate the smell of burnt fat which had accidentally been dropped on them. There was also no provision for top heat. Embedded in the top of the cooker were two hotplates, each loaded to 600 W—too much for simmering purposes, and too little for quick boiling. A quart kettle of water required 23 min. to boil. At Olympia, in 1911, a marked advance in the design of cookers was shown by Mr. A. F. Berry. Within two months of these cookers coming on to the market, the Derby mains had 30 satisfied consumers instead of two. These consumers had realised (1) the absolute cleanliness; (2) the reliability of the result due to constant pressure of the supply—relief from worry; (3) the saving due to non-shrinkage and the increase in the food value. These are the best money saving arguments. In the long run "Health is Wealth."

The rentals charged for electric cookers at Derby in 1913 were:—

For outfit including "duplex" cooker, extension heater, and oven, 4s. per quarter. Including griller and grease pan, 4s. 3d. per quarter. Additional extension heater, 1s. 4d. per quarter.

The small utensils used in conjunction with the hotplates were sold outright at prices approximately 10 per cent. above net cost.

To meet the drawback of slow boiling, Mr. Berry devised a specially shaped kettle into which a cartridge element was inserted. The loading was 1 200 W, and this could be assisted by standing the kettle on a hot plate. With an initial temperature of 40° F., 3 pints of water could be boiled in 6 min. with 2 000 W at an efficiency of over 98 per cent. Mr. Berry had already realised the necessity of lectures and demonstrations on electric cooking. These were arranged to be given in an interesting manner.

Table Cooking Before the War

About this time a cooking outfit was supplied by Mr. Berry's company to a boys' school at Eastbourne. The results for a term gave a consumption of just under 0·5 of a unit per head per day. There were, in all, 100 people to cater for, and besides the ordinary daily meals for boys and staff, the adults were served with a full course dinner in the evening. By 1913, table cooking with small appliances was being very successfully carried out, and a really reliable electric cooker was on the market, but the need for the reduction in the cost of electrical cooking outfits was fully realised.

Then about 6 years elapsed when research on electric cookers had to be abandoned. These years must be remembered in the development of the electric cooker, for the development of such things as motor transport was rather encouraged than delayed during this period.

By 1921, two main differences in the mode of heat transfer, corresponding to the two main types of hotplate, namely, the plain or enclosed type, and the open or radiant, type, were recognised. In the former a heating unit is clamped to the under side of an iron disc, the top of which is machined smooth, while in the latter the heater is generally a bare resistance wire, coiled and laid in a grooved disc of fireclay, which is covered with a bright grid to support the cooking utensil. It was also realised that the best results from enclosed boiling plates were obtained when using utensils with machined bottoms, whilst with open boiling plates bright utensils reflected the heat. The position of the heating element in the oven was still open to controversy, but the lagged oven showed distinct advantages.

Whilst the manufacturers in Great Britain were investigating the open and the closed hotplate with the view to rapid boiling, a thermal storage cooker was developed in Sweden. The hot plate is formed of a well-insulated mass of iron with heating elements fitted into it. This gives a very efficient boiling plate without undue high load demands on the power stations.

The year 1930 finds the enclosed hotplate more extensively used than the open type for boiling purposes, although the open type is used in the grill. The oven heating elements are arranged to supply either top and bottom heat, or side and bottom heat. From 1920 to the present day the history of the development of the electric cooker is too full of detail to record, but it is this development and the demand for this development that is most satisfying. Although the masses appear to be conservative the results are good, and it is up to the manufacturers and the supply companies to provide cookers on an attractive hire system and to demonstrate their use in the home if the progress is to be more satisfactory.

(The second article of this series will appear in our issue of April 18th.)

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SAFETY IN DOMESTIC ELECTRIFICATION.

Varying Views—Inadequate Earthing of Small Appliances—Dangers of Discontinuity in Wiring Systems—Disintegration of Sheathings—Bad Effect of Plasters on Metals.

By T. C. GILBERT.

NO apology is needed in connection with this return to a subject that has been so much to the fore recently; the question is still so far from settlement that apparently much more consideration will be necessary before the various divergent views are crystallised into anything like agreement, if this can ever be done. The official precis of the proceedings at the recent I.E.E. informal debate "To Earth or not to Earth" states that "the question, despite the official stipulation, is as moot as ever," and as the whole point of this and similar debates seems to have been completely misunderstood even by those most affected, perhaps a rather more detailed examination may not be without its reward.

Even technical writers in the trade publications appear to deprecate any attempt to bring this vexed question of domestic safety in any degree nearer a solution. The writer has been vehemently told that these earthing debates are "so unsettling to the industry," and that in the existing I.E.E. regulations finality has been reached: that these regulations represent the pooled wisdom of the various eminent compilers, and that any attempt to go beyond them is rank heresy. He is of opinion, however, that a really serious succession of accidents would prove to be far more unsettling to the industry, and that a consideration of all the factors making for safety cannot, under any circumstances, be construed into an attack upon the regulations, which he hopes to make quite clear in subsequent paragraphs.

Search for Something Better.

Many writers of the older school appear to think that any criticism of the earthing clauses of the regulations are prompted by the desire to avoid the taking of a small amount of trouble, and that opponents of earthing consider the regulations too stringent in this direction. This, I think, may be due to the title usually given to the controversy—To Earth or not to Earth—indicating a defence of earthing in face of an attack upon it: a far better title would be—"To Earth or Something Better?" which is clearly what is being sought, within practical limits. I am bold enough to state that probably the opponents of earthing are those who most conscientiously carry it out, as by this means they recognise its limits and menace: they have recognised the existence of a danger, and while applying safety measures that have received official sanction, seek and strive after something better, if such can be discovered.

With the ever-increasing use that is being made of electricity in the household, with supplies rapidly becoming changed over to a.c.—mostly at a decidedly lethal pressure—it is being increasingly borne in upon the practical installation engineer that it is time that our ideas of the steps necessary to ensure public safety were very seriously overhauled. The purpose of this short article will be to examine, calmly and without any undue bias, the present position regarding earthing as a means of securing safety from shock and to consider whether we are to remain satisfied with this position, or, if not, in what other direction we can work. I cannot agree that finality, or anything like it, has been reached in installation methods: it may well be that there is no finality in matters electrical. This being the case, any suggestions or criticisms, even if they are "disturbing to the industry," must be argued out to their logical conclusions in our efforts to achieve progress. If disturbing only, and without any practical value, they are soon disposed of, and will leave no permanent mark.

One of the greatest steps forward in this irresistible progress will be when a means of ensuring a higher degree of safety for the public has been found and, what is equally important, put into operation. It cannot be denied that the earthing idea has had an excellent innings, yet it is far from being universal practice to-day: for many years, at least a quarter of a century, earthing has been advocated as a safety measure in our text-books, fire office regulations, and, of course, in our own Institute regulations. Yet after this long period it is now seriously advocated in some quarters that legislation should be introduced with the object of making the earthing clauses in the regulations compulsory, the assumption being that many contractors do not earth portable gear, and that manufacturers do not encourage them to do so, because of apathy, expense or want of knowledge. Might not this position be due to the fact that after due consideration, both contractors and manufacturers—and we might even include some supply authorities—have come to the conclusion that the obvious drawbacks outweigh the problematical advantages? That protection is so uncertain by this means that it were better to avoid it altogether? Even, possibly, that greater and more subtle risks are introduced by its adoption?

Before considering the problem from the point of view of the person intimately concerned—the householder—let us examine the position of the above-mentioned supply engineer, manufacturer and contractor. What is their attitude, professed or not, regarding earthing? Do all, or any, of them conscientiously consider their clients' safety, or is their only object to squeeze the last penny of profit out of their jobs? Doubtless there are some in the latter category, but that there are many more in the former will, I hope, be made clear. Fairly obviously, the man vitally concerned, and on whom the final blame will fall, is the contractor.

Firstly, however, let us take the supply engineer: the only point of contact between him and the householder will be the service cable, fusebox and meter. In many districts service fuseboxes are bonded and earthed to the lead cable sheathing, but in other districts earthing is avoided. The reasons for not earthing main fuseboxes are various, depending upon the particular ideas prevailing in the supply engineer's mind, but there is, of course, one very sound reason. When a fuse blows, an arc is sometimes carried by the volatilised metal over on to the earthed iron box, resulting in the destruction of the cut-out. This naturally renders the fuse completely ineffective as such, and sets up a risk of fire. With the iron fusebox unearthed, however, there exists a risk of shock to individuals who may have to frequent its vicinity. All these troubles have now been eliminated by the introduction and rapid adoption of an all-insulated house service fusebox, possessing a much higher factor of safety than the older iron box, earthed or unearthed.

Very few supply authorities will earth metal meter casings, and many meters have no provision whatever made for this to be easily done. Various reasons, again, are stated, one being the possibility of the meter having to be adjusted on circuit, another the possibility of breaking the meter down to earth in some situations. I cannot repress a shudder at the sight of an unearthed meter snugly esconced between a well-earthed service fusebox and an equally well-earthed main switch. The solution of the domestic safety problem would seem to demand the abolition of the metal case for meters and the substitution of a moulded insulated case. There would appear to be no practical difficulty in the way of this, not even that of cost, and I believe there is at least one manufacturer of meters who is adopting this idea.

Supply Authorities' Inconsistency.

The position regarding the supply engineer, therefore, seems to be that while he will often insist upon the contractor rigidly earthing everything, and sometimes even test to ascertain as to how far his dictum has been carried out, yet for himself he will generally reserve the right to earth or not, according to how it may happen to suit his gear or apparatus, other considerations being secondary. In at least one district that I know, the supply authority discourages earthing anywhere, and will always object to any earth wires being clamped to the lead sheathing of their service cable. Needless to say, their own cut-outs are not earthed, and they will not under any circumstances fix meters to iron switch boards without the provision of wooden battens or some other insulating medium. The contractor does not really grumble at this attitude, he realises that the reasons for it are sound; but he does resent these same people insisting that all his gear and apparatus must be earthed, irrespective of *his* views.

Regarding manufacturers, it is extremely difficult to obtain appliances, especially of the lighter type, with really efficient earthing devices actually incorporated in the appliance itself.

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Earthing facilities, if provided, are apparently an afterthought, an attempt to please the contractor who demands, under force of circumstances, earthed equipment. It is fairly obvious that such equipment is supplied, if not actually under protest, yet with the idea that after all it is only a fad on the buyer's part ; that some attempt, however poor, must be made to meet it, but really it is a great nuisance, taking the manufacturer as it does away from his standard pattern. If manufacturers' catalogues are examined it will be found that in many cases no mention whatever is made of earthed appliances, even in lists published by really first class manufacturers. Some of these tell us that the demand is small, but growing ; yet I am informed by one of the largest of our appliance manufacturers that even if earthing facilities are provided it is the exception rather than the rule to find that an earth wire has been connected, and that in his opinion not one per cent. of appliances supplied and fitted to-day *are* earthed. There *must* be a reason for this extraordinary position, and we will try to discover it later on.

Even if earthed equipment is mentioned in the lists referred to, it is generally in rather small type at the bottom of the page, probably in the hope that it will not be noticed ; or else it is stated that an extra charge will be made for providing earthing facilities, which no doubt deters the undecided buyer.

Manufacturers and Earthing.

Again, there are some appliances to which certain manufacturers will not fit earthing arrangements : the large manufacturer previously referred to considers it is carrying things just a bit too far to provide earthing facilities on such articles as hair-dryers, and will refuse to do it except at my own risk. One cannot blame him for this attitude ; it is perfectly reasonable. It is obvious that an appliance such as a hair-dryer must be speedily broken down to earth by this means. A few strands of carbonised hair extending from the heater element on to the earthed case (and how often we find this little charred mass), the damage is done and the article probably rendered beyond repair. Yet this is the very type of appliance for which protection is required perhaps more than any other, considering the situations in which these useful articles are used. I occasionally watch my barber fiddling around with his hair-dryer amongst his water and gas taps ; I know it is unearthed, and yet I cannot advise him to earth it ! I must try and sell him one of the hairdryers completely constructed of insulating material, similar to the one I exhibited at the recent I.E.E. debate, which excited immediate interest. Once again insulation will solve the problem.

The criticisms that I have made concerning the earthing arrangements of the lighter appliances apply with equal force to those provided on the heavier equipment, such as radiators and cookers. Considering that these earthing arrangements will have to stand up to fault currents to anything from 30 to 100 A, the earthing pins or terminals, far from being larger or heavier than the regular current carrying pins, etc., are usually much more flimsy and nearly always smaller. These earthing " facilities " range—I am speaking now of first-class equipment—from a spring contact of practically equal size and current carrying capacity as an ordinary lamp-holder spring contact, to an ordinary telephone terminal mounted alongside the two-pin main contact. In the former case, the first really good earth fault will destroy the contact, which will in all probability never be replaced, and in the latter case, the earth wire has to leave the three-core flex outside the two-pin connector and go on by itself to the aforesaid telephone terminal. Every time the connector is taken off the earth wire must be unscrewed and disconnected, a perfectly hopeless arrangement, and in any case the terminal screw will probably be safely lost within a week, which will be all to the good.

Instances of this sort of thing can be produced *ad nauseam*, but I must just record another case I have noted recently. A vacuum cleaner, by a well-known firm, was supplied complete with three-core flex and earth clip to a buyer's special order. (I think he had been reading a book on wiring !) The earth clip was attached to the motor casing and the earth wire was as soundly connected as the job would permit ; unfortunately, the handle was of wood, and no attempt had been made to bond together the various metal portions on this handle, including the switch-plate which was a part of the metal hand-grip, and surely the most dangerous point of the whole machine. Yet the owner was very proud of it and used it, so I was informed, in places where he would not dare to use an unearthed machine.

The position regarding the supply of good earthed equipment is decidedly unsatisfactory ; manufacturers as a class do not encourage earthing, do not favour their appliances being subjected to it, and do all they can in as gentlemanly a way as possible to avoid having to supply earthed equipment. As I have said before, this attitude is perfectly reasonable, and one with which the contractor will sympathise.

I come now to the man of the three mentioned the most concerned—the unfortunate contractor. Here we have a man actually in intimate contact with the public, and who is in possession of first-hand knowledge as to how these various " protective " devices work out in practice. As a contractor myself, I know full well the difficulties with which the conscientious contractor has to contend as soon as he really seriously begins to consider his clients' safety. He is so very rarely a free agent and so often a buffer between the supply authority, with its various little fads, and the domestic consumer ; he also has often to model his work to the liking of a consultant to whom the letter of the regulations is the only unalterable thing in life. Neither of these superior beings, the supply engineer or the consultant, will take the contractor's experience as any guide as to what really *does* constitute a safety measure, or as to how far existing ideas fall short of the ideal ; yet our contractor is really the one man who *knows*. Let us assume that our consultant in his specification has called for completely earthed equipment throughout a building, and trace the contractor's difficulties step by step, if he is really going to study the safety problem and not merely blindly follow his regulations.

In the first place, with what wiring system in ordinary use to-day can the contractor absolutely guarantee earth continuity ? I do not mean immediately after the job is finished, which is usually the only time that such continuity is tested, if ever, but a few years later. With the possible exception of screwed conduit, I venture to state that earthing continuity cannot be guaranteed to be of any lasting nature whatever with ordinary wiring systems. Even with screwed conduit whole lengths have been known to disappear when buried in some forms of concrete—although I am willing to believe that this occurrence is not common—leaving a rust-lined tunnel through which the cables pass. This may isolate a whole bunch of points from earth, and the fact that it has been known just introduces that small element of doubt into one's mind which precludes the statement that we can guarantee earthing continuity by means of this system.

When we come to consider the many lead-covered systems, and grip or pin continuity devices, perhaps the less said the better : the practical and experienced man regards the value of their " continuity " qualities with wholesome suspicion. Tests on the sheathings or conduits of these systems should be made with a comparatively heavy current, certainly not less than 5 A, and, if this were done, many engineers' eyes would be opened regarding the continuity claims made by various makers for their systems. The inaccessible screw that is never tightened, the screw that gets lost or stripped, may provide a good enough contact to ring the consultant's bell but the heavy current will find it out.

Unsound Systems.

Possibly the condemnation of lead-covered wiring systems in connection with the recent Smethwick disaster was altogether too sweeping, and, as pointed out in the published opinion of the I.E.E. Council with reference to this condemnation by the expert witness, " there is every indication that the electrical installation did not comply with the I.E.E. wiring regulations " ; but be all this as it may, reliance cannot be placed upon these systems where human life is at stake. The conscientious contractor knows that most of these systems are mechanically and electrically unsound, the great number of joints in the earth circuit, made either by tiny screw clamps or simply by twisting together a slender bare wire, militates against reliability and invites disaster. if we are going to depend upon the continuity of this circuit. Luckily, in many installations where these systems are employed, earthing continuity is no great matter, the outer sheathing never being called upon to protect human life by exercising its earthing function, and the fact that this continuity does not exist is not discovered. Lead-covered wiring systems are neat and convenient, easy to instal, and enjoy a large measure of popularity amongst architects and consultants, but I do not think that the practical engineer will ever regard many of them as a 100 per cent. earthing job. Without exception, in every installation of these systems that I have recently tested for earthing continuity (all having been erected from four to ten years ago), one or more points were isolated from earth. In one case eight points were

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without continuity, and in another a whole floor was isolated owing to a sub-main clamp having become detached. In no case, not even the youngest installation, was continuity complete throughout.

Other objections to the use of these numerous systems, from the earthing point of view, will readily occur to many engineers. In certain situations, the outer sheathing disintegrates and completely disappears in sections for some reason, probably chemical, this being especially noticeable in the vicinity of oak and some patent plasters. Heavy earth faults will also destroy the sheathing. Then there is the vitally important question of workmanship, which must be conscientious in the extreme if anything like continuity is to be ensured even in a new installation. Most installations will test out quite satisfactorily as regards earthing continuity when newly made with these systems, even if clamps are not tight, the bright metal casings of the wires being in touch contact only, but after a few months or years of traffic or domestic vibrations, and the sagging of cables to which these systems are so liable, complete earthing continuity is extremely problematical, and in many cases non-existent.

That existing wiring systems, without exception, are unreliable from an earthing point of view is recognised by the foremost advocates of earthing as a safety measure ; in fact, so great is this unreliability that revolutionary wiring systems, some of them a reversion to earlier practice, are advocated in order to overcome this evil. In his paper on " Earthing as a Public Safeguard," read at the Cheltenham E.C.A. Conference, one of the most masterly treatments of the subject that it has been my pleasure to read, Mr. W. R. Rawlings, A.M.I.E.E.,

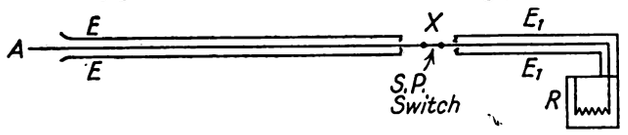

Fig. 1.—A, insulated conductor ; EE, earthed outer conductor, broken at X.
Result.—The outer casing of the appliance R, and all the outer conductor E1, E1, is at full line voltage above earth.

emphasised this unreliability of existing systems and advocated the general use of the earthed-concentric wiring system as the only one that could ensure safety. This view was also put forward by several other well-known engineers at the recent I.E.E. debate already referred to, and this claim would, on the face of it, appear to be well founded. The idea of an insulated conductor completely surrounded by a continuous bare earthed conductor, used with suitable junctions and fitments so that complete concentricity is maintained, seems sound until examined in its details, when doubts at once arise in one's mind.

Discontinuous Sheathing.

In the writer's opinion, such a system cannot become general, nor will it fulfil all expectations, for the following reasons. Very few supply authorities, probably not more than a dozen throughout the country, will at present approve the use of this system, nor are likely to do so. A great defect, to my mind, is that the outer earthed sheathing, far from being continuous, is made up of innumerable clamped or soldered joints, so that the system at once becomes subject to the same objections as have already been levelled against other wiring systems. Regarding a possible electrolysis trouble, it has been stated by those who advocate the system that as all supplies are likely shortly to be a.c., corrosion of the outer sheathing due to this cause will automatically disappear ; but it must not be forgotten that there are many other wandering earth currents, due to bell, telephone and other circuits, and these may safely be relied upon to exercise a corrosive effect upon the outer conductor. Also nearly all plasters and cements used in modern buildings appear to have a decidedly bad effect upon most metals, and this factor, aided by slight wandering earth currents, will be almost certain to cause trouble in actual practice.

With this multitude of joints in the outer, and with the other possibilities mentioned, there is a probability of a break in this earth circuit : this will be indicated at once, say the advocates of the system, by the failure of a lamp to light or a sweeper to function. This is so, but until the fault is traced and repaired there is in existence a certain amount of this bare exposed outer at line potential, should the aforesaid lamp or sweeper have been left switched on, not an unlikely proceeding under the circumstances. (Fig. 1.)

The difficulty of making extensions or alterations, and the trouble experienced to obtain concentric wiring supplies in connection with this system, are also against the possibility of it coming into general use, whatever measure of popularity it may have enjoyed in the past. The advocates of concentric systems, recognising these serious objections, have made alternative proposals to use heavy conduits, enclosing one insulated line wire and one bare earth return wire. This, again, is open to serious objection, as, while a true concentric system would give definite indication of an interruption in the earth circuit, such an alternative " concentric " system as proposed would give no such warning, and the consequences might be very objectionable.

Even with all these objections and shortcomings, however, in connection with the concentric system, Mr. Rawlings is right when he states that it ensures earthing safety better than any other system ; and if it should ever be our misfortune to have to face compulsory earthing regulations, I think the compulsory use of this system will have to follow, if only for the reason that a break in the earth conductor is made apparent as soon as it occurs.

(To be concluded next week.)

CANADIAN PROGRESS IN USE OF ELECTRICITY.

Industry 70 Per Cent. Electrified—Some New Applications.

(FROM A CANADIAN CORRESPONDENT.)

DURING the past year a number of interesting developments have taken place in the utilisation of electricity in Canada, quite apart from the immense strides in hydro-electric power development. In British Columbia, there has been brought into commission apparatus for converting alternating to direct current at high efficiency by the mercury arc rectifier. This rectifier, rated at 6 500 kW, is the largest single tank rectifier in the world. It will be used by the Consolidated Mining and Smelting Company of Canada, Limited, for the electrolytic decomposition of water into oxygen and hydrogen. The hydrogen will be used in the manufacture of synthetic ammonia, which in turn will be used in the new superphosphate fertiliser plant.

Canadian industry is now over 70 per cent. electrified, and during the past year electrical operation has been adopted for such special applications as the bridges over the new Welland Ship Canal, the new Cherry Street (Toronto) Bridge of the Toronto Harbour Commission, an electrically-operated dredge owned by the Dredging Contractors, Montreal, etc. The success of the electric dredge and the advent of huge dredging undertakings at the Beauharnois development, indicate a much more extensive use for dredging apparatus of this type.

There has been a remarkable advance in electric street lighting. Ornamental street lighting installations were made at Montreal, Calgary, Vancouver, Sault Ste. Marie, Welland, Sudbury, and Port Colborne. Flood-lighting, as an integral part of architectural design, was exemplified at the new Royal York Hotel, Toronto, the Edmonton Parliament Buildings, and the buildings at the Canadian National Exhibition, Toronto.

The increase of traffic in the streets has necessitated further study of electric traffic control. There are in Canada now 300 electrically controlled street crossings. Last year, Toronto added 25 new intersections, while Sarnia, Kitchener, Owen Sound, Woodstock, New Toronto, Mimico, York Township, Peterborough and Kingston also adopted electrical traffic control.

With the advent of night flying in air mail service, an entirely new field for lighting was opened up. During 1929 there were installed revolving beacons for the Western Canada and Western Ontario Air Mail routes and lighting equipment for airports at Edmonton, Medicine Hat, Winnipeg, Calgary and St. Hubert.

A paper by Lt.-Col. J. Hartley, of Chile, on engineering in Chile, was read before the Junior Institution of Engineers on March 7th. In the course of the paper, it was stated that a tube railway, 2¾ miles in length, under the Avenida Delicias, Santiago, was projected. A new steel works which had been commenced at the port of Corrall would cost 1½ millions sterling and employ electric blast furnaces of 50 000 tons capacity each, the electricity being obtained from the falls at Huilo-huilo.

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ROUND THE JOBS.

Incubus of a Tradition—Economy of Complete Domestic Electrification—Wrong View of Discounts—Incidental Publicity.

By "CONTRACTOR."

BECAUSE electricity was first introduced to the public as a medium for lighting, the tradition has continued to exist that electricity is mainly a medium for lighting. Electrical contractors do not need to be told that this is a stupid tradition and that electricity is just as much a medium for doing domestic work as it is for lighting. On the other hand, customers do need to be told this; they need to be told on every possible occasion that there is no household or domestic duty which cannot be more effectively performed by electricity. An example of the view which is in general taken of the possibilities of electricity for domestic service is given by the lamentable paucity of plug outlets in the average household. Every room should certainly have one for a vacuum cleaner alone; many rooms, such as a nursery or a kitchen, need more than one such plug, although it must be remembered that domestic appliances with a low loading require a special fuse which certain manufacturers now make in the form of an intermediate plug between the installed plug socket and the plug attached to the apparatus when such a plug is on the power circuit.

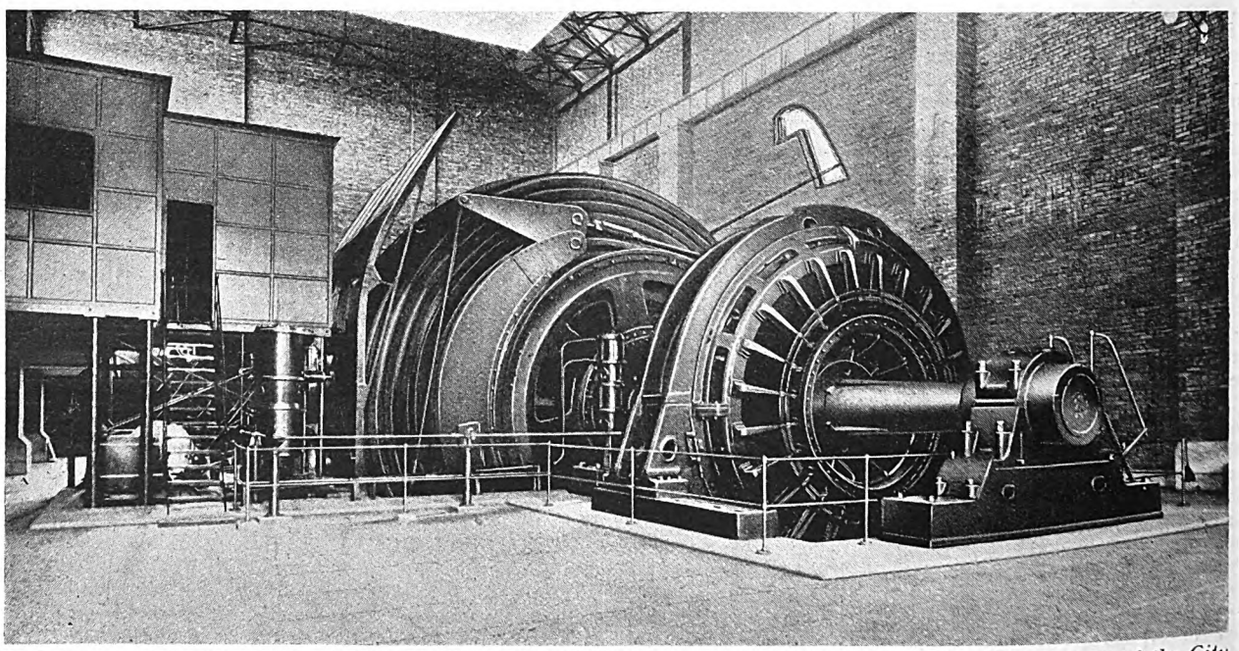
Another survival from the days of pioneering is the idea that electricity is expensive. Because it was once expensive—and it certainly was—the idea has stuck that electricity was, is and always will be expensive. Tariffs vary, of course, but generally speaking the impression that electricity is expensive is pure rubbish. I use electricity throughout my house for every purpose, not because I have made my bed and must lie on it, but because I thereby save myself many pounds yearly. The half-hearted use of electricity in the home is sometimes apt to be expensive, but a completely electrified home is beyond a doubt the most economical home that it is possible to have to-day.

It is interesting to reflect upon the exact function of discount as applied to articles which are listed in manufacturers' catalogues at a certain retail price and which are subject to a discount to the retailer or contractor. Many contractors and retailers regard this discount as profit and it is this view of discount which is doing such a great deal of damage to the retailing trade as a whole. From regarding such discounts as pure profit to regarding them as a bargaining margin is only a short step. Too many retailers and contractors to-day do in fact regard their discounts on, let us say, electric light fittings as bargaining margins. If I want to sell a motor car, and if the price I have decided in my own mind is £200, I shall probably start by asking £250 for that motor car, knowing that I am likely to be beaten down, and, after retreating to my second line of defence—£200—I am still getting what, in my own mind, I had hoped for.

Thus it is that many contractors are apt to regard their discounts. If, on the other hand, we apply a little bit of accountancy to the question of discounts it will very soon become apparent that out of, let us say, the 25% discount on an article, only a comparatively small amount can be regarded as profit; the cost of handling these articles is again, as in the case of electrical installation work, represented by a percentage, and that percentage is inexorably fixed by the ratio of the overhead charges of the business to the turnover. If discounts are to be used at all as a bargaining margin and there is really not the slightest justification for this—then the cost of selling the article should be accurately worked out, and the actual margin available for bargaining should be considered to be only that part of the percentage of discount over and above the percentage which is eaten up by establishment charges.

Probably all contractors indulge in a certain amount of publicity each year; the nature and amount of this publicity of course varies and many contractors would, offhand, say that they do no publicity or advertising, whereas they are doing it daily. Their delivery vans, their tricycles, their notepaper, their invoices, their shop-windows, their entry in the telephone directory and in the Buff Book—all these are advertising, and one is a little too prone to think that, because money is not being specifically allotted for publicity or advertising, no care need be exercised in the manner in which the name of a firm is brought before the public. I once made the same sort of mistake myself when talking to the managing director of a large store. I expressed surprise to him that he did no advertising whatsoever, for I had noticed that in the daily papers, where all his competitors seemed to advertise, he took no space. His answer was that he had a very large number of advertisements moving about London every day and being read by thousands of people. He was referring to

THE LARGEST MINE SHAFT WINDER IN THE WORLD.



5 000/12 500 h.p. Metropolitan-Vicker's winder recently put into commission at the head of No. 4 shaft of the City Deep Mine, Johannesburg. This winder lifts the gold ore 4 500 feet (from the head of No. 4A shaft, which descends a farther 2 500 feet) to the surface. The daily lift of ore is 3 000 tons handled in 12 hours.

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his delivery vans, and, correctly, he considered the appearance of these vans and the lettering upon them as every bit as much advertising as taking space in the press.

Now the taking of space in newspapers and periodicals needs no justification from me; the amount of money that is spent each year on this form of advertising alone is so vast that its value is automatically justified. Yet it must not be forgotten that every firm is doing a certain amount of publicity work, whether or not they do take space, and it is this incidental publicity which can make or mar a business very easily. Most prominent, to my mind, in this incidental publicity is the question of window lighting by electrical contractors and retailers. The shop window of an electrical retailer should be the best lighted in the street. It should be a perpetual reminder to all his potential customers of the comparative poorness of their own window lighting. If he lags behind in this, his own subject, he will find it difficult to persuade his customers to a proper view of the matter.

A correspondent of mine in Sweden has just written me a letter in the course of which he makes it clear that the problem of shoddy installations is not one which is confined to Great Britain. He is interested to know how we deal with the problem in this country and gives me some idea of how they are dealing with it in Sweden. They seem to suffer as we do from a lack of legislation, for he condemns their laws on the subject as being very poor, old-fashioned and incoherent. Therefore, the Association of Electricity Works have issued standard specifications and no installations are connected to the mains which do not, when inspected by the electricity works engineer, come up to these specifications.

At first sight this would appear to be similar to our own method, but it appears to have one outstanding advantage in that the standard specifications are issued by the association of all the electricity works, and it is not left to individual undertakings to arrive at their own specifications and regulations. These specifications again are adopted by the owner of a property even where he may be generating his own electricity.

Again, there has recently been organised a testing bureau under the auspices of the Association of Electricity Works and the fire insurance firms for the purpose of testing installation details. It is intended that any material accepted by this testing bureau shall be entitled to carry a special sign consisting of an " S " in a ring. All the more important Swedish electricity works have issued special orders that only such types of installation as carry this mark are to be allowed.

BOOK-KEEPING FOR ELECTRICAL CONTRACTORS—V.

Writing Off Bad Debts—Creating a Reserve Against Doubtful Debts—Method of Keeping Contract Accounts.

By S. HOWARD WITHEY, F.C.I.

BY comparing the items enumerated in the list of sales ledger balances with the amounts shown to be owing at the end of the previous month, it will be possible to keep the number of bad debts under control; but in the case of the electrical contractor transacting business in a variety of products and accessories, there are bound to be some debts that prove to be impossible of collection.

Debts which are, without question, irrecoverable for any reason should be written off against the periodical profits. To write off a bad debt, an entry should be made on the credit side of the personal account, giving the date and the words " By Bad Debt," or " By Amount Written Off," the amount being posted direct to the debit side of the Bad Debts Account opened in the impersonal ledger. At the end of the year or other accounting period, the balance of the Bad Debts Account will have to be transferred to the debit side of the Profit and Loss Account prepared for the purpose of ascertaining the amount of net profit realised, or the extent of the loss sustained. When debts are placed in the hands of a solicitor or agency for collection, the amounts should be transferred from the accounts of the debtors to the debit side of an account opened in the name of the collecting agency, any cash received in connection with these items being recorded on the debit side of the cash book in the usual way and posted direct to the credit of the agency account.

It is a good practice to create a reserve against future bad debts, and there are two ways of determining the amount to be reserved. Some electrical contractors make out a complete list of outstanding debts, as shown in the sales or customers' ledger at stocktaking time, and then calculate a certain percentage of the total balances. If the percentage of bad debts is fairly constant, this method is the better of the two, the total sum to be reserved being recorded on the debit side of the Bad Debts Account during the period under review, and thereby included in the amount transferred to profit and loss. Generally speaking, however, it would be more satisfactory to examine very carefully all the figures shown in the list of balances, making a sufficient allowance, at the same time, for all amounts which are known to be bad or which are uncertain of collection. These allowances should be set down on the list in an inner money column, the total being the amount to be reserved. Whichever method is adopted, special attention should be given to large debts of a doubtful nature, or which have been accumulating for a considerable time. As soon as the balance of the Bad Debts Account has been transferred, the reserve should be brought down on the credit side of the account, and this amount will have to be deducted from the total of the book debts, as shown on the assets side of the balance sheet.

The contractor who is frequently called upon to instal electric fires, lighting equipment, fittings, or who has contracts in connection with the illumination of schools, libraries, cinemas, hotels, offices, shops, etc., should be able to ascertain the profit made or the loss sustained as a consequence of executing work or rendering services at a stipulated figure. To arrive at reliable results, separate job or contract accounts should be opened in the impersonal ledger, each account being debited with the cost of the instruments, gear, accessories, materials and stores purchased in connection with the work or used on the job, the carriage and cartage expenses involved, the wages paid to men engaged in the various operations, and an adequate sum for the use of motors, plant, tools, dynamos, drills, machines, etc. If any meters, measuring instruments, standards, or machinery employed in the fulfilment of any contract have to be disposed of at a price lower than the book value, the difference should be debited to the particular contract account. On the credit side of the account may be recorded the amounts of cash received during the currency of the contract, although if the work has not been completed by the time the periodical profit and loss account and the balance sheet is drawn up, the balance of the account should be treated as an asset or a liability according to whether it is a debit or a credit balance. When the work has been finished in accordance with the agreement, the balance of the contract price should be recorded on the credit side of the account from where it will be posted to the debit side of the personal account, after which the balance of the contract account will represent a profit or a loss according to whether it is a credit or a debit balance. At stocktaking time this balance should be transferred to the profit and loss account.

The fact that a contract has been entered into does not, in itself, necessitate any entry being made in the contractor's books of account. But directly any goods, articles, materials, etc., are taken from stock or purchased in order to proceed with the work, the contract account should be opened in the ledger and debited with the cost or invoiced prices. Accessories taken from the contractor's stock should be passed through the day book, but if bought on credit for use on the job, the cost should be credited to the personal account of the suppliers kept in the purchases or bought ledger.

There is an alternative method of keeping account of contracts. This consists of recording on the credit side of the personal account all amounts of cash received on account of the work and debiting this personal account with the full contract price upon the completion of the job, the contract price being also inserted on the credit side of the particular contract account, against which should be shown the cost and expenses, depreciation, etc., involved. When these entries have been made, the balance of the contract account will represent the profit realised or the loss sustained, to be transferred to the profit and loss account at balancing time.

In those cases where two or more electricians agree to buy certain electrical products to be sold at a profit to be shared between them on an agreed basis, the cost of the purchases on joint account should be debited to a separate joint account

(*Continued in Col. 2, page* 368.)

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BIRMINGHAM ELECTRIC CLUB.

The Annual Dinner—Why Brookman's Park Uses 261 m.

THERE was a record attendance at the annual dinner of the Birmingham Electric Club—the pioneer electric club in the country—which was held at the Grand Hotel on March 14th. Mr. D. G. Brooks presided over a gathering of over 250 members and guests who, in addition to the speakers to the toasts, were provided with good musical and humorous entertainment. Mr. Percy Owens as Richard Cœur de Lion's batman and as a tub orator was the hit of the evening.

Mr. A. P. Young proposed the toast of "The City of Birmingham" and referred to the resiliency and complacency which had carried Birmingham through bad times in the past. He mentioned the local quickness to seize upon new industries to replace those which were declining for various reasons, and instanced the manufacture of electrical accessories. It was the vision of the electrical engineer to see all activity electrified. Among coming improvements in that direction he suggested the illumination of our highways at night and very much better lighting of railway stations than at present. (Hear, hear!)

The Lord Mayor, Alderman F. Samuelson, replying, said that the weekly output of electricity in Birmingham last year was equal to the total production for the whole of 1906.

Capt. P. P. Eckersley proposed "The Birmingham Electric Club" in a speech which caused as much laughter as Mr. Percy Owen's best efforts. He sounded a loud trumpet blast in favour of better financial treatment of technical men, himself not excluded. Mr. Brooks replied and asked Capt. Eckersley if he could explain why the B.B.C. adopted 261 m. as the wavelength for the second Brookman's Park transmission. Capt. Eckersley said that the band from 200–545 m. was allotted for broadcasting because it was wholly unsuitable for the purpose. The wavelengths from 600 m. upwards allotted to ships were also quite unsuitable for them but very suitable for broadcasting. The matter was decided at an international conference which cost £50 000. There would be another conference on the subject at Madrid in 1932.

Mr. F. W. Martin proposed "The Guests," and Mr. H. Foulds, in his response, threw a little further light on the B.B.C.'s reasons for adopting 261 m. He said that the B.B.C. being a thoroughly puritanical institution was naturally anxious to prevent British listeners from reaching out after Paris or feeling Toulouse—two stations which had very similar wavelengths.

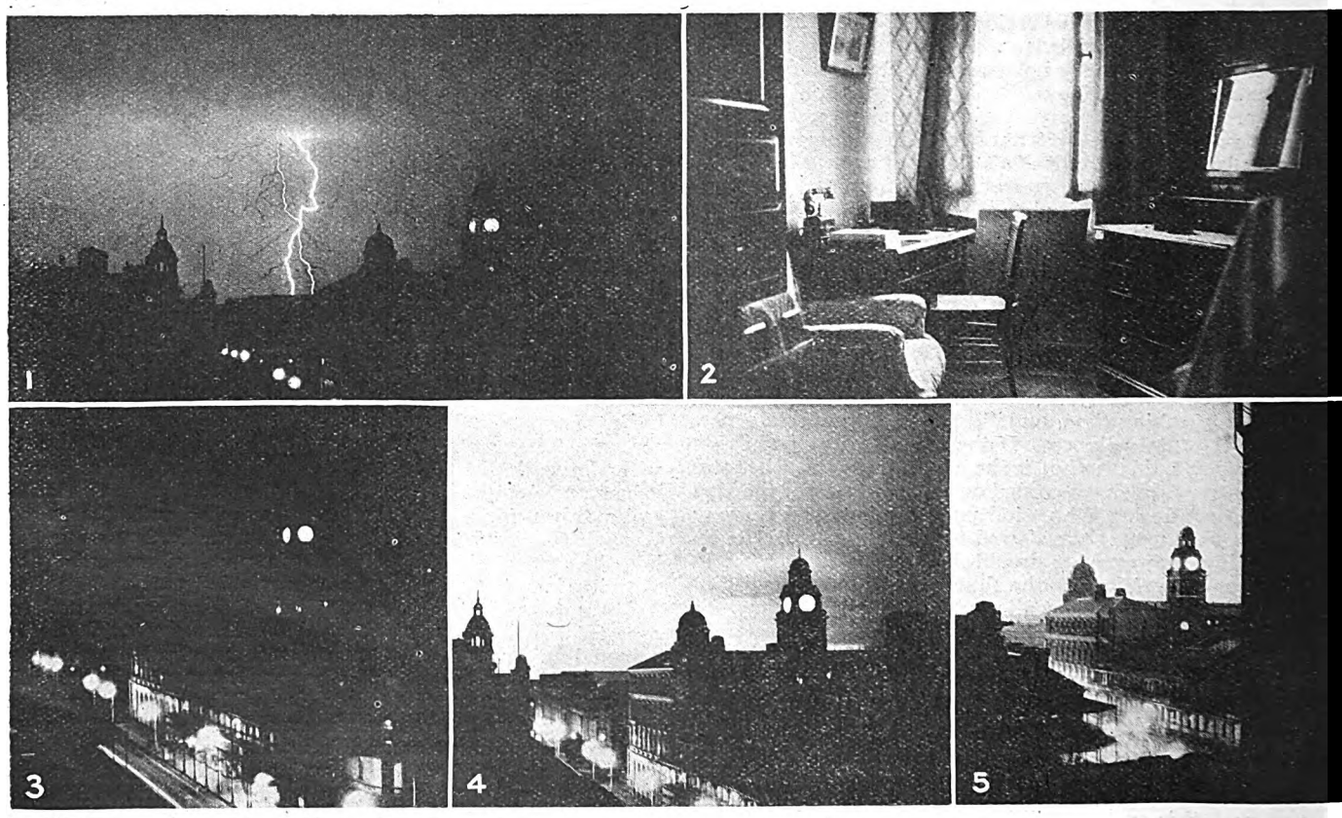
BOOK-KEEPING FOR ELECTRICAL CONTRACTORS.

(*Continued from page* 367.)

and credited to the manufacturer or supplier. The expenses and charges incurred in connection with the purchases should be posted from the payments side of the cash book to the debit side of the joint account, while the selling prices of the products bought on joint account should be credited to the account and posted direct to the debit side of the customers' accounts. If any cash has been received from one of the parties in the venture, the amount should be recorded on the debit side of the cash book and posted to the credit of the sender's personal account. As soon as all the products have been sold, each contractor should be credited with his proper share of the profit as shown by the joint account, or debited with the share of loss, as the case may be, the remaining balance of the account being transferred to the profit and loss account.

It is most important that adequate supplies of all materials and stores likely to be required in the execution of contracts should be available when needed, and consequently the stock on hand under any given heading should not be allowed to reach the minimum which past experience has proved necessary or advisable to carry, without a note being made of the fact. Moreover, all goods arriving on the contractor's premises should be subjected to an effective internal check and control, and in our next instalment the outline of a suitable method of organisation and stock reconcilation will be given, together with the most appropriate rulings for the books suggested.

(*To be continued in our issue dated April* 18*th.*)



A TRANSVAAL THUNDERSTORM.

PHOTOGRAPHS taken at Johannesburg on the night of October 24th/25th, 1929, by Mr. A. N. C. Horne—(1) Lightning flash at 10.30 p.m. local time; (2) interior taken by a flash at 1.30 a.m.; (3) Market Street lights between flashes, midnight (exposure 30 secs.); (4) the storm approaching from the south-west; (5) storm overhead, 2 a.m. The dark streaks on (1) probably represent red flashes of low actinic power.

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WOMEN'S WANTS.

Their Views on Domestic Appliances—Requirements that Must be Studied.

By HARRY MOSS, A.M.I.E.E.

THE opening of the twenty-first branch of the Electrical Association for Women, a few weeks ago, prompts one to ask the above question. The growing interest that women are taking in electrical matters, and the ever growing numbers who are enrolling in the Association is a distinct sign that the woman of the future is going to have a say in matters electrical that concern home life.

It is through such an organisation that the women will be able to ventilate their ideas as to what they require and expect in connection with domestic household equipment, and all other matters that directly or indirectly concern household consumers of electricity, and it will be good policy on the part of manufacturers, suppliers and contractors, to keep in close touch with the views they may express and do their best to supply the desired appliances.

Need of a Dish Washer.

Take the instance which occurred at the inaugural meeting of the latest branch in Bradford, when a well-known lady alderman said she wanted something electrical that would wash dirty, greasy dishes and dry them, as this was one of the most unpleasant tasks in a house, and one which had to be carried out several times a day. She said she wanted something like a "whizzer," electrically driven, of course, that would "whizz" or "swish" the water about the dirty pots and thoroughly cleanse them, and then dry them. Furthermore, this article must be cheap, and within the reach of all electricity users.

Can our manufacturers produce such an article, either separately or as an added equipment to an electric washer, which of course would save the cost of an additional motor? It certainly gives food for consideration. Anyway, if the opinion or "want" of that particular lady is anything to go by and if it represents the feelings of thousands of others, then there is a demand opening up, which will no doubt be satisfied by some manufacturer at an early date. It does seem a pity that a motor, say of one-fifth horse power, on a washing machine, is only used for about two hours a week, and is lying idle for the rest of the time, when by some simple adaptation, the same driving power might be used for dish-washing, knife polishing, boot cleaning, etc., all operations of a tiresome kind which have to be carried out many times per week in every household.

Another expression of opinion was that electric washing machines are too expensive, and are not within the reach of thousands of householders. Probably the solution to this problem will be found in mass production, with the simplest machine that can be designed.

There is further evidence that women are also interested in tariffs, and the present multiplicity and complexity of these are most bewildering to the female mind. Is a low flat rate with sliding discounts for quantity going to solve this knotty problem? The question of tariffs is now engaging the attention of various supply authorities, and it will be very interesting to watch which way the wind blows in this matter, and what is going to be the final solution.

Work of the E.A.W.

There is no doubt the supply authorities are keenly and deeply interested in the work of the E.A.W. and are supporting the organisation in a splendid manner. This is all to the good, because the E.A.W. is an educational organisation, and the more confidence that can be created in the woman's mind regarding electrical matters in the home, and the more electrical apparatus is used in an intelligent manner, the less trouble we shall all have with domestic installations, which will, in its turn, reduce maintenance costs and make electricity more popular than ever.

The womenfolk, and the woman's point of view will make itself felt very considerably in the future, both in design of apparatus and cost, and their views must be considered by all parties concerned. Many unpracticable ideas may be suggested, but no idea must be turned down haphazard if there is any germ of usefulness at all in it. Therefore it follows that whatever is done by the engineer in the future in connection with domestic electrical equipment, it will be advisable to keep the thought in view "What a bout the Women and their Wants?"

ELECTRICITY FOR WOMEN.

Mr. Borlase Matthews on "Outlets" and Electricity on Farms.

MR. R. BORLASE MATTHEWS, addressing the annual meeting of the Electrical Association for Women (Birmingham and Midlands Branch) last week on "Electricity in the Service of Women," said he imagined that he was addressing a gathering of women practically all of whom made electricity play a very large part in their lives, and whose cooking, heating, lighting, washing and cleaning were probably all done by the aid of electric power. He would like to dwell for a few moments upon a less widely accepted aspect of the question, and deal with the ways in which electricity could be of the greatest possible service to the country women. But, before doing so, he would like to refer to a stay which he made a short time ago at a hotel de luxe in Switzerland. In his bedroom, cupboards, passage and bathroom there were 27 lamps. They were not, of course, intended to be all turned on at once, but were ready in every position where it could possibly be anticipated that a local light would be advantageous. It pointed to a moral, and that was, always provide more than sufficient lighting points and outlets. He congratulated the Association upon the part it had played in the outlet campaign. If the decoration and arrangement of a room permitted of it, he liked to run a chair-rail all the way round with a pair of electric wires concealed within it. The outlets were placed on this chair-rail, and further outlets could easily be added at a future time. The same lay-out could be arranged around the skirting board, and he had also employed picture rails in the same way.

In support of electricity in the service of women, a Birmingham works turned out over 5 000 electric flat irons and over 2 000 electric kettles per week, with the original design of which he was proud to have been associated. These figures indicated what women thought of electric servants, and it must be borne in mind that there were other factories making similar articles. At his home they had an electric cooker, which had no electric switches on it. The hot-plate would boil two pints of water in 2¾ minutes—a thing that no gas, coal or other electric stove would do. Under the hot plate was an oven which was always kept at 200 deg. F. This served as a vastly improved hay box cooker.

He was now asking a Birmingham firm, and other firms, to make 3 000 of these cookers for use by the housewives of Lincolnshire, where a big rural scheme of electrical development, in which he was interested, was under way. A second oven for roasting and baking is also to be incorporated in the stove, with automatic control of the oven temperature—so that it would not need watching—and a grill in the upper part of the oven.

In the town the coming of electricity had been a boon to women; in the country it was going to revolutionise the social and economic aspects of the lives of the women. It was going to give them and their husbands a living as good as that to be obtained in any other walk of life. An electricity supply would bring the revival of many rural industries and the institution of village factories. The uses to which electricity could be put on the farm numbered nearly 300.

Mr. Matthews concluded his address by referring to the beneficial effects of electric light upon laying hens, and upon the output of eggs, which was increased by 15% to 20% by the use of electric light when eggs were dearest.

THE A.E.A. AND REGISTER OF THE MOTOR TRADE.

Arrangements have been made for the names of members of the Automobile Electrical Association to be entered in the new edition of the register of the motor trade which is now in process of revision by the Society of Motor Manufacturers and Traders, Ltd. The entries will be distinctive in that they will emphasise the fact that the concern named specialises in automobile electrical service. As the revision is now proceeding early application for membership of the Association is advisable. A neat badge of membership has been designed and blocks are available for use in notepaper headings. The accompanying illustration is a reproduction of the design.

The membership badge of the Automobile Electrical Association.

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NEWS IN BRIEF.

Scottish School Lighting—Police Telephone Boxes—Irvine's All-Electric Houses—Electrically Welded Cargo Vessel—Dunoon Electric Ferry.

KINROSS Education Authority has decided to replace gas lighting in its schools by electricity.

The police telephone boxes in Richmond and Wood Green have proved so successful that similar boxes are to be erected in other parts of London.

In connection with the Physical and Chemical Survey of the National Coal Resources, which is one of the important aspects of the fuel research work of the Department of Scientific and Industrial Research, the department has recently appointed a committee to deal with the West Yorkshire coal area.

Mr. G. H. Watson, district manager of telephones at Edinburgh, stated in a recent address at the Scottish Liberal Club, Edinburgh, that the number of telephones in this country had increased from 914 000 in 1920 to 1 850 000 at the present time. People in this country, however, had not yet got the telephone habit, especially in residences.

The Housing Committee of Irvine T.C. has decided to equip the next 148 of its houses with electricity throughout.

Shipley U.D.C. has instructed the Electrical Engineer to prepare a scheme for the lighting of the market stalls.

The next meeting of the Institution of Civil Engineers will be held on March 25th, when Mr. David Anderson and Mr. Geoffrey Lancaster Groves will read papers. A meeting of the Students' Section will be held on March 26th.

A meeting of the British Institute of Radiology was held on Thursday at the Institution of Electrical Engineers, when Mr. B. J. Leggatt read a paper entitled "The Medical and Surgical Applications of Electricity."

On March 11th the Birmingham and Midlands Branch of the Electrical Association for Women held its annual general meeting and a luncheon. Over 300 were present, and among the speakers were:—Sir John Brooke, Mrs. H. K. Beale (president), Coun. Beale, Mrs. M. L. Matthews, Mr. F. Forrest, and Mr. Borlase Matthews.

The 23rd annual dinner of the London Students' Section of the I.E.E. was held on March 6th, with Mr. P. V. Hunter, vice-president, in the chair. Mr. Crutch, hon. secretary, said he thought the alterations of the regulations governing the Associate membership would result in fewer students dropping out of the Institution when they reached the age limit for students.

A meeting of the North Midland Students' Section of the I.E.E. was held on Tuesday, when Mr. H. Copping read a paper entitled "The Control of Low Tension Induction Motors" and Mr. W. E. Park gave an address on "Chemistry as Applied to Steam Power Plant." Members of the Section are due to visit the Yorkshire Copper Works, at Stourton, Leeds, to-morrow, Saturday.

In the course of a paper read before the Liverpool and Manchester Section of the Institute of Transport recently, Mr. R. S. Pilcher, manager of the Manchester Corporation tramways, said tramcars might lose their advantage in seating capacity at any time, and if the design of the tram did not keep pace with that of the bus and railless vehicle the latter would supersede the tramways.

The B.E.A.M.A. index of production figure (per cent. of 1924) for the electrical engineering industry for January, 1930, was 112·5, against 104·1 for January, 1929. The monthly average for October to December, 1929, was 111·1 against 98·1 for October to December, 1928. The percentage of insured workers in the industry unemployed was 5·2 in January last, against 5·3 in January, 1929, and the monthly average from October to December, 1929, was 4·2, against 5·0 for October to December, 1928.

LOOKING BACKWARD.

FIFTY years ago it was reported in THE ELECTRICIAN *of March 20th, 1880, that electric light was being fitted in the Royal Exchange basement and the adoption of electric lighting by the Crystal Palace was also recorded, with the comment that some people found the new light "disagreeably cold" in appearance after the flaring gas jets to which they had become accustomed.*

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of March 17th, 1905, stated that an agreement had been reached between the Marconi Company and the government departments concerned for the provision of wireless equipment in the six lightships stationed in the Goodwin Sands area to enable them to communicate with a shore station at Dover.*

Reference was made to the construction by the American General Electric Company of two 50 kW 160 000 V transformers for testing insulators.

The inspectorate of H.M. Factory Department will this year be increased by two engineering and four electrical inspectors.

Prof. G. W. Howe, lectured to the Royal Philosophical Society of Glasgow last week on "The Production and Distribution of Electrical Power in Scotland."

The Society of Radiographers held a meeting on Wednesday, at the British Institute of Radiology, when Mr. L. A. Rowden read a paper entitled "Radiography, Old and New." The next examination will be held on June 19th and 20th.

On March 13th Mr. H. de A. Donisthorpe, of the General Electric Co., Ltd., lectured before the Kensington Radio Society—one of the few such societies that have survived and of which Mr. Donisthorpe was the first president. The lecture, "Radio Past, Present and Future," traced the progress of radio from its earliest days, the future being symbolised to some extent by a demonstration of a Baird television receiver.

While the value of total sales of domestic current to residence consumers in the United States was $656 000 000 in 1929, the total of appliance sales from all sources to these consumers was $808 000 000, not including a.c. radio set sales, valued at $727 000 000.

What is claimed to be the first rivetless cargo vessel has been completed at Charleston dockyard. The vessel was constructed entirely by electric welding, nine men being employed and 8 000 pounds of welding wire being used. The saving in weight is said to be 20% and on cost of construction 25%.

A ferry from Renfrewshire across the Firth of Clyde is made possible by the introduction of electricity to Dunoon, and the Town Council is considering the proposal.

The Electrical Trades Union has decided to withdraw from the joint investigation, with the employers, of working conditions on the Continent, which has been proposed as a preliminary to any wage claim by the Engineering Joint Trades movement. It is anticipated that the union will make an independent wage claim in the electrical manufacturing industry.

The Committee set up under the chairmanship of Sir Charles Sargant to consider whether any amendments in the Patents and Designs Acts, or any changes in Patent Office practice, are desirable, is continuing its weekly meetings at the Board of Trade. Any persons or associations who desire to submit suggestions or give evidence should notify their intention to the secretary to the committee, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25, Southampton Buildings, London, W.C.2, by May 1st next.

The local branch of the Electrical Contractors' Association has asked Eastbourne Electricity Committee for an increase in the agreed price for wiring electric cookers and water heaters. The Engineer recommends that, in the case of cooker connections, a minimum of £2 be paid for ten yards, and any excess *pro rata*, the Corporation to supply an iron clad switch and fuse unit, and in the case of water heater connections that the contractors be paid for the wiring at 3s. per yard, including an insulated switch mounted on a wood board. The recommendations have been adopted.

Birmingham Education Committee has reported as to the number of electrical contracts granted to Birmingham contractors, compared with those granted to outside contractors. Between January, 1927, and December, 1929, 74 tenders were accepted for new lighting installations or alterations, amounting to £18 602. Four out of these 74 contracts were secured by contractors outside Birmingham, the lowest tender being accepted in each case, and the amount of the four contracts was £2 874. Many orders for repairs have been placed during the period, all with Birmingham contractors.

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PERSONAL.

CANNOCK Urban Council has appointed Mr. F. E. Watts, of Llanelly, as assistant in the meter department.

Colchester City Council has increased the salary of the eleotrical engineer by £50 per annum as from March 1st, with a further increment of £50 a year hence.

Estate of the gross value of £10 924, with net personalty £4 520, was left by the late Admiral of the Fleet, Sir Henry Jackson, F.R.S., chairman of the Radio Research Board and one of the pioneers of wireless telegraphy, who died on December 14th last, aged 74 years.

St. Pancras (London) Borough Council has been recommended by the Establishment Committee to grant increases of salary to Mr. W. H. Wells, sub-station superintendent; Mr. W. E. Wilman, junior assistant engineer; and Mr. W. J. Elstone, public lighting superintendent.

The centenary of the British Association for the Advancement of Science falls next year, when the meetings will be held in London from September 23rd to 30th. The council has resolved to nominate General Smuts as president of the association, and he has accepted the nomination.

Among the speakers at the first national conference on employment management to be held in this country will be Mr. A. P. Young, general manager of the British Thomson-Houston Co., Ltd. The conference is to be held to-day (Friday) at the Hotel Victoria, London, under the auspices of the Industrial Welfare Society.

Sir Harry Haward will retire from the office of Electricity Commissioner at the end of this month, on completion of his extended term of office. Although he will cease to hold office, arrangements have been made by the Electricity Commissioners, with the approval of the Minister of Transport, under which he will act in a consultative capacity. Sir Harry, who is 67 years of age, was one of the original five Electricity Commissioners appointed in 1920 under the Electricity (Supply) Act, 1919. Prior to his appointment he held the office of Comptroller of the London County Council for 26 years, during which time he was actively engaged for many years in the investigation of various aspects of the finances of the public utility undertakings of London, including those relating to electricity supply and the financial problems connected with the supply of electricity in the London area. During the war and afterwards he served on a number of government committees dealing with financial and administrative matters. He received the honour of Knighthood in February, 1917.

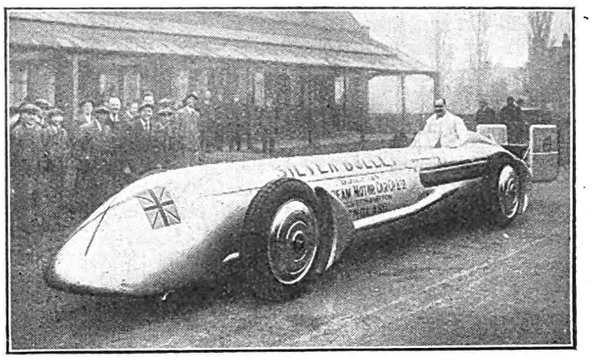
EXTENSIONS AT BURY.

Starting Up by Bury Corporation of New 10 000 kW Turbo-alternator.

THE Mayor, Alderman Lees, started up the new 10 000 kW turbo-alternator of Bury Corporation Electricity Department on March 12th, prior to a thorough inspection of the works. The contract for the turbo-alternator was placed with Metropolitan-Vickers Electrical Co., Ltd., who also erected the foundations, and provided the switchgear. The main contract for the boiler house plant was placed with Clarke, Chapman and Co., Ltd., of Gateshead-on-Tyne. The turbine is of the high pressure, impulse type, with two cylinders designed for operating at a steam pressure of 300 lb. per sq. in. gauge, and 700 deg. F. It is arranged with 24 expansion stages and multi-exhaust. The condenser is of the central flow type, and is bolted directly to the turbine exhaust flange, and mounted on suitable springs carried on concrete blocks. The total cooling surface provided is 11 400 sq. ft. The condenser consists of 4 660 tubes, each 12 ft. 6 in. long, and ⅞ in. external diameter. Feed water heating is carried out in two main stages, the resultant temperature of the condensate being raised to 200 deg. F. The alternator is rated to give a maximum output of 10 000 kW continuously, generating three phase, at 6 200/6 800 V between phases with a periodicity of 50 cycles. The boilers are of the "Woodeson" patent water tube header type, arranged with economisers of the Green's tri-tube type. The heating surface of the boilers and economisers is 9 230 sq. ft., arranged for a normal evaporation of 60 000 lb. per hour, to a working steam pressure of 325 lb. per sq. in., total temperature 700 deg. F. Stokers of the Underfeed Class "L," travelling grate type, are included in the installation. See page 379.

BUSINESS ITEMS.

THE EDISON SWAN ELECTRIC CO., LTD., announces that the Ponders End telephone numbers of the company have been changed to Enfield 2800–2808.



MR. KAYE DON at the wheel of the "Silver Bullet" on which, at the time of going to press, he anticipated making an attempt to break the world's record. The car was produced by the Sunbeam Motor Co., Ltd., and is fitted with high tension ignition wire supplied by Callender's Cable and Construction Co., Ltd.

Among the firms exhibiting in connection with the Stoke-on-Trent Historical Pageant, and the Josiah Wedgwood Bi-centenary Celebrations, to be held at Stoke-on-Trent from May 19th-24th, are Bullers, Ltd., Doulton and Co., Ltd., the Electric and Ordnance Accessories Co., Ltd., Wm. Kent, J. Macintyre and Co., Ltd., Taylor Tunnicliffe and Co., Ltd., and G. Wade and Sons, Ltd.

One of the outstanding features of the BRITISH THOMSON-HOUSTON CO., LTD., at the Ideal Homes Exhibition, which opens at Olympia, London, on Monday, will be a special tableau devoted to Mazda lamps. The central figure will be the ballet girl associated with the company's advertisement "Beauty Enriched by Light," in front of a wine coloured curtain, and the foreground will be suffused with light constantly changing in colour and intensity. Illuminated fountains will also play their part in the tableau. Over four hundred lamps of various sizes and colours will be used in the display, the majority of them being installed under the floor in the foreground. These lamps are automatically controlled by a four circuit dimmer and the total connected load will be about 22 kW. The stand is No. 149 on the ground floor.

RADIO RESEARCH BOARD.

First of New Series of Annual Reports.

IN past years a section summarising the work of the Radio Research Board has been included in the annual report of the Department of Scientific and Industrial Research, but the published results of the researches carried out directly by the Board are attracting so much attention, both at home and abroad, that it has been considered desirable to issue each year as a separate publication a more complete statement of the progress of the work carried out by the Radio Board. The first of the series of the separate annual reports is published to-day (Friday) and is obtainable (price 3s. 6d.) from H.M. Stationery Office, Adastral House, London, W.C.2. The report includes the results of investigations completed and in progress, and deals with the study of signal fading and the influence on the Heaviside layer; the propagation of long waves; the determination of the conductivity of the ground; investigation of nature of electromagnetic field of waves at a receiver; the attenuation of wireless waves over land; a study of performance of radio direction finders; the rotating loop transmitter; the development of short wave direction finding apparatus; a direct reading instantaneous direction finder; radio frequency standards and precision measurements; the study of antennæ; the performance of amplifiers; the measurement of the interference of transmitting stations; the preliminary work of short waves (less than 10 metres); a description of a linear time base for cathode ray oscillograph work; forced life tests on thermionic valves; the deactivation of thoriated tungsten filaments under certain voltage conditions; the development of high vacuum pumps; a valve wavemeter with a range of 30 000 to 15 kc/s; an azimuth repeater; and a note on electromagnetic screens.

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KIOSKS FOR LEICESTER.

Eight New Transformer Sub-stations for Corporation Electricity Department.

THE GENERAL ELECTRIC CO., LTD., has recently supplied to Leicester Corporation eight transformer sub-stations of the kiosk type, the general construction and equipment of each being similar. Each unit is built up of heavy gauge steel plate welded to a rigid framework, and a welded steel roof and rolled steel cornice pieces make the whole weather-proof. Each kiosk is divided into three compartments, for the transformer, h.t. and l.t. switchgear respectively. Sheet steel doors fitted with locks and keys give access to all three compartments, the ornamental beadings fitted to the floors and sides adding to appearance and acting as stiffening pieces. Provision is made for adequate ventilation, but, at the same time, the internal apparatus is completely screened and is inaccessible to vermin. The h.t. supply to the kiosks is at 6 600 V 3-phase 50 cycles, and is brought to the h.t. busbars through a set of manually operated isolating links. In cases where the h.t. feeder is brought in and out, with the oil circuit breaker teed off, such as at the Braunston Housing Estate, three sets of links are provided, for the incoming feeder, outgoing feeder, and oil circuit breaker respectively. The h.t. supply to the transformer is controlled by a manually operated oil circuit breaker fitted with overload trips, time limit fuses, and leakage trip coil, while the necessary current transformers are inserted in each phase for the three ammeters. These instruments are also fitted with maximum demand indicators. This h.t. equipment is contained in steel plate cubicles, access to each cubicle being obtained by means of hinged steel plate doors. The operating handle of the oil circuit breaker is collapsible in order to avoid waste space between the front of the cubicles and the door of the kiosk. The transformers, all of which are of 100 kVA capacity (although eventually they will be increased in size to the maximum of 300 kVA), are delta/star connected, the neutral point of the secondary windings being brought out to a 3-phase 4-wire l.t. distribution system, giving 415 V 3-phase and 230 V single-phase. The l.t. distribution switchgear consists of G.E.C. unit type " Handguard " fuses mounted on bakelite insulated supports, the three main fuses being rated at 500 A and each of the distribution circuit fuses at 150 A.

THE PUBLIC AND FUMES.

Sir Harry Haward, vice-chairman of the Electricity Commission, addressing a meeting of the Surveyors' Institution last week, said while public attention was concentrated on the effects of gaseous fumes from the Barton station and the new Battersea station, it ignored the emissions from many smaller stations in process of being shut down and from factories and dwelling houses. Recent experiments went to show that the oxides of sulphur could be eliminated. The potential demand for electricity in the country districts during the next ten years had been computed at 280 000 000 kW per annum.

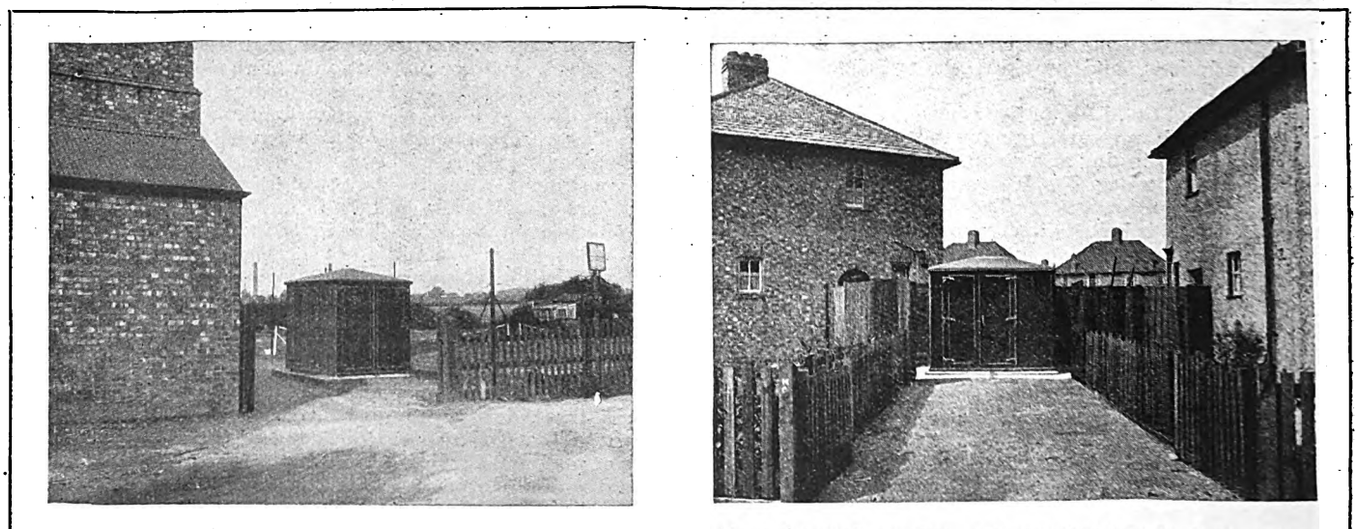
THE SOCIAL SIDE.

AT the twelfth annual reunion of the Ex-British Westinghouse Association, held on March 17th at the Hotel Cecil, London, Mr. J. S. Peck presided over a record attendance, which exceeded 150 in number, from all parts of the country. The proceedings followed the usual informal lines, the members being seated at round tables accommodating ten, an arrangement which always adds to the enjoyment of the company. The ballot for life membership was won by Mr. H. A. McGuffie, who, being already one of the select few, auctioned the ticket for 47s. 6d.; consolation prizes were won by Messrs. Rook, Stainton and Fletcher, the last receiving a toffee apple. In a speech packed with humorous reminiscences of Trafford Park, Mr. P. A. Sanders proposed the toast of " The Association." His remarks also had a serious side, and he specially paid tribute to the engineering genius of the late George Westinghouse; in particular he recalled the fact that the Lots Road power house for London's Underground Railways was originally planned for reciprocating steam plant, but Westinghouse insisted upon turbines, and, in the face of great opposition from other engineers, succeeded in having them installed. He coupled the chairman's name with the toast, which was accorded musical honours. Mr. J. S. Peck, in his reply, was also reminiscent of the early " nineteen hundreds " when H. S. Loud was in charge at Trafford Park. He told an amusing story of the light and airy way in which anyone could walk into Loud's office and tell his tale, though the room was filled with smoke and generally packed with people. His tributes to Mr. Lange, who produced a new spirit at the works, converting discord into co-operation, were keenly appreciated.

Mr. E. M. Herr, of Westinghouse Electric and Manufacturing Co., Pittsburgh, who was returning to America from a world tour, and Mr. J. Snow Huddleston, representing the newly-formed Association of Ex-Siemens men, were welcomed as guests, and both extended greetings from their respective interests. The toasts to " Absent Friends " and " The Silent Toast " were given at ten o'clock, and with the latter were coupled the names of Ex-B.W. men who had died during the past year, Messrs. Dunkley, Bradshaw, Toplis, Loud and Lieut.-Col. Cradock. Telegrams regretting inability to attend were sent by some 50 X.B.W.A. men.

Due to the closing of the Hotel Cecil, the committee are selecting another venue for next year's gathering and this and the date of the 1931 dinner will be announced later.

Henley's Dramatic Club presented at the Cripplegate Theatre, London, E.C., on March 14th, a well-produced performance of " Rookery Nook," a farce in three acts by Ben Travers. This is the eighth season of the club. The characters were:—Gertrude Twine, Miss Dorothy Josling; Mrs. Leverett, Miss Elsie Savage; Harold Twine, Mr. F. J. Batten; Clive Popkiss, Mr. Robert K. Edney; Gerald Popkiss, Mr. A. V. Burnett; Rhoda Marley Miss Kathleen Hayward; Putz, Mr. Hugh Stanley; Admiral Juddy, Mr. Frank Bettley; Poppy Dickey, Miss Kitty Thurgood; Clara Popkiss, Miss Fay Smith; Mrs. Possett, Miss Netta Taylor.



EXAMPLES of the kiosks installed by the General Electric Co., Ltd., for Leicester Corporation. That on the left controls the supply to Wyvern Laundry, in Barkby Lane, and the other picture is of the sub-station which supplies the Braunston Housing Estate.

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ELECTRICAL DOMESTIC & RADIO APPLIANCES.

New Apparatus and Equipment for the Home—Items to Interest the Contractor—Accumulator Charging Plant for Garages, etc.

WITH the increasing use now being made of shop window reflectors, contractors may be especially interested in particulars of "Frink" unbreakable reflectors. This reflector is marketed by L. G. HAWKINS AND CO., LTD., 30–35, Drury Lane, London, W.C.2; it is all-metal and has a reflecting surface of pure silver, hermetically sealed against deterioration. There is no glass to break or paint to peel. The outside finish is dark statuary bronze. Other features include provision for three distributions of light from the same lamp, a very simple type of adjustable collar, and absence of springs, nuts and screws. Extensive, intensive, focussing and combination reflectors are available. For use with certain models of these reflectors the firm offers colour screens in red, amber, green and blue. The company also supplies "Intensalite" electric window signs, made in aluminium. Type R.1, frosted on the reflecting surfaces, is suitable for shallow windows dressed to their extreme height. Type R.2 is designed to increase the illumination on the display area in normal windows; its efficiency is increased by the use of a corrugated mirror on the reflecting surface. Type R.3 is intended to give the maximum intensity on the display area, with an increase in the side illumination. The individual reflectors can be adjusted to suit the window dressing, and can be equipped with colour screens.

A further accessory for shop window display lighting is the "Frink Spot-o-Flod," a combination spot and floodlight with universal adjustment. It is equipped with special fittings to permit rapid adjustment to any angle and light control from a spot 24 in. diameter to a flood of 10 ft. diameter at a distance of 10 ft. It can also be used for a wide-angle flood by removing the lens. The "Spot-o-Flod" is furnished with red, blue, green or amber colour screens in glass or gelatine. No solder is used in its construction, and all parts and accessories can be instantly applied without tools. It is equipped with 3¾ in. spherical mirror, 5 in. condensing lens and 6 ft. of cord and plug.

Messrs. L. G. Hawkins are also manufacturing a "practical office lamp" with a green and white opal adjustable shade to direct the light where required. It is doubly adjustable, to enable it to be used efficiently on roll-top or pedestal desks, and it has a heavy, baize-covered base. The standard finish is bronze; other finishes can be supplied at a small extra charge.

The MORECAMBE ELECTRICAL EQUIPMENT CO., LTD., Fahy's Buildings, Euston Road, Morecambe, have sent us brief particulars of their "Non-Fayl" electric coffee mill. It has a granulating capacity of ¾ lb. to 1 lb. per minute, and is designed to meet the needs of café proprietors, grocers and multiple shops. The coffee mill is supplied with flexible cord and adapter; its dimensions are: base, 12 in. by 8 in., and overall height, 24 in. The weight is 60 lb.

Another interesting application of electricity to the preparation of food is the "Auto-Grill" for cooking bacon. This device, which is marketed by FRANK V. MAGRINI, LTD. 19–23, Oxford Street, London, W.1, is made in two models. Model No. 8 grills from two to eight slices of bacon at a time. The cooking plates are monel metal. The overall size is 8½ in. by 13½ in., and the height when closed is 10½ in. The shipping weight is 22 lb. We understand that this "Auto-Grill" operates on 110 V, or 220 V if specified. The 16-slice "Auto-Grill" consists of two No. 8 units mounted on a single base. Both models are operated as follows: The bacon can be put into the machine in its parchment paper if it is sold covered, and cooking in this way ensures that all the flavour is retained. The top is then pulled down and the dial turned. The current is turned on, the bacon cooked and the current turned off automatically. The cover is also opened by automatic action. The pan at the base of the grill retains the clear bacon dripping.

A special type of toaster for the use of restaurants, etc., is marketed by the same firm. It is known as the "Toastmaster," and is produced in four models. The eight-slice model will make its full capacity of toast in 1¼ minutes, giving 360 large slices of toast per hour. The consumption is 5 500 W. The four-slice "Toastmaster" has a capacity of 200 slices per hour, and for many purposes it is recommended to be used in multiple instead of one or more of the eight-slice models. The three-slice and sandwich models are also automatic toasters of similar pattern.

A further variation of the double-cone principle, as applied to loud speakers, is seen in the Wates double-cone loud speaker chassis, a sample of which has been sent to us. The "Wates Universal Chassis," as it is called, employs two cones made of specially treated paper, scrolled out in both cones in an endeavour to obviate a direct line through the sound waves. The large cone responds to the lower frequencies and the small one to the upper registers. The bracket is ingeniously designed so as to be adaptable for use on any of the well-known makes of loud speaker units. Reproduction of the low and high frequencies is good, and the chassis is certainly splendid value at its low retail selling price of 11s. 6d., complete with screws, bolts and full directions for use with the various units. On test the results were infinitely better than when a single medium-sized cone was used, and vastly superior to the reproduction given by a well-known make of the horn type speaker, the Wates cone handling a large volume without distortion. Further details and trade terms can be obtained from the makers, the SHAFTESBURY RADIO CO., 184–188, Shaftesbury Avenue, London, W.C.2.

The "Davenset" accumulator charging set of Partridge, Wilson and Co.

Two new imitation coal fires are now being made by METRO-VICK SUPPLIES, of Trafford Park, Manchester. In the Tudor and Savoy 2 and 3 kW fires the coal fire effect is obtained by means of a standard flame lamp placed at the back of the fire, and each element bar is controlled by a separate switch. The reflector and fire bars are in all instances chromium plated; the available finishes for the Tudor fires are chromium plated, oxidised copper and oxidised silver; the last two finishes form the choice for the Savoy fires. Another recently introduced model is the 2 kW screen fire, which is claimed to be an efficient heater and at the same time decorative.

A new nickel-iron alloy transformer, known as the "Hypermite," is announced by RADIO INSTRUMENTS, LTD., 12, Hyde Street, New Oxford Street, London, W.C.1, the makers of the "Hypermu." It weighs only 7 oz. but has a primary inductance of over 50 henries, with a ratio of 3½–1. The "Hypermite" is claimed to be the smallest commercial intervalve transformer ever produced with such a high primary inductance. Ample reproduction of low notes is guaranteed, without loss of the higher frequencies; the new nickel-alloy core enables high efficiency to be obtained with a reduced number of turns and without introducing excessive self-capacity. The transformer may be used in the conventional manner, the primary winding being direct connected in the anode circuit of a valve; in the alternative method of resistance-capacity-auto-transformer coupling the d.c. anode current is entirely diverted from the transformer primary, reducing breakdown possibilities to the minimum, and giving also a more uniform amplification. The "Hypermite" is mounted in a bakelite moulding, and the primary and secondary are wound on three separate bakelite bobbins.

A range of electric fires has been added to the products of LANE AND GIRVAN, LTD., of Bonnybridge, near Glasgow. Particular features claimed for these fires are as follows: There are no heavy refractory supports for the coils to heat up before the maximum radiant heat is available. The "Caledonia" element is of simple design, and is screwed into position by hand to give the correct focal length from the reflector. The resistance coils in the elements are laid in deep

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grooves in tough refractory formers of light section. Behind them is a vertical parabolic reflector. In some of the fires the reflectors are of hammered copper and in others they are chromium plated.

Dealers will soon be thinking once again of electric fans, and a large range of these is manufactured by FALK, STADELMANN AND CO., LTD., 83-93, Farringdon Road, London, E.C.1, under the trade name of "Antarctic." Included among the numerous fans offered are swivel and trunnion desk and bracket fans, rigid bare desk fans for d.c. only, low voltage fans for use with accumulators and house lighting plants, cabin and exhaust fans.

An Electric Radiator.

The WARDLE ENGINEERING CO., LTD., Elsinore Road, Old Trafford, Manchester, have sent us particulars of their "Maxheat" tubular electric heating system. This system is claimed to "mark one of the greatest advances in industrial heating since the introduction of the tubular system;" the "Maxheat" tube is stated to afford approximately five times the radiation area of the conventional 2 in. dia. tube, and 2½ times the radiation area of a plain tube with a diameter equal to its own external diameter. "Maxheat" tubes are available in lengths from 2 ft. to 14 ft., and in loadings of 150, 200 and 250 W per foot run of tube.

The "Maxheat" tubular electric radiator is suitable for all ordinary purposes, but it is particularly recommended for situations where cost or fire risk prohibit the use of the exposed-element type of heating unit.

Two models are available. The Senior, rated at 750 W; and the Junior, rated at 500 W. The standard finish is black heat-resisting enamel, with white metal relief. The Senior model is supplied with a three-heat switch fixed on the right-hand supporting bracket. In the Junior model the switch is of the rotary "on" and "off" pattern. Both models are fitted with a carrying handle and are supplied with two yards of three-core circular braided flexible. In these radiators the element comprises a number of fireproof porcelain units, each having four projecting arms, threaded on a steel core of square section. The nickel chrome alloy spiral is threaded in and out of the recesses formed by the projecting arms, and is held rigidly in position, no part of the surface being enclosed. The terminals are shrouded in a porcelain block, terminal wiring being effected by beaded flexible. The element can be withdrawn as a complete unit.

The "Davenset" starter charger, manufactured by PARTRIDGE, WILSON AND CO., of Leicester, forms a means of charging motor car starter batteries from a.c. mains. It operates on the principle of a gas-filled valve rectifier, and has a maximum d.c. output of 15 A at 75 V. The components—with the exception of the controls and the current measuring instruments—are completely enclosed in a black crystallised steel case, which has its sides perforated for ventilation. A hinged door, opened by the removal of two screws, is provided in the left hand side of the case; the gas-filled rectifying valve, which can be removed by detaching the two anode leads and unscrewing it from its porcelain holder, is situated immediately behind this door. On the control panel are two pairs of output terminals, marked Nos. 1 and 2. Each circuit is independently controlled by a variable resistance of the sliding type. Circuit No. 1 is arranged for charging currents up to 6 A, while No. 2 is designed for currents up to 10 A. Thus, for example, starter batteries may be charged on No. 2 at, say, 9 A, conjointly with wireless accumulators charging at, say, 3 A on circuit No. 1.

The d.c. voltage output of both circuits is adjustable from 15 V to 75 V in steps of 15 V, by an arrangement of transformer secondary tappings controlled by means of a five-position rotary switch. Two of the three d.p. rotary switch-fuses at the bottom of the control panel are the output switches, whilst the third and centre switch is the mains switch controlling the a.c. input to the transformer primary. The six fuses fitted in these switches may be easily examined by hinging back a section of the base of the apparatus. Two Ferranti moving coil ammeters are fitted as part of the standard equipment.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, have recently added to the Magnet range of bakelite fittings a detachable ceiling rose. This ceiling unit, which has a 2½ in. base diameter, with two fixing holes at 2-in. centres, is designed to be suitable for mounting direct to conduit boxes of British standard specification. The advantage of installing this plug-in or detachable type ceiling rose is claimed easily to compensate for the slight extra initial cost—particularly in mills and factories where colour washing or painting of ceilings and walls must be carried out frequently. With the new ceiling rose it is only necessary to unscrew the clamping ring and withdraw the two-pin plug. The G.E.C. have also introduced a three-hook suspension plate for ceiling roses, for earthing the metal parts of bowl pendants. It has been designed for the purpose of connecting the metal work of any three-chain suspension pendant or bowl fitting directly to the conduit box, thus ensuring earth continuity. The plate is intended for fixing between the ceiling rose and conduit box.

The "Permacore" transformer, manufactured by MULLARD WIRELESS SERVICE CO., LTD., 111, Charing Cross Road, London, W.C.2, is designed for transformer coupling on the l.f. side of a set. It has a step-up ratio of 3–1, and a high primary impedance, claimed to ensure pure reproduction even at very low musical frequencies. A primary winding of silver and a secondary of nickel claim to guard against the presence of resonant peaks. The transformer is not much larger than a matchbox, and is completely shrouded.

The Mullard P.M. filament transformer is designed to operate the recently introduced Mullard indirectly-heated a.c. valves. Its function is to step down the mains voltage to operate the 4 V a.c. valves. Every care, it is claimed, has been taken to ensure perfect safety. The details of the various types of the transformer are as follows:—

Type No.	A.C. Mains.
103	100–106
111	107–114
210	200–214
222	215–228
240	229–245
253	246–260

Details have been sent us of the range of mouldings produced by the ELMAR MOULDINGS CO., of Thimble Mill Lane, Birmingham. These mouldings are stated to be made of bakelite powders of very high dielectric strength; they can be made in various colours, and are not affected by oils, acids or water. The company specialises in moulding articles to any shape ordered, and is able to deal with large-scale requirements owing to the high-powered process installed.

The B.A.G. Diffuser, produced by BRITISH B.A.G., LTD., 23, Farringdon Avenue, London, E.C.4, has previously been described in THE ELECTRICIAN. It is now adapted for use as an operating light for dentists, and it is claimed that, besides being mobile and adjustable, the new unit gives perfect distribution of light and dispersal of shadows, together with complete freedom from glare. The standard is made of white enamelled iron, and is mounted on castors. The total height of the apparatus is 5 ft. 4 in. Daylight glassware can be supplied at an extra charge.

A new table lamp has been put on the market by HAILWOOD AND ACKROYD, LTD., of Morley Works, Leeds. The globe and body of the lamp bear deeply etched designs, and the decoration is increased by ornamental fittings in bronze finish.

New Ceiling Fitting.

A new ceiling fitting has been introduced by PHILIPS LAMPS, LTD., of Philips House, Charing Cross Road, London, W.C.2. It is designed for use with Philips Argenta lamps, and is made of three-ply opal glass. It is neat in appearance and can be easily erected, providing an efficient, attractive and economical means of lighting corridors, porches and small rooms. The fitting is secured in an instant by means of an ingenious spring clip which is held against the ceiling by the batten holder. When the lamp is inserted in the holder it appears to form part of the ceiling plate, the light from the neck of the lamp showing through the opal glass. The fitting is made for use with Argenta lamps of 40–75 W. Its design prevents dust collecting, and, as it has no exterior metal parts, it can be very easily cleaned.

In addition, Messrs. Philips have lately introduced a series of floodlight reflectors, known by the trade name of "Philiflood." The series consists of four types, designated FL.A, FL.B, FL.C and FL.D, stated to cover every floodlighting requirement. They are strongly made from vitreous enamelled steel and cast iron, types FL.A and FL.B being fitted with white enamel reflectors, and types FL.C and FL.D with silvered reflectors, similar to the well-known "Philiray" shop window reflectors. Type FL.B is of particular interest, as it is entirely unconventional in design. It is rectangular in shape, measuring 16 in. by 9 in. by 4½ in., the light aperture being 7½ in. in diameter. The great advantage of this model is that it can be made to harmonise with the surrounding architecture and does not offend the eye during the daytime. The small dimensions are made possible by the use of a 1 000 W tubular projector lamp.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

MANCHESTER CORPORATION, March 21st.—Six months' supply of electric cooking ranges. Specification (No. 267) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

BRADFORD CORPORATION, March 22nd.—Electric light installation at Semon House, Ilkley. Specifications, etc., from the City Architect, Town Hall, Bradford.

DALKEITH CORPORATION, March 22nd.—Electrical work in connection with erection of about 28 houses at Gibraltar Gardens. Schedules, etc., from Mr. Jas. L. M. Dougal, burgh surveyor, Dalkeith.

EDINBURGH CORPORATION, March 22nd.—Electric light installation in 156 dwelling houses at Niddrie Mains (first development). Specification, etc., from the Engineer, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s.

Tramcars and Electrical Equipment.

BELFAST CORPORATION, March 24th (extension of time).—Supply of (1) 50 double deck top-covered tramcars complete; or (2) 50 tramcar bodies; (3) 50 tramcar trucks with wheels and axles; (4) tramcar electrical equipments. Forms of tender, etc., from the General Manager, Tramways Department, Sandy Row, Belfast; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, March 24th.—Supply and erection of 33 kV and lower voltage transformers, in connection with the North West England and North Wales Electricity Scheme. Specification (N.W.E.-S.T. 4) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

ECCLES CORPORATION, March 24th.—Twelve months' supply of h.t. and e.h.t. paper insulated cables; and l.t. paper and fibre insulated cables, all of British manufacture. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft; deposit £1 1s.

EDINBURGH CORPORATION, March 24th.—Twelve months' supply of materials, including underground insulated cables, conduits, house service fuse boxes and fuse boards, electrical material for interior wiring, electricity meters, etc. Specifications, etc., from the Engineer and Manager, Electricity Department, Dewar Place, Edinburgh.

KENDAL CORPORATION, March 24th.—Supply and erection of electrically driven blower, electric lift for retort house and lathe with electric motor drive, at the gasworks. Specifications, etc., from the engineer and manager, Mr. T. Crowdy, Parkside Road, Kendal.

LONDON COUNTY COUNCIL, March 24th.—Supply and erection in Blackwall Tunnel of (1a) four electrically-driven exhaust propeller fans, 8 ft. diameter, each with 15 B.H.P. motor; (1b) two centrifugal blowing-fan sets, each with 55 B.H.P. electric motor, and suction and delivery air ducts; and (2) girders, joists, platforms, etc. Specifications from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £5 in each case.

MORTLACH PARISH CHURCH, March 24th.—Electrical work in connection with alterations and additions to church. Schedules, etc., from Messrs. A. Marshall Mackenzie and Son, architects, 173A, Union Street, Aberdeen.

KIRKCALDY DISTRICT COMMITTEE, March 25th.—Electric lighting installations in 20 houses at Windygates (types "A" and "B") and 24 houses at Lochore (type "B"). Plans, etc., from Mr. G. B. Deas, Central Chambers, Kirkcaldy.

GLASGOW CORPORATION, March 26th.—Electric lighting work, in connection with erection of Anderson Child Welfare Centre. Specification, etc., from the Office of Public Works, 249, George Street, Glasgow.

WEST RIDING EDUCATION COMMITTEE, March 26th.—Electric light installation at Ecclesfield New Secondary School and caretaker's house. Specifications from the Education Officer, County Hall, Wakefield.

WEST RIDING EDUCATION COMMITTEE, March 26th.—Electrical installation in extensions of Normanton Grammar School. Specification from the Education Officer, County Hall, Wakefield.

WEST HAM GUARDIANS, March 27th.—Laying of main and sub-main cables, and wiring work in various blocks at Central Home, Union Road, Leytonstone, London, E.11.

EAST AND WEST MOLESEY URBAN DISTRICT COUNCIL, March 28th.—Supply, etc., of small electric lighting plant for sewage works, with wiring and fittings for 12 points. Further particulars from the Surveyor, Council Offices, East Molesey.

LIVERPOOL CORPORATION, March 28th.—Supply of 12 step down transformers. Specification, etc., from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

BIRMINGHAM CORPORATION, March 29th.—Manufacture and supply of 1 400 tons of grooved steel girder rails and fishplates. Specifications, etc., from the General Manager, Tramway and Omnibus Department, Council House, Birmingham.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, March 29th.—Six months' supply of electrical fittings, etc. Forms of tender from Mr. C. L. Addison-Smith, 19, Heriot Row, Edinburgh.

RHONDDA URBAN DISTRICT COUNCIL, March 29th.—One year's supply of ordinary and prepayment a.c. meters, cable, joint boxes, compound cut-outs, etc. Specifications and forms of tender from Mr. J. M. Bowman, Electricity Works, Porth, Glam.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, March 31st.—Supply and erection of one 1 000 kVA and two 500 kVA three-phase transformers. Specification, etc., from Mr. David J. Keep, town clerk; deposit £2 2s. Technical inquiries can be made of Mr. H. W. Couzens, 9, Old Queen Street, London, S.W.1.

CENTRAL ELECTRICITY BOARD, March 31st.—Supply and erection of metering equipment required in the area of the North-West England and North Wales Electricity Scheme. Specification (N.W.E.-G.M. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CONGLETON CORPORATION, April 1st.—High tension and low tension switchgear, transformers, kiosks, h.t. cables, l.t. cables and l.t. overhead distribution. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

WATFORD CORPORATION, April 1st.—Wiring of lighting and heating points in dwelling houses. Specifications, etc., from the borough electrical engineer, Mr. A. W. Barham, Cardiff Road, Watford.

BEXHILL CORPORATION, April 2nd.—Laying and jointing of about 1 600 yards of 0·5 sq. in., three-phase, paper insulated, lead covered and armoured, 11 000 V cable of British manufacture. Specification from the Borough Electrical Engineer.

GREAT WESTERN RAILWAY CO., April 4th–24th.—Supply of electrical cables and wires (list 20) and telegraph ironwork (list 21). Specifications with forms of tender from the Office of the Stores Superintendent, Swindon (form of tender for list 20 on and after April 14th). Tenders for list 21 by April 4th and for list 20 by April 24th.

CENTRAL ELECTRICITY BOARD, April 7th.—Supply and erection of 66 kV and lower voltage transformers, in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.-G.T.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

LONDON COUNTY COUNCIL, April 14th.—Manufacture and supply of h.t. and l.t. cables; and reconstruction of existing l.t. cables. Specification, etc., from the General Manager of Tramways, 23, Belvedere Road, London, S.E.1; deposit £2.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

IXELLES MUNICIPALITY, March 21st.—Supply of 845 V, 440 V and 220 V d.c. electricity meters. Cahier des Charges (fr. 6¾), from Service de l'Electricité, 20, Rue d'Alsace Lorraine, Ixelles, Belgium.

ANTWERP MUNICIPALITY, March 24th.—Supply of crane plug boxes, for electric cranes at new docks and 20 junction

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boxes for cables supplying electric motors. (Reference B.X. 6 243.)

INDIAN STORES DEPARTMENT, March 24th.—Supply of cab-tyre sheathed cables for one year (order No. N. 10 896). (Reference B.X. 6 260.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 24th.—Supply of resistances and reactances (schedule C. 557). (Reference B.X. 6 046.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, March 25th.—Supply of cordless telephone switchboards (schedule C. 566). (Reference B.X. 6 071.)

EGYPTIAN PORTS AND LIGHTHOUSES ADMINISTRATION, March 27th.—Supply and installation of electric cables in the Port of Alexandria. (Reference B.X. 6 199.)

Cables for Johannesburg.

JOHANNESBURG MUNICIPALITY, March 27th.—Supply of paper insulated, lead covered, double steel tape armoured and jute served cable (contract No. 348). (Reference B.X. 6 200.)

JOHANNESBURG MUNICIPALITY, March 29th.—Supply of metallic filament traction lamps (contract No. 351). (Reference B.X. 6 246.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays, for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

INDIAN STORES DEPARTMENT, March 31st.—One year's supply of lead sheathed cable (order No. N.10 899). (Reference B.X. 6 259.)

INDIAN STORES DEPARTMENT, April 14th.—Supply, erection, etc., of three oil engine-driven d.c. generating sets. (Reference B.X. 6 231.)

VICTORIAN ELECTRICITY COMMISSION, April 14th.—Supply of 22 000 V switchgear and accessories, for sub-station "C" at Brunswick (specification No. 30/17). (Reference B.X. 6 182.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Supply of lead-covered switchboard cable (schedule C. 574). (Reference B.X. 6 202.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 22nd.—Supply of braided switchboard cable. (Reference B.X. 6 201.)

VICTORIAN ELECTRICITY COMMISSION, May 5th.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000 V circuit (specification No. 30/19.) (Reference B.X. 6 226.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13th.—Supply of terminal strips (P. and T. 151/2 200.) (Reference B.X. 6 209.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20th.—Supply of terminal strips (schedule No. C. 578). (Reference B.X. 6 247.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20th.—Supply of telegraph instruments (schedule C. 579). (Reference B.X. 6 248.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24th.—Supply of 110 kV outdoor steelwork and switchgear, for Waitaki power scheme—section 71. (Reference B.X. 6 238.)

Tenders Accepted.

STOCKPORT CORPORATION.—Craven Bros., electric crane for electricity works, £2 445.

PLYMOUTH CORPORATION.—British Insulated Cables, Ltd., and Derby Cables, Ltd., supply of cables.

ISLINGTON (LONDON) BOROUGH COUNCIL.—Metro-Vick Supplies, one year's supply of electrical accessories.

H.M. OFFICE OF WORKS.—Patent Office and Record Office London: electric wiring, Malcolm and Allan (London), Ltd.

EAST HAM CORPORATION.—Brush Electrical Engineering Co., Ltd., four double-deck car bodies, with trucks and brakes, £1 917 each.

HERTFORDSHIRE COUNTY AGRICULTURAL COMMITTEE.—Giffens, electric light and power installation at Oaklands, £374 15s. 6d.

FORFARSHIRE EDUCATION COMMITTEE.—J. E. Fenton, electric lighting equipment at Arbroath High and Keptic Schools, £4 149.

HACKNEY (LONDON) BOROUGH COUNCIL.—Tudor Accumulator Co., Ltd., renewing plates of main battery at generating station, £756. (Recommended.)

NORTHERN IRELAND MINISTRY OF FINANCE.—Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of Siemens vacuum and gasfilled lamps, etc.

DIRECTOR OF NAVY CONTRACTS.—General Electric Co., Ltd., supply of about 308 000 Osram electric lamps (made at company's Wembley and Hammersmith works).

METROPOLITAN WATER BOARD.—Worthington-Simpson, Ltd., supply of four steam turbines with centrifugal pumps, and two electric generators, for Surbiton pumping station, £48 980.

GLASGOW CORPORATION.—T. B. and J. A. Mathieson, Ltd., electrical installation at City Hall, £828 7s. 6d.; Barber and Colman, electric traffic signals, £129 5s. (Both recommended.)

LIVERPOOL CORPORATION.—Edgar Allen and Co., Ltd., 200 pairs of cranked steel tramway rail fishplates, £1 2s. 4d. per pair; Stewarts and Lloyds, Ltd., about 170 street lighting poles, £6 per pole.

WIMBLEDON CORPORATION.—C. A. Parsons and Co., Ltd., supply of 7 500 kW two-phase turbo-alternator, with surface condenser, air ejector and extraction pump, £19 342, plus £484 10s. for spare parts.

WORTHING CORPORATION.—Callender's Cable and Construction Co., Ltd., provision and laying of e.h.t. ring main, distribution cables and connections at three sub-stations, also provision and laying of e.h.t. cables between Ferring and East Preston. £28 740. (Recommended.)

Turbo-Alternator, Cables and Meters.

BATH CORPORATION.—Brush Electrical Engineering Co., Ltd., one 7 000 kW Brush-Ljungstrom turbine alternator (making five Brush-Ljungstrom sets installed, total 20 000 kW); Callender's Cable and Construction Co., Ltd., cables; Metropolitan-Vickers Electrical Co., Ltd., and Ferranti, Ltd., meters.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—British Insulated Cables, Ltd., erection of overhead power line from Stourport to Banbury. The line will be 50 miles in length, and will consist of steel cored aluminium conductors supported on steel lattice towers. The voltage is 66 000, and the amount of the contract approximately £110 000. The conductors will be manufactured at the company's works.

LONDON, MIDLAND AND SCOTTISH RAILWAY CO.—Westinghouse Brake and Saxby Signal Co., Ltd., supply and installation of power signalling plant at St. Enoch's Station, Glasgow, including one 227-lever all-electric interlocking frame; one illuminated diagram; 53 main three-aspect colour light signals, with posts, ladders, fittings, etc.; 99 shunt and call-on signals; 26 route indicators; 106 power-operated point layouts; 128 a.c. condenser-fed track circuits; and 450 (approx.) a.c. relays.

GENERAL POST OFFICE.—Cable manufacture, supply, drawing in, etc., Polegate-Heathfield, Callender's Cable and Construction Co., Ltd.; Oxford—Banbury, Johnson and Phillips, Ltd. Electric lighting: Station Street Sorting Office Leicester, W. Cross and Son; Leicester Station Starting Office, W. L. Timson. Construction of cable jointing chambers and loading Birmingham-Liverpool section, Standard Telephones and Cables, Ltd. Telephone Exchange Equipment; Chester, and telephone repeater equipment, Marks Tey (Essex) and Aldeburgh (Suffolk), Standard Telephones and Cables, Ltd.

GLASGOW CORPORATION.—James Laidlaw and Sons, Ltd., electric cable troughing and supports, for Dawsholm gas works, £120 12s.; Metropolitan-Vickers Electrical Co., Ltd., 5 new motors, 212 meters, transformer, etc., £1 409 3s. 6d.; Lancashire Dynamo and Motor Co., Ltd., 20 new motors, £934 6s.; J. P. Hall and Co., Ltd., 22 new motors, £1 551 10s.; British Thomson-Houston Co., Ltd., 28 new motors, £193 18s. 6d.; Herbert Morris, Ltd., 3 motor hoists and one reconditioned, £462 0s. 6d.; Electrical Apparatus Co., 175 reconditioned meters, £118 2s. 6d.; Measurement, Ltd., 305 meters reconditioned, £213 10s.

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WORK IN PROSPECT.

BEBINGTON AND BROMBOROUGH.—Houses (62). Particulars from the Surveyor.

BEVERLEY.—Houses (24), for the Town Council. Particulars from the Borough Surveyor.

CARLISLE.—Additional 100 houses, for the City Council. Particulars from the City Surveyor.

CHESTERTON.—Houses (16), for the Rural Council. Particulars from the Housing Officer, 12, St. John's Street, Cambridge.

COVENTRY.—School, for the City Education Committee. Particulars from the Director of Education.

CROYDON.—Library, Norbury, for the Town Council. Particulars from the Borough Engineer.

DARLINGTON.—Library extensions to cost £30 000, for the Town Council. Particulars from the Borough Surveyor.

DEWSBURY.—Additional 56 houses, for the Town Council. Particulars from the Borough Surveyor.

DURHAM.—55 new schools and secondary schools, Hooker Gate, Stockton, Billingham, and Crook, for the County Education Committee. Particulars from the Director of Education, Durham.

FARNHAM ROYAL.—School (520 places), for Bucks Education Committee. Particulars from the Secretary, Mr. C. G. Watkins, Aylesbury.

GRANTHAM.—Additional 52 houses. Particulars from the Borough Surveyor.

GOOLE.—Two schools to cost £43 000, for West Riding Education Committee. Particulars from the Director of Education, Wakefield.

GOLBORNE.—Houses (54), for the Urban Council. Particulars from the Surveyor.

HARROGATE.—Secondary school to cost £72 000, for the Borough Education Committee. Particulars from the Director of Education.

HODNET.—School (400 places), for Salop Education Committee. Particulars from the Clerk, Shrewsbury.

HOLBEACH.—Cinema theatre. Particulars from the architect, Mr. F. B. Ward, 8, South Brink, Wisbech.

KIDDERMINSTER.—Houses (122), for the Town Council. Particulars from the contractors, Eadie Towers and Co., Wolverhampton, and 86, particulars from the contractors, Griffiths and Sons, Wolverhampton.—Two central schools for the Borough Education Committee. Particulars from the Director of Education.

TRADE PUBLICATIONS.

THE current stock list of A.C.E.C. has been sent to us.

Specification A.500, dealing with d.c. switchboards, has been issued by CROMPTON PARKINSON, LTD., Guisley, Leeds.

An attractive calendar has been received from W. H. WILCOX AND CO., LTD., 38, Southwark Street, London, S.E.1.

List No. 824, describing starting compressor sets, has been issued by the HAMWORTHY ENGINEERING CO., LTD., Poole, Dorset.

The current stock list of "Furniculus" fires has been received from the A. E. G. ELECTRIC CO., LTD., 131, Victoria Street, London, S.W.1.

"Jacelite" flush plates—a new line introduded by J. A. CRABTREE AND CO., LTD., of Lincoln Works, Walsall—are dealt with in a new publication, No. 1 054.

"K-B" drying plants are the subject of publication No. K 129 just issued by JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, London, E.C.4.

New publications of W. J. FURSE AND CO., LTD., Traffic Street, Nottingham, include leaflets W.26 and 27, describing slider and radial type electric lighting dimmers.

SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E.18, have published catalogue No. 160, section 1, dealing with l.t. feeder pillars of the company's manufacture.

Catalogue No. 74, dealing with a varied stock ranging from ammeters to electric drills, has been published by LESLIE DIXON AND CO., 218, Upper Thames Street, London, E.C.4.

A new range of h.t. straight-through joints for belted type cables is dealt with in list UD2, published by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.

"An Industrial Lighting Problem on Glareless Lamps and How it was Solved" is the title of a new issue, leaflet No. 1 110, by BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, London, N.17.

We have received from the ELECTRO-DYNAMIC CONSTRUCTION CO., 733B, Old Kent Road, London, S.E.15, a copy of a new leaflet devoted to d.c. to a.c. rotary transformers for radio and similar purposes.

We have received from the SUFFOLK IRON FOUNDRY (1920), LTD., Gipping Works, Stowmarket, a copy of the fifth edition of the company's booklet entitled "The Superman from Mars Welding the World." The book deals with the oxy-acetylene welding of cast iron and 12 additional pages are included in this new edition.

WHAT is probably the largest job ever carried out in the British Isles for 33 000 V cables laid under water, has just been completed by W. T. Henley's Telegraph Works Co., Ltd. The contract comprised the installation of seven lengths of 0.15 sq. in. 33 kV single, paper insulated, lead covered, non-magnetic wire-armoured cable, each length being 1 400 yards and weighing nearly 13 tons, across the bed of Larne Lough. An ordinary dredging barge was specially converted for the purpose, and was loaded with the cables at Belfast, being towed round to Larne on March 1st. Preliminary work began soon after 5 o'clock on the Sunday morning, but not until about half-past-ten was the main part of the programme commenced. The installation began at the step-up 33 000/6 600 V sub-station 100 yards north of the generating station. Three motor boats took the cable barge in tow to a point as near the shore as possible, when a winch on shore was substituted for the motor boats. To the satisfaction of the Antrim Electricity Supply Company's engineers, the seven lengths of cable were laid across the lough in one tide—somewhere about five hours! The main contractors for the scheme were Henry Boot and Sons, Ltd., of Sheffield.

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ELECTRICITY SUPPLY.

Electric Houses for Hemel Hempstead—Halifax and the Unemployment Grant—A New Set for Ipswich—South Wales and the Central Electricity Board—St. Pancras and the Grit Problem—South Shields and the Grid.

WOLVERHAMPTON T.C. is to give a supply of electricity to 174 houses on the Parkfield Road estate.

Hemel Hempstead T.C. has decided to adopt electric lighting in 72 houses on the Handpost Farm site.

Bury T.C. has decided to renew a portion of the h.t. switchgear at the Chamber Hall power station at a cost of £27 000.

Electricity will be available in Tain on April 1st, when the switching on of the supply will be marked by a public ceremony.

Blackpool Electricity Committee seeks sanction to borrow £8 000 for the extension of electricity mains to Hardhorn and Singleton.

The Unemployment Grants Committee has approved schemes launched by the Halifax Electricity Committee, involving an expenditure of £30 564.

Lampeter T.C. has decided to offer no objection to the application for an electricity supply Special Order by the Lampeter Electricity Supply Co.

The Mayor of Ipswich, Mr. A. L. Clouting, formally switched on the new 12 500 kW Brush-Ljungstrom generating set at the Corporation's electricity works.

Bradford Electricity Committee recommends the change over of the system of supply from d.c. to a.c. in the Horton Grange Road district, at an estimated cost of £16 712.

The Tasmanian Hydro-Electric Department is constructing the Shannon River power station to develop 15 000 H.P. This will form part of the Great Lake hydro-electric undertaking.

Colchester T.C. has applied for an additional loan of £7 637 in connection with the erection of the new station, etc., and also for £3 856, excess expenditure on the construction of e.h.t. transmission lines.

It is stated that Godalming T.C. has now withdrawn its opposition to the application of the Aldershot Gas, Water and District Lighting Co. to take over from the Urban Electric Supply Co. its Godalming electricity undertaking.

Maidstone T.C. is to extend the mains to East Malling, at an estimated cost of £3 500, those at Ditton Corner are to be linked up with extensions at Aylesford, at a cost of £1 060, and street lighting mains are to be laid at Ditton at an outlay of £500.

Durham County Council has granted an application by the Consett Iron Co. for permission to cross the Durham-Leadgate main road at Woodside Bank, with an overhead power line, for the purpose of conveying a supply of electricity to the Iveston Coal Co.'s drift.

Eastbourne Electricity Committee has received sanction to borrow £5 334 in respect of mains for parade lighting and £23 604 for switchgear and transformers required in connection with the receipt of a bulk supply of electricity.—The Committee is considering a supply to Birling Gap estimated to cost £2 550.

The Central Electricity Board has applied to the Electricity Commissioners for a Special Order authorising an increase of the Board's borrowing powers. The draft Special Order is available for inspection at the Board's Offices, London and Glasgow. Any objections must be sent to the Commissioners by April 4th.

A settlement has been arrived at between the Ayrshire Electricity Board and the West Kilbride Electric and Lighting Co. An offer by the Ayrshire Board to take over the local undertaking has been accepted by the shareholders of the company, and the charge for current for lighting purposes is to be reduced from 10d. to the uniform rate of 5½d. per kWh.

Leeds Electricity Committee has estimated its expenditure on capital account for the next financial year at £500 000.—The Committee has obtained sanction to borrow £50 000 for the erection of buildings at Kirkstall generating station and £10 000 for generating plant.—The Electrical Wholesalers' Federation has asked the Corporation Electricity Committee for permission for a deputation to attend to discuss the question of proposed purchases from manufacturers of certain materials required by contractors in connection with the carrying out of work under the assisted wiring scheme. The Committee has decided to receive the deputation.

Estimates have been obtained from the City Electrical Engineer for an electric cooking equipment for the sanatorium, Cottingham, Hull. The capital cost is estimated at from £250 to £375, the latter price including a double oven range, stock pot, fish fryer, two 15-gallon water boilers, steam oven, 30-gallon vegetable boiler, hot cupboard and 30-gallon storage water heater. The annual current consumption would range between 40 000 and 50 000 kWh, which could be supplied at one half-penny per kWh, and would amount to between £80 and £100. The cost of wiring and installing would be about £100. The proposals have been adopted by the Health Committee.

Proposals have been submitted to the Central Electricity Board for linking up their scheme of supply for South-West Wales with the counties of Carmarthen, Pembroke, and Cardigan. The h.t. mains of the scheme stop short at Llanelly, and at a recent conference at Carmarthen, regret was expressed that the counties named appeared to be excluded from the scheme. Dr. Purvis, consulting engineer for the Carmarthen Electric Supply Co., has interviewed the technical adviser to the Board, and it is believed that if a combined effort were made to link up all the existing undertakings in the three counties the Board would probably extend its main from Llanelly into the district.

A well-printed illustrated brochure, containing a record of the last five years' progress of its undertaking, has been issued by the West Gloucestershire Power Co., Ltd. An interesting feature is a bird's-eye view of the area served by the company's system, 679 sq. miles in extent. There are excellent pictures of the plant in the company's Lydney power station, which comprises a 7 500 kW and two 5 000 kW turbo-alternators, the switch-room, industrial works to which current is supplied, a demonstration electric house, the Cinderford showroom, transmission lines, masts and poles, etc. The length of mains has increased from 73 to 187 miles in the last five years, and the electricity sold from 7 159 000 to 13 263 745 kWh per annum.

At the request of the Electricity Commissioners, Stoke-on-Trent Electricity Committee is withdrawing its application for sanction to borrow £50 000 in connection with the overhead transmission lines to Market Drayton and Stafford, which it was proposed should be erected by the Corporation on behalf of the North West Midlands Joint Electricity Authority.—The Electricity Committee has obtained land for a sub-station at Strongford and has decided to seek sanction to borrow £2 500 for its erection and equipment. The Committee has approved plans for a sub-station in Kingsway, Stoke-on-Trent, to cost £1 500. Mains are to be extended to supply 40 houses to be erected by Messrs. Shenton Bros. in a new road off Milton Road, Sneyd Green.

Mr. J. Edgar, borough electrical engineer, has reported to South Shields Electricity Committee that, having regard to the fact that in all probability the Central Board's scheme will be in operation by 1932, it is only necessary to consider what additional size of unit will be required to carry safely over the next two winters. A 3 000 kW turbo-alternator will meet the case. He submitted two tenders for the plant, one from Fraser and Chalmers, Ltd., and one from the Metropolitan-Vickers Electrical Co., Ltd. The Committee decided that the Central Electricity Board be asked to expedite, as quickly as possible, the linking up of the various stations in the area, as the Committee cannot see its way at the present time to entertain the question of further expenditure for the provision of additional generating plant.

St. Pancras (London) Electricity Committee reports on the results of experiments in dealing with dust and grit which has at times emanated from the chimney shafts at the King's Road generating station, by means of water-spraying apparatus and expansion tanks. A contract was entered into with Messrs. Babcock and Wilcox, Ltd., to instal the necessary apparatus, which was applied to two boilers, and has been in continuous operation since December last. The results are as follows:—Boiler working hours, 1 035 hours; coal consumed, 2 770 tons; dust and grit collected, 67·4 tons (dry) and 126·5 tons by washing chambers; total grit, etc. elimination, 193·9 tons; retained in ash pit, 6.9 tons; total ash content of coal, 200·8 tons. Of the total ash content of the coal consumed 3·5% is retained in the ash pit and 96·5% is trapped; 33·5% by the Davidson grit arrester, which has been in operation for some time past and 63% by the new washing chambers.

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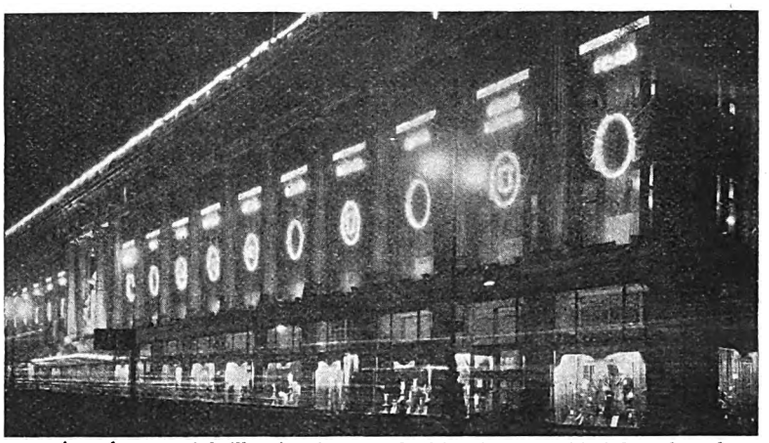
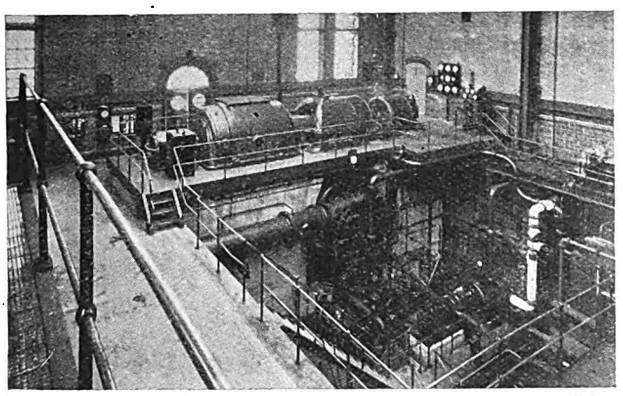
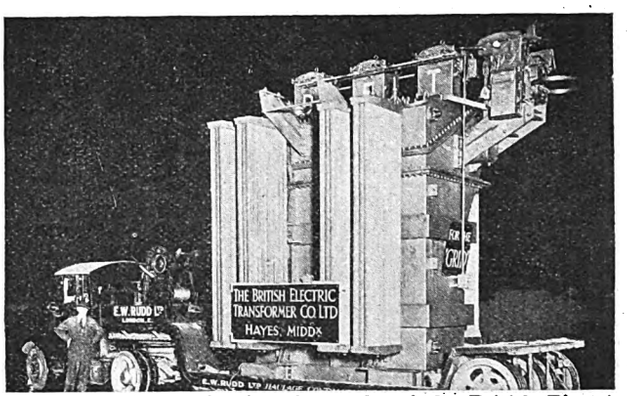
ELECTRICAL PICTURES OF THE WEEK.



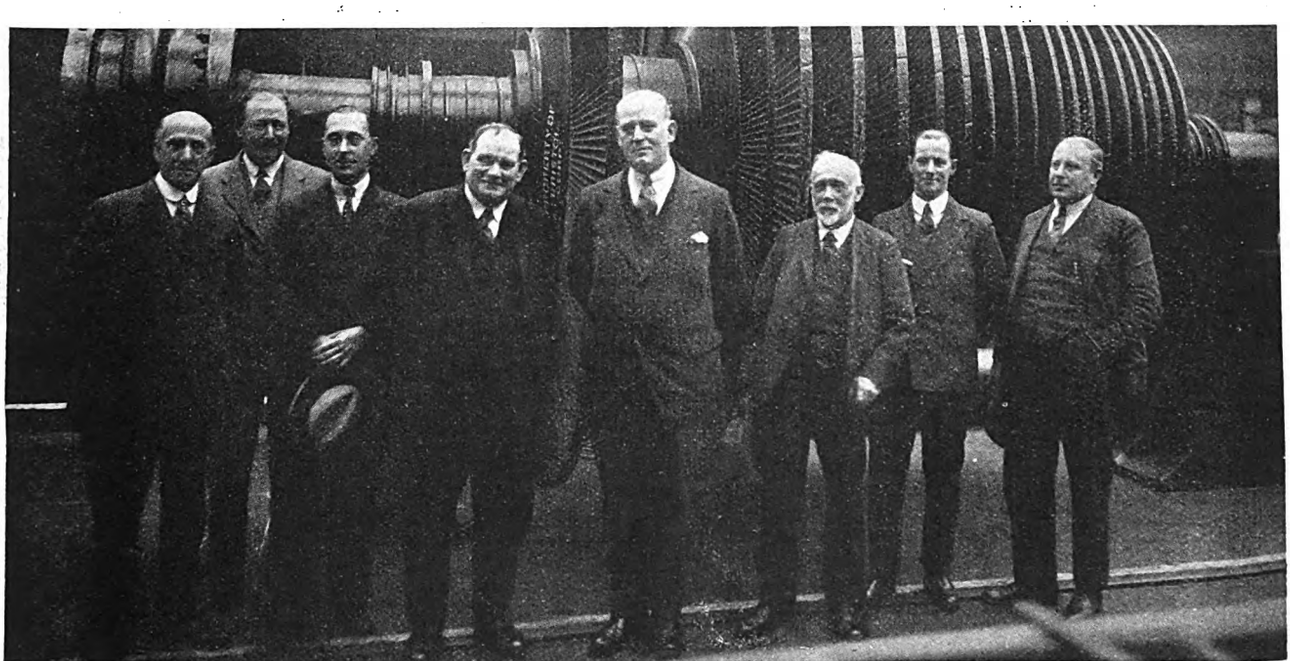
Selfridge's "Birthday Week" has again been the occasion for special illuminations, and this, the 21st birthday, has been treated with even greater thoroughness. The centrepiece on the left is an excellent example of artistic floodlighting, while the picture on the right, of part of the general scheme, indicates in moving light the various countries which the firm serves.



A general view of the new extensions of Bury Corporation Electricity Department, which were started up by the Mayor, Ald. Lees, on March 12th. The new equipment includes a 10 000 kW turbo-alternator, details of which are given on page 371.



A large transformer leaving the works of the British Electric Transformer Co., Ltd., at midnight, on March 13th. The unit weighs 42 tons, and forms part of an order for 1 600 000 kVA placed with the firm by the Central Electricity Board.



A group taken on March 14th on the occasion of an informal visit by the Lord Mayor of Sheffield, Ald. C. W. Beardsley, to the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. Reading from left to right, the names are:—Mr. G. H. Harrison, Lord Mayor's secretary; Mr. A. E. du Pasquier; Mr. G. H. Nelson, manager of the company's Sheffield works; the Lord Mayor; Mr. G. E. Bailey, director; Ald. Snelgrove; Coun. Oates; and Mr. R. G. MacLaverty, Sheffield district manager. The party is standing in front of the low pressure spindle of the 50 000 kW turbine the company is supplying to Portishead.

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COMPANY NEWS.

Improvement of Cables and Wireless Stocks—County of London Co.'s Increased Dividend—Telegraph Construction Co.'s Loss on Trading—New Companies.

THE feature of the week in the electrical share market is the long overdue turn of the tide in Cables and Wireless issues. The 7½ per cent. "A" ordinary stock at 64½ is 5 points higher than a week ago; the "B" ordinary stock is a point better at 29½, and the 5½ per cent. cumulative preference stock has risen 3½ points from 93 to 96½. Speculators in American Telephone and Telegraph stock have called a halt, and the quotation has eased from 250 to 245. Eastern Extension 4% debenture stock is 2 points up at 78. Radio Corporation of America shares continue to be bought, and are not far off 55; International Telephone and Telegraph Stock is $5 lower at 67½. New York Telephone Bonds are above par. Anglo-Portuguese Telegraph shares have improved to 22s. 6d.

No great activity has been seen in the department for the shares of electricity supply companies. The increase in the County of London Company's ordinary dividend from 10 to 11 per cent. for the year, on over three millions of capital, has caused an advance of only 7½d. in the quotation for the shares. Market confidence in the future is evidenced by the early closing of the subscription lists for the £750 000 five-and-a-half per cent. debenture stock of the North Metropolitan Electric Power Company, whose ordinary shares have risen during the week from 46s. 3d. to 47s. 6d. Yorkshire Electric Power shares are 7½d. higher at 32s. 6d., and Whitehall Investments preference are 3d. better at 24s. 3d. Calcutta Supply shares are 1s. 3d. down.

In the electrical equipment section, W. T. Henley's, International Automatic Telephone, and Johnson and Phillips ordinary shares are all 1s. 3d. to the good; but Siemens ordinary shares have fallen the like extent. General Electric "A" preference shares have shed a shilling at 23s., but the 7 per cent. debenture stock is up from 102½ to 104. Crompton Parkinson 8% preference shares have changed hands in the neighbourhood of 22s.

The railway and tramway department is quiet. Metropolitan ordinary stock has eased from 63 to 62½, and the 3½ per cent. debenture stock has put on ½ a point to 68.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	,, ,, "C" Cum. Pref. ..	21/-	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	60/-	60/-	78/-	29/9
6	,, ,, ,, 6% Cm. Pf.	22/-	22/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	45/7½	46/10½	60/-	32/6
5	,, ,, ,, 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	79½	79½	81	77½
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95⅝	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	25/6	25/6	51/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	35/-	35/-	44/6	26/6
8	,, ,, ,, ,, 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	45/-	44/4½	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(*g*)	Electric Supp. Corp. Ord. ..	45/7½	45/7½	59/6	29/6
6	,, ,, ,, 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	,, ,, ,, 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	,, ,, 4½% 1st Mt.Deb.Stk.	87	87	92	80½
—	Hydro Electric Securities.. ..	46½	46½	87	20
—	International Holdings	6½	6½	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/6	26/6	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	,, ,, ,, 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	,, ,, ,, 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	27/-	27/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97	97	104	95
10	Melbourne Electric Ord. Stk. ..	672	172	182	150
10	Metro. Elec. Sup. Ord.	38/9	38/9	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/-	17/-	18/3	16/3
7	Mid. Counties E.S. Ord.	27/-	27/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	32/6	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-TyneElec.Sup.Ord..	23/9	23/9	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	46/3	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	26/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/6	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-*	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/-	27/-	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	94½	94½	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	57/6	57/6	69/-	46/3
	Railways and Tramways.				
4½	BirminghamDist.Inv.Trust1stDeb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	91½	91½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	124½	124½	152	116
7·67	,, ,, ,, ,, 6% Pf. Stk.	129½	120½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	,, ,, ,, 5% Cum. Pf.	12/6	12/6	15/9	13/-
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	73	73	74½	54
4½	,, ,, ,, 4½ Pf.	79½	79½	85½	78
4	,, ,, ,, 4% Deb.	77	77	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	,, ,, 4% Perp. Deb. ..	76½	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	79	42½
4	,, ,, ,, ,, 4% Pf. Stk.	71	71	77	68
4	,, ,, ,, ,, 4% Deb. ..	77	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	,, ,, ,, 5% Deb. ..	70½	70½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	62½	63	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	60½	60½	76	60½
3½	,, ,, ,, 3½% Deb. ..	68	67½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	72½	72½	81½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	78½	78½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	86½	86½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
8	Underground Electric Rlys. Ord.	22/6	22/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	4/3	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	25/-	25/-	58/6	26/3
8	,, ,, ,, 8% C.P.	51/10½	51/10½	56/9	49/6
4	,, ,, ,, 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	73/9	73/9	99/4½	56/-
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	,, ,, ,, 7% Deb.	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	71/3	71/3	91/3	63/9
6½	,, ,, ,, 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	,, ,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
12	Consolidated Signal Ord.	35/-*	35/-	52/-	6/6
5	,, ,, ,, 6% C.P.	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	22/6	22/6	27/-	14/-
6	,, ,, ,, 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	,, ,, 7% C.P. ..	18/9	18/9	22/9	20/-
4	,, ,, 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	95/-	95/-	112/6	60/-
7½	,, ,, ,, 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	,, ,, 6% C.P.	7/6	7/6	18/9	5/-
5½	,, ,, 1st Mt. Deb. ..	86	86	103½	86
6	,, ,, Conv. Deb... ..	65½	65½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	17/6	17/6	92/3	17/10½
10	,, ,, 7% Partic. Pref. ..	28/6	28/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	46/3	81/3	26/6
6½	,, ,, "A" C.P.	23/-	24/-	26/-	22/-
7½	,, ,, "B" C.P.	25/6	25/6	27/9	22/9
7	,, ,, 1st Mt. Deb. ..	104	102½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	121/3	120/-	136/10½	69/3
10	International Auto. Telephone Ord	37/6	36/3	50/6	35/-
10	Johnson & Phillips Ord.	37/6	36/3	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	23/9	25/-	36/6	23/6
10	,, ,, ,, Cum. Pref.	31/3	31/3	34/3	28/9
4½	,, ,, ,, Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	25/-	25/-	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	245	250	314½	144½
4½	,, ,, ,, Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	,, ,, 6% Prefd. Stk.	101½	101½	105½	91
1½	,, ,, Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	22/6	21/10½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	64½	59½	90½	73½
—	"B" Ord. Stk.	29½	28½	104	33
—	5½% Cum. Pref. Stk. ..	96½	93	99	90
3½	Eastern 3½% Pref. Stk.	63½	63½	70½	58½
4	,, 4% Deb.	77	77	81½	73
4	Eastern Extension 4% Deb. Stk.	78	76	80½	73
22	Great Northern Telegraph (£10)	30½	30½	43½	26
—	International Teleph. & Teleg. ..	$67½	$72½	161½	48½
15	Marconi Int. Mar.	43/9	43/9	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	100½	99½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	54½	53½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	77	77	82	73

(*a*) 19/16d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2½d. per share. (*h*) 88s. 2·136d. *Ex dividend.

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Directors' Reports, etc.

POSTAL TELEGRAPH AND CABLE CORPORATION.—Qrtrly. div. of 1¾% on 7% non. cum. pfd. stk. will be payable on Apl. 1.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Fin. div. of 5½%, less tax, makg. 8½% for year, on ord. shs. is announced.

CANADIAN GENERAL ELECTRIC CO.—Quarterly div. of 1¾% for qrtr. ending March 31, 1930, on pref. stk. will be payable on Apl. 1.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½% p.a., less tax, on pref. stk. for qrtr. endg. March 31, 1930, will be payable on April 15.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Subscriptns. have been invited during the present week for £750 000 5½% deb. stk. at par.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Fin. div. of 5¼%, makg. 8% for year, less tax (same as last year), is announced.

TEES POWER STATION CO., LTD.—Pft. for 1929, £118 270, agst. £122 231. Int. £57 981, agst. £63 213. Div. 5¾% subject to tax. Fwd. £2 793, agst £750.

SOUTH STAFFORDSHIRE TRAMWAYS CO.—Income for 1929, £3 426, includg. £895 brt. in. Blce., after deductg. exes., £3 027. Div. on pref. shs., 3% ; fwd., £747.

COUNTY OF DURHAM ELECTRICAL POWER DISTRIBUTION CO., LTD.—Pft. for 1929, £65 799, agst. £59 300. Int. £33 376, agst. £26 862. Div. 6%, subject to tax (same as last year). Fwd. £1 546, agst. £1 224.

ENGLISH ELECTRIC CO., LTD.—At the adjourned mtg. of hldrs. of 5½% sinkg. fund 1st mtge. debs. on Tuesday, the resolution approving and sanctioning cap. reorganisatn. scheme was carried unanimously.

BRUCE PEEBLES AND CO., LTD.—Div. at rate of 7½% p.a., less tax, being fixed div. on pref. shs. for half-year to Dec. 31, 1929, and 2½% on ord. for year, are recommended. A transfer of £7 000 from res. to pft. and loss acct. has been made, leavg. £103 000 standg. to gen. res.

BELL TELEPHONE CO. OF CANADA.—Exchange rev. for 1929 $28 945 314, agst. $26 920 593 ; long distance rev. $10 343 894 increase $1 375 507 ; miscellaneous revs, $1 661 787, increase $325 071. Blce. carried to surplus $668 126. Net gain in telephones 47 211, agst. 45 862.

NEWCASTLE AND DISTRICT ELECTRIC LIGHTING CO., LTD.—Pft. for 1929, £68 361, plus £15 564 brt. in. After provisn. for int. on debs. and loans, redemptn. funds and depreciation (£27 500), blce. is £38 183. Div. at rate of 7%, less tax, for year is recommended. Fwd. £15 055.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Fin. div. of 8%, less tax, makg. 11% for year 1929, agst. 10% on ord. shs. is announced. On ord. shs. issued in December last int. on instalmts. at 5% will be paid until Dec. 31, 1930, after which they will rank for div. *pari passu* with the old ord. shs.

FOREIGN POWER SECURITIES CORPORATION (MONTREAL).—Revs. for year ended Oct. 31, 1929, $520 092, agst. $341 039, pfts. from investmts. $416 887, agst. $122 820. Net earngs $756 665, agst. $434 317 ; added to surplus $415 898. Earngs equal to $3.65 p. sh. on common stk. agst. $1.18 in preceding 18 months.

TELEPHONE MANUFACTURING CO. (1929), LTD.—Statutory rept. states that total number of shs. allotted is 1 000 000, all allotted as fully paid, in consideratn. of business acquired under agreemt. Company has not, up to March 10, 1930, received any cash or made any paymts. Prelim. exps. estimated at £1 000.

BRITISH ALUMINIUM CO., LTD.—Net blce. for 1929, £153 637, agst. £151 921, includg. £33 918 brt. in., and after mtg. all charges and setting aside £50 000 to depreciatn. res., £100 000 to res. fund and £10 000 to staff benefit fund. After providg. for pref. div., fin. div. of 6%, makg. 10% for year, on ord. shs. is recommended. Fwd. £35 559.

TELEPHONE RENTALS, LTD.—Statutory rpt. states that total number of shs. allotted is 2 000 000, all allotted as fully paid up in consideratn. of shs. acquired under agreemt. Receipts to March 10 : cash from sundry installatn. co.'s, £3 650. Blce. at bank £3 650. Prelim. exps. estimated at £2 000, of which £1 000 is payable in respect of duty.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.—Year's tradg. resulted in a loss, but directors have made a transfer from reserves not required and have declared net pfts. for year of £77 801, to which is added £114 123 brt. fwd. Intm. div. of 2½% was paid on July 1, 1929 ; further div. of 7½% (tax free) proposed ; fwd. £102 284.

TILLING-STEVENS MOTORS, LTD.—Pft. for 1929, £82 008, agst. £81 105. Div. on ord. shs. 15% agst. 7½%, after clearing off arrears of pref. div., which was effected in cash or new ord. shs., at hldrs' option. To depreciatin., £10 000, to taxatn. res., £8 500 ; to res., £20 000. After provisn. of £1 050 for additional directors' fees, carry fwd. is £19 211.

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER CO., LTD.—Total rev. for 1929, £5 608. Workg. exes., depreciatn., int., directors' fees, etc., absorbed £4 655, and blce. at debit of net rev. acct. as at Dec. 31, 1928, £463, leavg. blce. of £490. Div. of 2½% on ord. shs. is recommended. Fwd. £156. Electy. sold 239 375 kWh, agst. 156 752.

CORK ELECTRIC SUPPLY CO., LTD.—Shhldrs. have been informed by the directors that the Irish Free State Electy. Board has decided to acquire the co.'s electric lightg. undertakg. as from April 3. Shhldrs. will be advised at gen. mtg. as to the value to be paid for undertakg. and other particulars. In the meantime they are advised not to part with their shs.

HENDON ELECTRIC SUPPLY CO., LTD.—Pft., after mtg. int. on deb. stk. and intm. div. on ord. and div. on pref. and other charges, for 1929, £38 749, agst. £39 811. To repairs and renewals fund £9 125, makg. total of £74 000 ; to gen. res. £3 809, makg. £60 000. Income tax £5 800. Fin. div. 2s. p. sh., tax free, agn. makes 15% on ord. ; fwd. £10 405, agst. £9 628.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Gross pft. for 1929, £473 972, plus int. from investmts., £1 831, discts. on purchases, £1 004, and amt. brt. in, £7 657. After provisn. for int. on deb. stks., loans, etc., singk. fund contributns. (£143 211) special res. company's sh. of consumers' benefit (£58 042), and allocation to co-partners' fund (£39 277), divs. are proposed of 6% on 1st pref., 8% on 2nd pref., and 10% on ord. shs. Fwd. £6 974.

HYDRO-ELECTRIC SECURITIES CORPORATION.—Net income for 1929, $6 893 863, agst. $1 159 134. After deductg. exes. and diff. of exchange, $103 968, and fees to directors and committee, $19 361, total income was $7 017 172, agst. $1 296 439. Investments, valued at $79 194 233, show advance of $35 436 435 over their original cost. Div. of $1 was paid on common shs. for 1929. Qrtrly div. of 50 cents., in respect of currt. year, is now payable.

CROYDON CABLE WORKS, LTD.—An offer has been made by Acons Nominees, Ltd., to purchase the whole of the ord. and pref. shs. of Croydon Cable Works, Ltd., at 20s. 6d. for each £1 1st pref., 17s. for each £1 2nd pref., and 12s. 6d. for each £1 3rd pref. sh., and 11s. for each £1 ord. sh. Acceptances will be received until Mar. 28, and the agreemt. is conditnl. upon acceptance by shhldrs. hldg. at least 75% of each class of sh., or less at the purchasers' optn.

CLYDE VALLEY ELECTRICAL POWER CO.—Pft. for 1929, £354 495, plus £84 586 brt. in. After provisn. for divs. on 6% cum pref. and 8% 2nd pref. and intm. div. of 3% on ord. shs. issued prior to 1929 and transferrg. £152 500 to contingency, blce. is £201 581. Fin. div. of 5% on ord. shs. issued prior to 1929, makg. 8% for year, and div. of 8% from due dates of calls are proposed. To staff benevolent fund £10 000, to writg. off cost of 1929 sh. issue, £808 ; fwd. £86 288.

MERSEY POWER CO.—Satisfactory demand for electy. continues in company's areas. Nearly 1 200 new connections were made during 1929, and sale of electricity increased 10%. Percival Lane power station has met all demands made upon it during year, and has still some reserve of plant to supply new connectns. Although costs have been increased by more than £10 000 for local rates under new assessmt. compared with previous year, yet working pfts., with int. received, for year, is £94 230. Amt. brt. fwd. from previous year is £17 081, makg. total £111 311. After providg. trades facilities, loan int. and pref. div. £43 837, there remains £67 483. Div. of 5% on ord. shs. £24 823, depreciatn. res. £25 000, fwd. £17 660.

BRITISH INSULATED CABLES, LTD.—Pfts. for 1929 advanced from £617 951 to £685 980, to which was added £250 089 brt. in. After makg. provisn. for deb. int., directors' fees, etc., div. on pref. shs., and the intm. paymt. on ord. shs., which absorbed £190 263, directors have again set aside £100 000 as depreciatn. on bdg., etc., and transferred £198 333, agst. £299 966 to res. Fin. div. of 10% is recommended on ord. shs., makg. distributn. for year again 15%., leavg. £280 807 to be carried fwd. Arising from settlemt. of claims in respect of taxtn. and other matters, a sum of £300 000, which had been provided over a period out of rev. is now no longer required. This sum has been set aside as a div. equalisatn. acct. Last year 333 333 ord. shs. and 500 000 5½% "A" pref. shs. were distributed as bonus, and ranked for div. as from Jan. 1, 1929.

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NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.—Pft. for 1929, £876 351, agst. £819 456; int. on deb. stk., loans, etc., £188 567, agst. £204 671; to res. for special depreciatn. and contingencies other than equalisatn. of divs., £175 000, agst. £150 000; to res. for plant renewals and improvements, £75 000, agst. £60 500; brt. fwd. £80 653, agst. £43 206, makg. available pft. £518 437, agst. £447 491. Directors recommend divs. of 3¾% on 7% cum. pref. shs., makg. 7% for year, 2½% on 5% pref. shs., makg. 5% for year, and 3½% on ord. shs., makg. 6% for year, all subject to tax. Fwd. £96 029, agst. £80 653. Expenditure during year on plant renewals and improvemts. amtd. to £85 217, which has been charged agst. res. for plant renewals and improvemts. Additional cap. expenditure for year amtd. to £243 480, and mainly represents extensns. to company's distributn. systems.

OSWESTRY ELECTRIC LIGHTING AND POWER CO., LTD.—The last report of the directors (for nine months ended Sept. 30, 1929) which was adopted at the mtg. on March 11, states that Oswestry Corporation has bought the undertaking for £19 300. The company's cap. and liabilities amt. to £18 450, and the assets, which will accrue to the Corporation, are put at £25 622. The directors state that after providg. for depreciatn. and int. and adding blce of £1 247 from previous year, they are justified in recommendg. a div. at rate of 10% p.a. for the nine months. The result of their negotiatns. with Oswestry Corporation was the sale to the Corporation of their undertakg. for the agreed sum of £19 300, and the Corporation agreed to pay the purchase money, with int. (6½%) as from Oct. 1, when it took over the management. At the date of the report it was expected that the purchase would be completed shortly, and then arrangemnts would be made for windg. up the company.

Company Meetings.

LIVERPOOL OVERHEAD RAILWAY CO.—Ald. M. H. Maxwell, presiding at the meeting last week, said the receipts for the past year fell by £2 738, of which £2 064 was attributable to a reduction of round trip tickets—£1 307 during the week corresponding to Civic Week in 1928. The rates payable on line and stations had been increased approximately 500%. Mr. A. T. Harding protested against the continuance of an allowance to the late manager, Mr. Neachell, and he added that it was ridiculous that the company's drivers and guards should get the same wages as main line men. The chairman agreed that the wages paid were absurd for the class of work, but they were under the Railway Act, and unless the Minister of Transport could be persuaded to change them into a light railway, they could do nothing. The report and accounts were adopted.

HADFIELDS, LTD.—Sir Robert Hadfield, presiding at the meeting on Monday, said the report recommended a dividend of 2½%, less tax, on the ordinary shares. This would leave a balance of £92 295, which it was proposed to carry forward, thus representing an improvement of £1 724 on the amount carried forward from 1928, which in itself was an increase of £4 000. Unfortunately there had been no revival of trade, only a continuance of the serious trade depression throughout this country. There had been a very large diminution in Government work, and this was to be further accentuated. The question of taxation was a serious one for this country. The cost of social services amounted to about £400 000 000, and more than half of that sum was contributed by the productive industries. He hoped the Government would give assistance somehow or other. The chairman also mentioned that small but most important parts of the engines of the Schneider Trophy aeroplanes, which created the present world's record, were made of Hadfield special steel. To show the severity of the test of the sparking plugs, he said 2 000 sparkings per minute (4 000 revolutions) took place in each of the 24 plugs, 48 000 sparkings per minute in all.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Col. R. E. Crompton, presiding at the meeting on March 13th, said the rapid growth of the company's business compelled them to accelerate the work of changing their system from direct current to the new standard alternating current system, and they proposed, therefore, to embark upon an intensive programme in the current year. For this reason it was probable that expenditure of capital during the next few years would be heavy. Turning to the revenue account, it would be observed that the item, "purchase of current," from the London Power Co. increased beyond that of 1928, but this was only natural, seeing that the units sold in 1929—approximately 19 500 000—exceeded by over 3 000 000 their output in 1928. Sales of electricity produced £181 262, against £171 834 in 1928. Their average return in 1929 was 2·237d. per kWh, compared with 2·514d. Their consumers had benefited during the last five years to the extent of early 40%. Whereas in 1924 69% of their sales was represented by lighting, they found that in 1929 supply for lighting represented only 33% of the total. The surplus, shown by their report, was £32 032. Benefit due to ordinary shareholders under the sliding scale was £10 316, which it was proposed to transfer to special reserve. The amount appropriated to the co-partnership fund was £3 998. Out of 22 500 000 kWh purchased from the London Power Co. the electricity paid for by consumers amounted to 19 500 000 kWh; in other words, the efficiency in conversion and distribution was 86½%.

New Companies.

BARKER'S WIRELESS, LTD.—Cap., £500. Wireless and wireless accessory agents and contractors, etc. Office: Buchanan Buildings, 24, Holborn, London, E.C.1.

UNITED UTILITY CO., LTD.—Cap., £2 000. Manufacturers of and dealers in telephone and motor appliances and parts, etc. Reg. Office: 12, Denman Street, London, W.1.

WILLEY AND CO., LTD.—Cap., £1 000. Electrical engineers, manufacturers of and dealers in electricity meters, and other electrical apparatus, etc. Reg. Office: Water Lane, Exeter.

SCIENTIFIC APPLIANCES, LTD.—Cap., £500. Electrical and mechanical engineers, scientific appliances manufacturers, etc. Solicitor: W. H. Lane, 27, Chancery Lane, London, W.C.2.

S. O. BOWKER, LTD.—Cap., £1 000. Manufacturers, importers and exporters of or dealers in electrical equipment and fittings and accessories, wireless equipments, telephones, etc. Reg. Office: 43, Cannon Street, Birmingham.

WESTBROOK AND CO., LTD.—Cap., £500. Contractors, electricians, electrical engineers, etc. A director: G. A. Day, 17, Chichester Road, Portsmouth, builders' merchant. Reg. Office: 67, Ripley Grove, Portsmouth.

MOSBROUGH ELECTRIC SUPPLY CO., LTD.—Cap., £5 000. To carry on at Mosbrough and elsewhere in Derbyshire the business of an electric lighting and supply company, etc. Solicitors: Hall and Renwick, Eckington, near Sheffield.

BALCOMBE'S SUPPLIES, LTD.—Cap., £1 000. Importers and exporters of and dealers in electrical and metal goods, lighting, heating and cooking appliances and accessories, etc. Reg. Office: 52 to 58, Tabernacle Street, London, E.C.2.

GOODALIS (MERTHYR TYDFIL), LTD.—Cap., £500. Manufacturers of and dealers in electric and other apparatus required for use in connection with business of wireless, television, telephone and telegraph company. Solicitor: B. Hamilton, Merthyr Tydfil.

METAL AND CHEMICAL PRICES.

TUESDAY, March 18th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£76 0 0	£0 5 0	—
Electro Wirebars .. .. ,,	£84 5 0	—	—
H.C. Wire, basis .. .. .. per lb.	11¼d.	—	—
Sheet .. .. ,,	11 11/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. .. per lb.	1s. 2¼d.	—	—
Brass (60/40)—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet ,, ... ,,	10¼d.	—	—
Wire ,, ... ,,	10¼d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. ,,	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£20 0 0	—	—
Foreign or Colonial .. .. ,,	£18 10 0	—	—
Tin—			
Ingot .. .. per ton	£160 17 6	—	17s. 6d.
Wire, basis .. .. .. per lb.	2s. 2¼d.	—	—
Aluminium Ingots .. .. .. per ton	£95 0 0	—	—
Spelter .. .. ,,	£18 0 0	—	2s. 6d.
Mercury .. .. per bottle	£22 17 6	—	2s. 6d

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £30 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2¼d.
Sodium Bichromate—Per lb., 3¼d.
Rubber—Para fine, 8¼d.; plantation, 1st latex, 7 7/16d.

*** The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

The lead market, according to James Forster and Co., showed a steadier tone last week. The American price now stands at 5.50 cents per lb. as against 6.25 cents on February 25th, a fall of about 75s. per ton as against a drop in London since February 18th of 62s. 6d. per ton. Closing prices on March 14th were £18 10s. for March, £18 12s. 6d. for April, £18 13s. 9d. for May, and £18 15s. for June, or unchanged on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CARTER, Mr. G. H., 34, Aldermanbury, Bradford (trading as UNIT ELECTRICAL SERVICES), electrical factor. £23 9s. 3d. February 13th.

COOK, Marshall R., Southchurch Road, Southend, wireless dealer. £11 2s. 8d. November 12th.

CROSS, Ernest W., 48, Exmouth Street, Barrow-in-Furness, electrical engineer. £15 10s. 6d. January 22nd.

DE WITT, Mr. F., 145, Wandsworth Road, wireless goods dealer. £18 14s. 7d. February 3rd.

FEATHERSTONE, Mr. W. H., 15, St. Paul's Road, Walworth, electrical engineer. £71 15s. 5d. February 12th.

HARPER ELECTRIC CO., 30, Durward Street, E., electrical engineers. £27 5s. 1d. February 11th.

HENWOOD, W. R., AND CO., 9, Victoria Villas, St. Budeaux, Devonport, wireless dealers. £13 6s. 6d. January 16th.

HIGHFIELD ELECTRIC CO., 26, Sparkenhoe Street, Leicester, electrical engineers. £11 8s. 7d. February 7th.

NORTH SURREY ELECTRICAL FACTORS, LTD., 77, George Street, Croydon, electrical and wireless factors. £11 8s. 4d. January 9th.

STATION STORES, 183, High Road, Dagenham, wireless dealers. £20 2s. 7d. December 20th.

THOMAS AND STINCHCOMBE, LTD., 6, Narrow Wine Street, Bristol, radio engineers. £18 11s. 6d. January 15th.

WALLER, Joseph, 80, Hampstead Road, Hampstead, electrical and wireless dealer. £13 8s. 6d. February 5th.

WARNER, Leslie Charles, 4, School Lane, Leominster, wireless dealer. £15 9s. 3d., February 3rd; £22 13s. 2d., January 21st; and £11 17s., January 27th.

Deed of Arrangement.

WALLER, John Dallas, 21, Church Street and 51, Skipton Road, Ilkley, electrician. Dated March 7th, filed March 12th. Trustee, T. Kirkley, Lloyds Bank Chambers, Brook Street, Ilkley. Liabilities unsecured, £594; assets, less secured claims, £205.

Receiverships.

ARTANDIA, LTD.—J. M. Napier, of 317, High Holborn, W.C.1, was appointed receiver on February 28th, 1930, under powers contained in instrument dated January 17th, 1928.

CLAYTON TOOL CO., LTD.—W. F. Baker, of 93, Mortimer Street, W.1, was appointed receiver and manager on February 28th, 1930, under powers contained in first mortgage dated October 15th, 1929.

STAFFORDSHIRE ELECTRICAL ACCESSORIES CO., LTD.—D. H. Bates, incorporated accountant, of 10, Cheapside, Hanley, Stoke-on-Trent, was appointed receiver and manager on March 3rd, 1930, under powers contained in debentures dated July 29th, 1921.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

AEONIC RADIO, LTD., London, W.—Registered March 5th, £6 000 debenture, to J. L. Gottlieb, 10, Hillcrest Avenue, N.W.11 general charge (subject, etc.)

BORDER ELECTRICAL FACTORING CO., LTD., Carlisle.—Registered February 25th, £1 000 debenture, to T. B. Harris, Eastview, Blackwell Road, Carlisle; general charge.

LANGHAM RADIO, LTD., London, W.C.—Registered March 8th, debenture to Bank; general charge.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

STAFFORDSHIRE ELECTRICAL ACCESSORIES CO., LTD., Lichfield Street, Hanley.—At the statutory meeting of the creditors in this voluntary winding up, the statement of affairs showed ranking liabilities of £1 261, all due to unsecured creditors, and assets estimated to realise £1 007, subject to preferential claims of £85, and debentures totallng £1 462. The assets were insufficient to pay the debentures in full, and consequently there were no assets available for the unsecured creditors. It was reported that the company was formed in 1919 to take over an existing business. Shares to the value of £2 251 were issued to the vendor, and further shares to the value of £2 251 were allotted for cash. The debentures were issued in March, 1920, and were subsequently transferred to the bank. The accounts showed that in 1927 there was a profit of £39, and in the following year a profit of £8. In 1929 there was a loss of £350. The sales in 1928 totalled £6 067, but in the following 12 months they fell to £4 518. In consequence of a distress for rent the bank appointed Mr. D. H. Bates, accountant, of Hanley, as receiver. The creditors passed a resolution confirming the voluntary liquidation of the company with Mr. Bates as liquidator. The principal creditors are:—Kelvinator, Ltd., £133; Davies Insulating Co., £145; General Electric Co., £64; British Thomson-Houston Co., £95; Teeton, H. W., Ltd., £103; Bates, D. H., and Co., £72; Credenda Conduits, Ltd., £44.

London Gazette, etc.

Companies Winding-up.

M. E. D. A. S., LTD., 185, Hammersmith Road, London. Winding-up Order, March 10th.

SYMPHONY GRAMOPHONE AND RADIO CO., LTD. Winding-up Order, March 17th.

Companies Winding-up Voluntarily.

COOK'S WIRELESS CO., LTD.—Meeting of creditors at the London and North Eastern Railway Hotel, Liverpool Street, London, E.C.2, on Monday, March 24th, at 12 noon.

STAFFORDSHIRE ELECTRICAL ACCESSORIES CO., LTD.—By reason of its liabilities, March 11th. D. H. Bates, 10, Cheapside, Hanley, incorporated accountant, appointed as liquidator.

STANDARD ELECTRIC CO., LTD.—By special resolution, March 11th. J. Johnston, C.A., 190, West George Street, Glasgow, appointed as liquidator.

WELLSTEEDS (SWANSEA), LTD.—By reason of its liabilities, March 12th.

Notices of Dividends.

HUNT, Sydney Everest, 8A, Torwood Street, Torquay, electrical engineer and contractor. First and final dividend, 1½d. per £, payable March 26th, 4, Charterhouse Square, London, E.C.1.

LITTLER, John, 9, Hoghton Street, Southport, electrical and radio engineer. Second and final dividend, 8d. per £, payable March 20th, at the offices of A. T. Eaves, chartered accountant, 47, Mosley Street, Manchester.

Partnerships Dissolved.

BATTY, J., AND CO (Tom DAWSON and Gilbert BERRY), electrical and wireless engineers, 9, Fleet Street, Burnley, by mutual consent as from March 13th, 1930. Debts received and paid by T. Dawson, by whom the business will be carried on.

WHOLESALE ELECTRO SUPPLY STORES (Allan BUCKLEY and Clifford VOWLES), merchants and factors of electrical accessories and appliances, Lower George Yard and 10, Gaol Lane, Halifax, Yorks, by mutual consent as from February 21st, 1930. Debts received and paid by A. Buckley.

Bankruptcy Proceedings.

STANDARD PLATINUM CONTACTS, LTD., 121-3, Shaftesbury Avenue, London, W.C.2. In the compulsory liquidation of this company, the Official Receiver has issued a summary of its statement of affairs, which discloses unsecured liabilities £2 684, net assets £522, and a total deficiency of £5 661 with reference to the shareholders. In his accompanying observations, the Official Receiver reports that the Company was incorporated in August, 1927, with a nominal capital of £5 000 divided into shares of £1 each, of which £3 499 has been issued. It was promoted by Charles Edward Taroni, senr., who states that in August, 1926, he began for his son a business under the style of the Standard Platinum Screw Co., in Mortimer Street, W. The company was formed in order to take over the business so that Taroni, who was financing it although he took no practical part in its direction, might have the benefit of the limited liability afforded by the Companies Act. The manufacturing part of the company's business was conducted in Holden Road, Finchley. It has throughout been financed by Taroni, who also guaranteed a bank overdraft. In July last the lessors of the registered offices distrained for renr and furniture, plant and machinery were sold in September undet the distraint. Taroni admitted that it was owing to this distraint that the idea of a debenture being issued to him to secure part of his advances was suggested and on August 22nd last a debenture for £600 constituting a floating charge over the assets was issued to him. The circumstances connected with this debenture are such that in the Official Receiver's opinion it is invalid as a charge. Taroni has acquiesced in this view and he consented to the company's assets being realised and distributed without regard to the charge. Of course, the amount he has advanced will rank as an unsecured claim. He attributes the failure of the company to inefficient management and to the liabilities incurred in connection with the premises in Shaftesbury Avenue. The Official Receiver states that directly all the assets have been realised a dividend will be paid, but it is obvious from the figures that its amount will be small.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

322 159 J. J. Brewer and F. F. Brewer. Blocks for switches, ceiling-roses and other electrical fittings. (23/7/28.)
322 171 Pennant Manufacturing Co., Ltd., and A. D. Arter. Device for preventing the unauthorised use of electric switches. (21/8/28.)
291 101 Ganz-Fele Villamossagi Reszvenytarsasag. Apparatus for regulating voltage in a.c. distribution systems. (28/5/27.)
322 199 Ganz-Fele Villamossagi Reszvenytarsasag. Apparatus for regulating voltage in a.c. distributing systems. (1/6/28.)
322 197 J. Neale. System of railway control and signalling. (31/5/28.)
322 118 S. O. Cowper-Coles. Electrolytic removal of metal from metallic bodies. (5/6/28.)
297 769 M. Charles. Electric switches for motor vehicles. (27/9/27.)
322 208 W. S. Smith, H. J. Garnett, J. N. Dean, H. C. Channon, W. Gardner, and H. F. Wilson. Electrical insulating-materials. (25/8/28.)
322 188 Electrolux, Ltd. (Platen-Munters Refrigerating System Aktiebolag). Thermostat devices for refrigerating-apparatus. (27/8/28.)
296 311 M. J. Goldberg and Soehne Ges. Apparatus for the production of sounds and the reception of wireless signals. (27/8/27.) (Addition to 244 133.)
296 315 H. Hartman. Incandescent electric tubes. (26/8/27.)
322 190 Standard Telephones and Cables, Ltd., E. P. G. Wright, J. H. E. Baker, and A. H. Cameron. Call-finders for automatic and semi-automatic telephone systems. (29/8/28.)
322 192 S. L. Price. Telephone apparatus for transmitting and/or reproducing audible signals. (29/8/28.)
307 042 Westinghouse Brake and Saxby Signal Co., Ltd. Railway switch-operating apparatus and the like. (3/3/28.)
322 225 G. M. Wright and S. B. Smith. Photo-electric cells and circuits therefor. (31/8/28.)
322 239 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic or semi-automatic telephone systems. (5/9/28.)
322 240 Standard Telephones and Cables, Ltd., and J. K. Webb. Power cables. (5/9/28.)
322 241 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic and semi-automatic telephone exchange systems. (5/9/28.)
322 242 Automatic Telephone Manufacturing Co., Ltd., W. H. Paulett, and C. Gillings. Telephone systems. (5/9/28.)
322 244 J. Brown. Feeder-distribution boxes particularly for wireless aerials. (5/9/28.)
322 251 L. Fuller and G. J. A. Fuller. Galvanic batteries. (6/9/28.)
322 262 British Power Railway Signal Co., Ltd., and E. C. Irving. Light signals for controlling railway and other traffic. (15/9/28.)
297 363 Kalle and Co. Akt.-Ges. Manufacture of light-sensitive layers. (19/9/27.)
297 442 Schoeller and Co. Elektrotechnische Fabrik Ges. Electric cigar or the like lighter. (21/9/27.)
322 271 Igranic Electric Co., Ltd., and A. D'A. Hodgson. Radio valve circuits. (28/9/28.)
299 306 Siemens and Halske Akt.-Ges. Electrolytic production of protective coatings of peroxide of lead on electrical conductors. (22/10/27.)
322 283 Brandes, Ltd., T. D. Ward-Miller, and A. K. Paterson. Transformer coils, particularly for wireless receiving-apparatus. (11/10/28.)
322 285 E. P. Griffin and W. A. Buckley. Electric batteries. (11/10/28.)
322 288 General Electric Co., Ltd., and W. P. Gauvain. Electric power apparatus for dairy farms. (15/10/28.)
322 290 J. Schurmann and Fabrik Elektrischer Zunder Ges. Electric blasting-fuses. (17/10/28.)
313 909 Rockbestos Products Corporation. Insulated conductors. (19/6/28.)
322 293 H. E. Wimperis. Apparatus for indicating or signalling acceleration. (22/10/28.)
322 294 S. G. S. Dicker (N.V. Philips' Gloeilampenfabrieken). Electrical amplifying arrangements. (24/10/28.)
299 780 Westinghouse Lamp Co. Electric incandescent lamps or similar articles. (31/10/27.)
299 715 Westinghouse Lamp Co. Vacuum electric tube devices. (27/10/27.)
322 308 British Thomson-Houston Co., Ltd., A. P. Young, and L. Griffiths. Electric contact-breakers. (10/11/28.)
322 309 British Thomson-Houston Co., Ltd., A. P. Young, and L. Griffiths. Electric contact-breakers. (10/11/28.)
322 316 General Electric Co., Ltd., and J. P. S. Pillans. Electrical apparatus. (15/11/28.)
322 326 R. T. Smith and C. H. Smith. Wireless direction-finding systems. (22/11/28.)
322 347 W. Dornig. Constant-speed multi-frequency electrical generating-apparatus. (8/12/28.)
322 356 Siemens Bros. and Co., Ltd., and D. A. Christian. Switch mechanisms as used in automatic telephone and like selective systems. (14/12/28.)

Applications for Patents.

November 14th.

34 799 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Dynamo-electric machines.
34 804 F. J. Buckley. Magnetic mechanism.
34 776 F. B. Cox. Electric switches.
34 777 F. B. Cox. Electric switchgear.
34 768 Electric Fires, Ltd. Electric kettles, etc.
34 851 W. Engelke and H. L. Read. Light sensitive bridges, etc.
34 863 L. Koros. Arrangement for connecting discharge gaps for maintaining constant voltage. (15/11/28, Hungary.)
34 821 G. E. Liljeckvist. Means for connecting cables to accumulators, etc.
34 765 R. S. Long. Electric heater for motor cycle handlebar.
34 842 H. Muller. Apparatus for guiding and protecting cables. (15/11/28, Switzerland.)
34 768 F. L. Newhouse. Electric kettles, etc.
34 818 Gisbert, Freihers von Romberg. Plug for electric circuits.

November 15th.

34 952 Associated Electrical Industries, Ltd., and D. R. Davies. Electric switchgear.
34 911 A. Bamford. Electric plug and socket connections.
34 920 C. G. Borthwick. Automatically switching off current in motor vehicles, etc.
34 898 G. B. Burnside and Electrical Central Heating and Ventilating Co., Ltd. Electric heating and ventilating systems.
34 937 Burovox, Ltd., S. Canthery and S. C. Winfield-Smith. Telephone systems.
35 046 A. M. Codd. Telephone receivers.
35 043 Espe Werk Ges. Strewlow and Prunzel. Electrical transformer device for internal combustion engines. (17/11/28, Germany.)
34 886 Etchells, Congdon and Muir, Ltd., and F. Muir. Gate locking apparatus for electric lifts.
35 019 H. J. Garnett. Submarine cables.
34 875 Gramophone Co., Ltd. Electron emitting cathodes for electric discharge devices.
35 023 H. C. Grant and W. Kidde and Co., Inc. Electrical systems.
34 972 M. Grutzmacher. Conversion of variations of light intensity into variations of electric current. (16/11/28, Germany.)
34 984 E. C. Hamilton and E. R. Troughton. Primary batteries.
35 031 Koch and Sterzel Akt.-Ges. Electric switches. (29/11/28, Germany.)
34 936 G. Mascarini. Electrically heated boilers. (16/11/28, Italy.)
34 973 Mix and Genest Akt.-Ges. Microtelephones. (16/11/28, Germany.)
34 981 Mix and Genest Akt.-Ges. Telephone casings.
35 012 Mix and Genest Akt.-Ges. Dialling apparatus for automatic telephones. (20/11/28, Germany.)
35 019 W. S. Smith. Submarine cables.
34 948 Standard Telephones and Cables, Ltd. (W. Hatton and R. Dahl). Automatic telephone systems.
34 926 R. N. Wellington. Electric plug connectors.
34 910 P. J. de Wet. Electric terminals, etc.

November 16th.

35 089 Associated Electrical Industries, Ltd., and G. E. Bailey. Insulating bushings.
35 092 British Thomson-Houston Co., Ltd. Systems of motor control. (16/11/28, U.S.)
35 058 M. Brown and Simplex Floor Planing and Treatment Co (1929), Ltd. Single phase squirrel-cage motors.
35 099 A. Chanin and J. Nisenson. Controlling devices for wireless apparatus.
35 115 E. H. Chapman and T. B. Franklin. Location of underground conductive bodies.
35 101 Ing. F. W. Dannhauser and Co. Electric illumination of pianofortes. (16/11/28, Germany.)
35 082 V. W. Edwards. Wireless loud speakers.
35 109, 35 110 H. C. Heide (Moto Meter Gauge and Equipment Corporation). Electric indicating instruments, etc.
35 100 Kolster-Brandes, Ltd. Broadcasting systems. (17/11/28, U.S.)
35 054 A. W. Macnamara. Machines for production of electric coils.
35 108 Marconi Wireless Telegraph Co., Ltd., and N. Wells. Thermionic modulating systems.
35 102 Maschinenfabrik Oerlikon. Electric motor vehicles. (14/12/28, Switzerland.)
35 114 G. Millington and P. W. Willans. Telephone transmitters, etc.
35 121 D. N. Sharma. Television, etc., systems.
35 088 Siemens-Schuckertwerke Akt.-Ges. Manufacture of electric cables. (17/11/28, Germany.)
35104 Siemens and Halske Akt.-Ges. Influencing transmission equivalent of discharge tubes, etc. (17/11/28, Germany.)

COMING EVENTS.

Friday, March 21st (To-day).

British Electrical Development Association.—Savoy Hotel, Strand, London. Luncheon, 1 *p.m.*; followed by annual general meeting. 3 *p.m.*

Batti-Wallahs' Society.—Hotel Cecil, Strand, London. Annual dinner and dance. 7 *p.m.* for 7.30 *p.m.*

Institution of Electrical Engineers (North-Eastern Students' Section).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. J. Bennet and O. A. Chrisp on "A Survey of Switch and Control Arrangements with Examples of Modern Practice." 7.15 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference. 7.30 *p.m.*

Saturday, March 22nd.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Visit to the Post Office (London) Railway, Mount Pleasant. 4 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London. Informal meeting. 7 *p.m.*

Monday, March 24th—Thursday, April 17th.

Ideal Home Exhibition. Olympia, London.

Monday, March 24th.

Electrical Contractors' Association (Ealing Sub-Branch),—Ordinary meeting.

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. H. A. Humphrey, D. M. Buist and J. W. Bansall on "The Imperial Chemical Industries, Ltd.'s Steam and Electric Power Plant at Billingham." (To be illustrated by a cinematograph film). 7 *p.m.*

Tuesday, March 25th.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Ordinary meeting.

Illuminating Engineering Society.—Lecture Theatre at the Home Office Industrial Museum, Horseferry Road, London, S.W. Paper by Mr. S. Anderson on "Textile Lighting." 7 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, King Street, Leeds. Paper by Messrs. H. A. Humphrey, D. M. Buist and J. W. Bansall on "The Imperial Chemical Industries, Ltd.'s Steam and Electric Power Plant at Billingham." (To be illustrated by a cinematograph film.) 7 *p.m.*

Institution of Electrical Engineers (Students' Section of the North-Western Centre).—Engineers' Club, Albert Square, Manchester. Paper by Mr. F. C. Walmsley on "The E.H.T. Oil Circuit Breaker." 7.15 *p.m.*

Wednesday, March 26th.

Electrical Power Engineers' Association, Manchester.—Paper by Mr. G. L. Porter on "Tap Changing of Transformers under Load."

Electrical Contractors' Association (West of London Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—Ordinary meeting.

Electrical Development Association (North East Area).—Sopwith's Lounge, Northumberland Street, Newcastle-on-Tyne. Paper by Mr. K. M. McKenzie on "Generation and Supply of Electricity." 7.15 *p.m.*

Thursday, March 27th.

Electrical Association for Women.—Visit to the Ediswan Works, Ponders End, Middlesex. 2.30 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Paper by Mr. H. H. Harrison on "Developments in Machine Telegraph Systems and Methods of Operation." 6 *p.m.*

Friday, March 28th.

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington. Annual general meeting. 5 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Joint meeting at the invitation of the Manchester Association of Engineers. Paper by Mr. J. Calderwood on "Marine Diesel Installations, with particular reference to Auxiliary Machinery." 7.15 *p.m.*

Royal Institution of Great Britain, 21, Albemarle Street, London. Lecture by Sir E. Rutherford on "The Transmutation of Matter." 9 *p.m.*

Saturday, March 29th.

Association of Mining Electrical Engineers (Western Sub-Branch).—Informal discussion on H.M. Electrical Inspectors' Report for 1928.

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

Finsbury Technical College Old Students' Association. — Trocadero Restaurant, Piccadilly Circus, London. Annual dinner. 6.30 for 7 *p.m.*

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THE ELECTRICIAN. March 28, 1930.

TENTH ANNUAL SPRING TRADE NUMBER.

THE ELECTRICIAN

Vol. CIV.—No. 2704. Friday, March 28, 1930. [Registered at the General Post Office.] One Shilling

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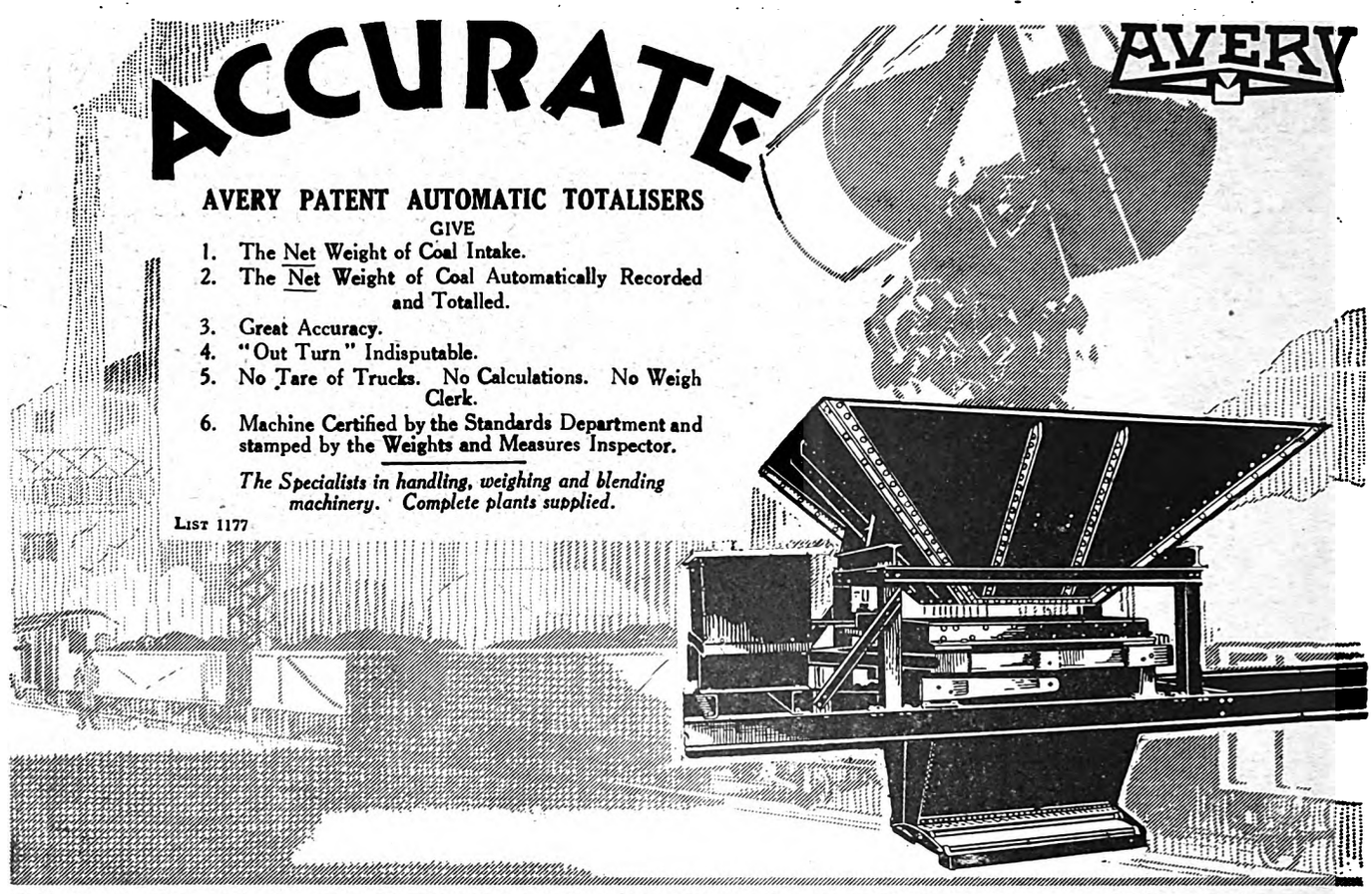

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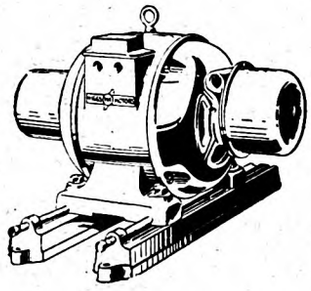

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

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No. 2704. [No. 13. Vol. CIV.] Friday, March 28, 1930. Annual Subscription, 25s. Overseas, 30s.

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E.D.A.'s Record and Possibilities.

THE latest annual report of the British Electrical Development Association, covering the calendar year 1929, contains as usual a remarkable record of activity in a very wide field. When it is remembered that the annual revenue at the disposal of E.D.A. does not much exceed £30 000—little more than the amount usually regarded by advertising experts as the minimum on which a national campaign can be usefully conducted—the achievements of Lieut.-Colonel VIGNOLES, Mr. DALE and their capable staff can be more readily appreciated at their true value. The report is certainly not guilty of exaggerating the results attained when it records that "the influence of the Association is growing steadily, while interest in electrical matters is rapidly increasing." The increase in membership during the year is described as gratifying, and the establishment of three additional provincial area sub-committees is a valuable extension of the ground which is under intensive cultivation. There are now nine of these sub-committees in existence in addition to eleven sub-committees dealing with particular aspects of electrification. The Industrial Electric Heating and Exhibition Advisory Sub-Committees have been very active; so has the committee representing all sections of the industry set up last May to supervise the E.D.A. Electric Homes (Outlet) campaign. This has already justified itself, and is to be placed on a more permanent basis. Already nearly half a million copies of "The House You Want" have been disposed of, and it seems probable that many more will have to be printed.

Satisfaction with what has been and is being accomplished by E.D.A., as the spearhead of electrical publicity and propaganda in this country, must not blind us to the fact that a great deal more could be done if the industry contributed on a more adequate scale to the Association's revenue. One-tenth of one per cent. of the annual revenue of a supply undertaking is not an onerous subscription towards a national campaign, yet little more than half the amount that would be available if all such undertakings contributed on this scale is actually at the disposal of E.D.A. Some of the subscribing undertakings pay less than the recommended amount; others do not contribute anything, though they derive nearly as much advantage from E.D.A.'s activities as the subscribing concerns. To such non-contributing undertakings, Mr. R. P. SLOAN, speaking at the annual luncheon of the Association a week ago, aptly quoted EMERSON'S line: "He is base who receives favours and renders none." We gather than one self-confessed black sheep, through its representative at the annual general meeting which followed the luncheon, promised to mend its ways. Last year thirty-four others saw the light, and eight of the black and white variety adopted an increased rate of subscription, so that we may hope before long to see all the delinquents brought into the fold, and 100 per cent. white.

There is no fear that an increase in the available funds will lead to wasteful or unprofitable expenditure. Much useful work remains undone merely because the money required to finance it is lacking. Displays such as the pavilion at Charing Cross underground station, which has already been inspected by more than 70 000 persons, could be arranged with advantage in many other places throughout the country. Every exhibition, show and fair should have its E.D.A. stall, and there is great scope for travelling demonstrations such as the Canadian motor bungalow, of which a picture is reproduced on page 391. Advertising could be greatly extended without extravagance or redundancy, and many more booklets dealing with various uses of electricity could be circulated. One might extend the list indefinitely. The organisation exists, and it has already shown conclusively that it is capable of doing great things with very limited resources. Given adequate financial backing it would be difficult to set a limit to its possibilities.

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Current Topics.

The Silver Lining.

WHEN prices tumble about our ears, bank rates fall, and unemployment figures mount, pessimism would seem to be natural. It is certainly fashionable. Most of the scribblers in the lay Press, and, of course, most of our politicians, are busy explaining to us and to the world the horrible plight of our industrial and commercial position. All this may be true at the moment on a very short view, but there is another and a brighter side. The present depression is one more step towards that condition of normality and stability which must be reached some day, and the sooner the better. Those business men whose memories and experience go back to the pre-war period suffer from no delusions on this matter. They know that a price level is a natural thing which must develop out of the needs of the market, and must represent the point at which supply and demand in that market can meet in a natural and a healthy way.

Progress Towards a Natural Basis.

FAR too many people, whose knowledge of practical economics is limited to the artificial conditions which have ruled the world since August, 1914, still cling to the impression that prices can be arranged, values adjusted, markets secured and production controlled by various artificial regulations and arrangements. Nobody else believes that such arrangements can have any permanent value in them. They may help us over a crisis now and again, but, in the end, business can never be sound until it is on a natural basis. During the war we reduced the value of the £ from 20s. to 8s. 6d. By a long, weary and troublesome process we have since got so far with the work of restoration as to make the old £ worth 16s. or 17s. There is still 3s. or 4s. worth of war-time inflation in it, and that has to go before we can once again be sure that a pound is a pound, and proceed with solid business on that firm foundation. If the present slump has achieved, as it seems possible that it may have done, a large part of this unpleasant but healthy and necessary task, then we are all the nearer to a normal state of affairs and a prospect of prosperity that is real.

Empire Radio Telephony.

IN a letter to "The Times" the Marchese MARCONI has challenged some of the statements made by the Postmaster-General in the House of Commons in support of his decision not to employ the Marconi Beam stations for long distance radio-telephony. The White Paper giving the replies of Dr. SMITH and Professor HOWE to the questions submitted by the Cabinet Committee contains so many "probablys" that the demand for a series of strictly controlled comparative tests of the Post Office and the Marconi Beam systems will be reinforced by the publication of this document. The considered view of the experienced engineers of the Marconi Co. as to the value of high aerials for long distance telephony ought not to be overridden by the cautious statement of the two experts consulted by the Cabinet Committee that the Post Office low aerial system is *probably* equally efficient. The case for further inquiry which would embrace fully comparative tests of the two systems is so strong that the Government will be well advised to refer the matter to an expert committee for a complete investigation of the whole question. There still remains grave doubt as to the wisdom or equity of separate control of long distance telephony and telegraphy, and it is to be feared that such a division cannot fail to bring about a lot of friction that would be much better avoided.

Advertising the Telephone.

AT the general meeting of the Automatic Telephone Manufacturing Co. a few days ago, Sir ALEXANDER ROGER, the chairman, said that as the result of the expenditure of nearly £70 000 in five years on advertising by the Telephone Development Association, the various branches of the British telephone industry had obtained new business to the value of over £6 000 000. He regarded this result as an indication of what might be expected to follow a more liberal policy in telephone advertising and propaganda. Dealing with the remarkable strides made by telephony in the past ten years, Sir ALEXANDER ROGER pointed out that we were rapidly approaching the time when millions of telephone subscribers throughout the world will be able to converse with one another over any distance and between any two countries. It would not matter whether we were on land, at sea or travelling through the air. The whole business world was rapidly becoming one huge multiple telephone area. Certainly in a few more years the man who wishes to escape temporarily from civilisation and its mechanical intrusions on privacy and leisure will have to go to a lot of trouble to cover his tracks.

Canada as a Market.

APART from such matters as price, customs tariff and marketing arrangements, there are several other fences to be negotiated by British electrical manufacturers who seek to sell their goods in Canada. To the extent that the approval of the Ontario Hydro Electric Commission is now being accepted in most parts of the Dominion as readily as that of the Underwriters' Laboratory at Chicago, one of the difficulties formerly encountered is becoming less serious. But approval of apparatus was not the main obstacle in the way of an increased sale of British electrical goods in the Dominion. Differences of wire sizes, conduits, threads, and so on, in the case of many of the smaller appliances are, as Mr. W. P. DOBSON, chief testing engineer for the Ontario Hydro Electric Power Commission, points out in the Canadian weekly, "Hardware and Metal," a much more powerful deterrent to prospective buyers. Canadian standards must be met in such cases or the British article will have little chance in that market, even if the approving body—whether American or Canadian—has passed it as complying with requirements in regard to quality.

Supply Voltage Variations.

LIEUT.-COL. H. W. WATTS draws our attention to the fact that in last week's issue the variation on either side of the declared pressure permitted to supply undertakings under the Electricity Commissioners' regulations was given as 2½% whereas it is actually 4%. The former figure relates to the frequency. It will be seen, therefore, that an all mains set should be designed to tolerate an overall variation of not less than 10% in order that it may perform satisfactorily where the actual supply voltage variation does not exceed the statutory ±4%. To cover actual variations a considerably larger tolerance factor would seem desirable.

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BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION.

Annual Luncheon—Mr. Herbert Morrison Urges Extended Publicity Effort—Appeal to Non-Subscribing Undertakings—Example Set by Gas Companies.

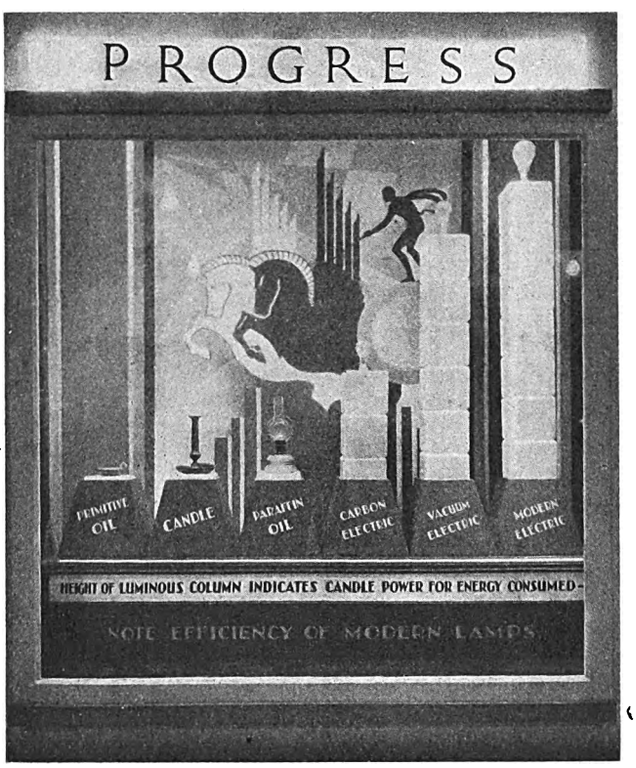
THE annual luncheon of the British Electrical Development Association was held at the Savoy Hotel on March 21st. Captain J. M. Donaldson, M.C., presided, and the large gathering included Alderman E. Huntsman (who was elected to the presidency of the Association at the annual general meeting held at the conclusion of the luncheon), Lord Meston, Sir Andrew Duncan, Sir John Brooke, Col. Sir Thomas Purves, Sir James Devonshire, Sir Archibald Page, Sir Felix Pole, Sir Philip Nash, Sir Douglas Newton, M.P., Sir Harry Haward, Sir Duncan Watson, Col. R. E. Crompton, Mr. W. W. Lackie, C.B.E., Mr. J. K. Brydges, Mr. P. Rosling, Mr. H. Willoughby Ellis, Mr. A. F. Berry, and Alderman W. Walker.

Proposing the toast of "The British Electrical Development Association," Mr. Herbert Morrison, Minister of Transport, said that if British consumption was to teach a level corresponding or that in the United States, our annual output should be 30 000 000 000 units instead of the 8 500 000 000 probably attained in 1929. In his judgment there were two things needed in the British electrical industry—first, a universal and scientific push by all the supply undertakings instead of only some of them, and, secondly, a really wholehearted publicity campaign conducted on a national scale.

It was the duty of supply undertakings to see that they were adequately equipped with a sales organisation which not merely preached the virtues of electricity, but was a service organisation ready to take the consumer by the hand and give him the best advice and assistance in the economical and effective use of electrical energy. Assisting consumers to get the maximum result with a relatively small consumption was sound business, and would lead to greater consumption by increasing the number of purposes for which electricity was used.

The Electrical Development Association was a valuable institution. Within its resources, its work had been admirable. But a prosperous industry such as electricity supply ought not to stint the Association so far as finance was concerned. Its total income made it impossible for the Association to render services on a scale proportionate to the importance of the industry. He was glad to know that an increasing number of supply undertakings were becoming associated with the organisation, but he would urge all the 50% who remained outside to come inside. He appealed on the Association's behalf for the support of all branches of the electrical world. Let them learn from the publicity campaigns being conducted by other branches of commerce, and in particular from the first-class publicity and service activities of the great gas industry, for whose energy and push he had the warmest admiration.

Electricity seemed capable of doing anything. It was now being developed for use in the heat treatment of steel with automatic temperature control, and on the other hand it was being increasingly employed for purposes of refrigeration. Like politicians, it could "blow hot and cold" at the same time. It was his ambition to enable the work of the Electricity Commissioners, the Central Electricity Board and the Ministry of Transport to become still more effective with the object of establishing a great nationally organised industry. Undoubtedly electricity was one of the bright spots in British industry at the present time. Given a live organisation locally, and adequate support for a body like the Electrical Development Association nationally, the measure of its progress in the past would be small compared with the enormous possibilities of the immediate future. They could rely upon the encouragement of his department in the development of rural supplies, to which he attached great importance, and the Government had demonstrated its desire to help by the assistance which the Lord Privy Seal had proffered under the Development Act for accelerated electricity schemes.



PROGRESS IN LIGHTING.
Part of the joint E.L.M.A. and E.D.A. Exhibit at Charing Cross Underground Station.

Mr. R. P. Sloan, C.B.E., responding, said that the national grid scheme was an anticipation of the development that would have taken place if there had been no such scheme although the process would then have occupied many years. As an instance of the tendency towards rationalisation he mentioned that on the North-East Coast they had closed down 15 small stations. To make the national scheme a success two conditions must be fulfilled. Generating costs must be reduced and consumption must be increased. The first was in the hands of the Central Electricity Board, but although the Board had many problems to solve the difficulties were under their control. In the case of the second—increase of consumption—the case was very different, and the work had to be carried out by some hundreds of independent undertakings scattered all over the country. There was only one association—E.D.A.—which represented them all. It was essential at the present time that all should combine for the purpose of increasing consumption. An entirely fresh set of circumstances had been brought about by the national scheme. The electricity supply industry would in the end have to foot the bill and be responsible for the redemption charges on the expenditure. The only way to help the scheme to success was to co-operate and do everything possible to increase the consumption of electricity in all directions. He urged everyone to help the Association and so assist in reaching this end. E.D.A. was the only association representing all interests, and it desired the support of all. He quoted Emerson's dictum: "He is base who receives favours and renders none." Criticism of E.D.A.'s activities usually came from those who did not subscribe on the recommended scale and who did not subscribe at all.

At the subsequent annual general meeting the following officers were elected for 1930–31:—President, Alderman E. Huntsman; chairman, Mr. H. Marryat; vice-president, Sir Felix Pole.

(*Extracts from the Annual Report for 1929 of the British Electrical Development Association will be found on page 393, and a photograph taken during the annual luncheon is reproduced on page 415.*)

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E.D.A. SALESMANSHIP CONFERENCE.

Selling Policy and Practice of Supply Undertakings—Planning of Sales Organisations—Publicity and Propaganda—Weekly Current Bill of All-Electric Houses—Hiring and Assisted Wiring Schemes.

THE subject discussed at the E.D.A. Salesmanship Conference on March 20th, in the lecture hall of the Royal Society of Arts—the last conference of the 1929-30 session—was Selling Policy and Practice in electricity supply undertakings. Mr. A. C. Cramb (borough electrical engineer, Croydon) presided.

Lieut.-Col. W. A. VIGNOLES (director and secretary of the E.D.A.), who opened the discussion, stressed the importance of arriving at a definite sales policy in any business. It had been proved in many instances that the policy of reducing prices had increased profits as the result of greater turnover, and many of the undertakings which adopted this policy of serving the public to the best of their ability were in a sound financial position.

The next problem was the planning and development of a sales organisation. In every undertaking, except possibly the very smallest, there should be a sales manager or engineer responsible to the general manager, and the sales manager should be given adequate assistance. In a large undertaking the sales manager would require assistants to deal with (1) consumers' department; (2) sale and hire of apparatus; (3) assisted wiring; (4) installation work; (5) publicity. The directorate would have to decide whether the undertaking should sell direct to the public or through a contractor, and there were other problems, such as whether or not the rentals for hired apparatus should be designed to cover the entire cost of the apparatus and its maintenance, or whether the undertaking was to charge low rentals and depend upon securing an adequate return from the sale of the electricity which the apparatus consumed. This was an important aspect of the development of the electricity business which needed to be explored to a greater extent than it had been hitherto. The policy of charging low rentals was adopted by most gas undertakings. Again, a number of electricity supply undertakings were operating assisted wiring schemes through contractors, to the great advantage of the undertakings. It was better that consumers should be charged fixed sums for their installations, payable at intervals, rather than they should be charged, in respect of the apparatus, a small extra charge per unit on the units metered, because when the latter method was employed there was a tendency towards a definite check on the use of electricity for purposes other than lighting. Some undertakings had introduced assisted wiring and were charging an additional 2d. per unit consumed, and had wired a very large number of premises on these terms, although as a rule electricity was used only for lighting in such cases. A system such as that adopted by one undertaking, which, on introducing an assisted wiring scheme, had insisted upon the provision of at least two plugs in each installation, ought to be developed.

Publicity Allocation.

Publicity and propaganda policy should also be decided upon, and a definite sum allocated. The amount to be so expended should be about 1 per cent. of the gross revenue, this allocation including the contribution to the E.D.A. as members. Inasmuch as this latter contribution was only one-tenth of 1 per cent., nine-tenths of the total publicity allocation would be available for local publicity. In this connection he urged all concerned to make full use of the E.D.A. literature, posters and window displays. Emphasising the value of proper provision for the training of the sales staffs, he said that the work of the E.D.A. in this connection had included a recent practical course in home electrification for women in the electrical industry, which had been attended by some 130 women, and this work could be developed if undertakings required it.

Mr. E. E. HOADLEY (borough electrical engineer, Maidstone), emphasising the increasing importance of selling efforts, said that he had a most efficient sales engineer, but the latter had other things to attend to besides selling electricity. All the men employed in the department, however, were salesmen and received written instructions from time to time as to what they were required to do, and they were paid for any business they secured. Meter readers were instructed always to try to interview the householders and persuade them to use further apparatus; this policy worked very well. As an example of the success of the policy of pushing out into country districts, one district was connected up last autumn and over 100 consumers were secured before Christmas. He had a very attractive tariff for all-electric houses—i.e., houses with no coal fire—and there were 155 such houses in the district. Hiring rates included maintenance service. Since the war the Maidstone Corporation had built 1 100 houses, and, at last, the electricity department had persuaded them to put up six electric houses, as an experiment, alongside six all-gas houses. Careful statistics over a period of twelve months had shown that, whilst the cost of gas houses was 3s. 9d. per week, the all-electric houses cost 3s. 9½d. A further 314 houses were being erected by the Corporation and there would be no gas mains on that estate. The electricity supply would be charged for on the basis of a first charge collected with the rent, and 1d. per unit collected through a slot meter.

Value of Efficient Demonstration.

Mr. A. C. BOSTEL (County of London Electric Supply Co.) said that, except in the use of vacuum cleaners and irons, little development had been made in regard to demonstrations, but the public did take advantage of apparatus which was demonstrated to them by efficient salesmen. The policy of linking up with the various manufacturers had proved itself, especially in the sale of vacuum cleaners, and he urged that the pushing of electrical apparatus must be extended along those lines. He stressed the importance of the adequate training of salesmen, and criticised the inadequate salaries offered to men of good qualifications.

Mr. W. MILLNER (Westminster Electric Supply Corporation) said that the hiring of vacuum cleaners led in many cases to purchase. The hiring out scheme was based on the return of the capital within seven years, but there were few kinds of apparatus in respect of which it took seven years to recover the capital expenditure, and in the case of irons it was nearer three years. The cost of maintenance of fires was almost negligible; it had worked out at less than 8d. per fire per annum over a series of years. The necessity for hiring would be less as time went on, having regard to the reductions in the cost of apparatus. Electrical apparatus was advertised more by persons outside the industry than by those inside it, apart from the manufacturers, of course, and the electrical industry was allowing the stores and other non-electrical concerns to secure a large proportion of domestic sales which were the legitimate right of the industry.

Mr. E. BROWN (Hackney Electricity Department) said that the assisted wiring scheme in Hackney was confined to small domestic premises. The undertaking had its own contracting department, and originally had carried out the free wiring itself, but the work had increased considerably, and for some time practically the whole of it had been sub-let to local contractors, who were members of the "Hackney Electricity Circle," an organisation sponsored by the undertaking. The practice was to endeavour to obtain first an order for an installation on a cash or credit basis; if this could not be obtained, easy purchase terms were offered; and if there were no favourable prospect of obtaining an order on either basis, free wiring was offered.

The CHAIRMAN urged that plain, simple tariffs should be arranged.

Col. WATTS (Epsom) said that in his district there were 300 all-electric houses, the weekly cost of the supply being from 3s. 6d. to 3s. 8d. The hiring of radiators should not be done too freely.

ELECTRICITY IN MEDICINE.

At the I.E.E. on March 20th, Dr. Bernard Leggett, M.R.C.S., L.R.C.P., A.M.I.E.E., read a paper on "The Medical and Surgical Applications of Electricity."

The paper gives a general review of the important applications of electricity in scientific medicine and surgery. As the greatest field is without doubt the diagnostic and therapeutic applications of X-rays, a large proportion of the paper is devoted to a general consideration of X-ray radiology. The subjects of ultra-violet radiation, diathermy and other applications of electricity to stimulative therapy are also dealt with. The author draws attention to the comparatively small importance of radiology in this country, as compared with its importance upon the Continent and in America.

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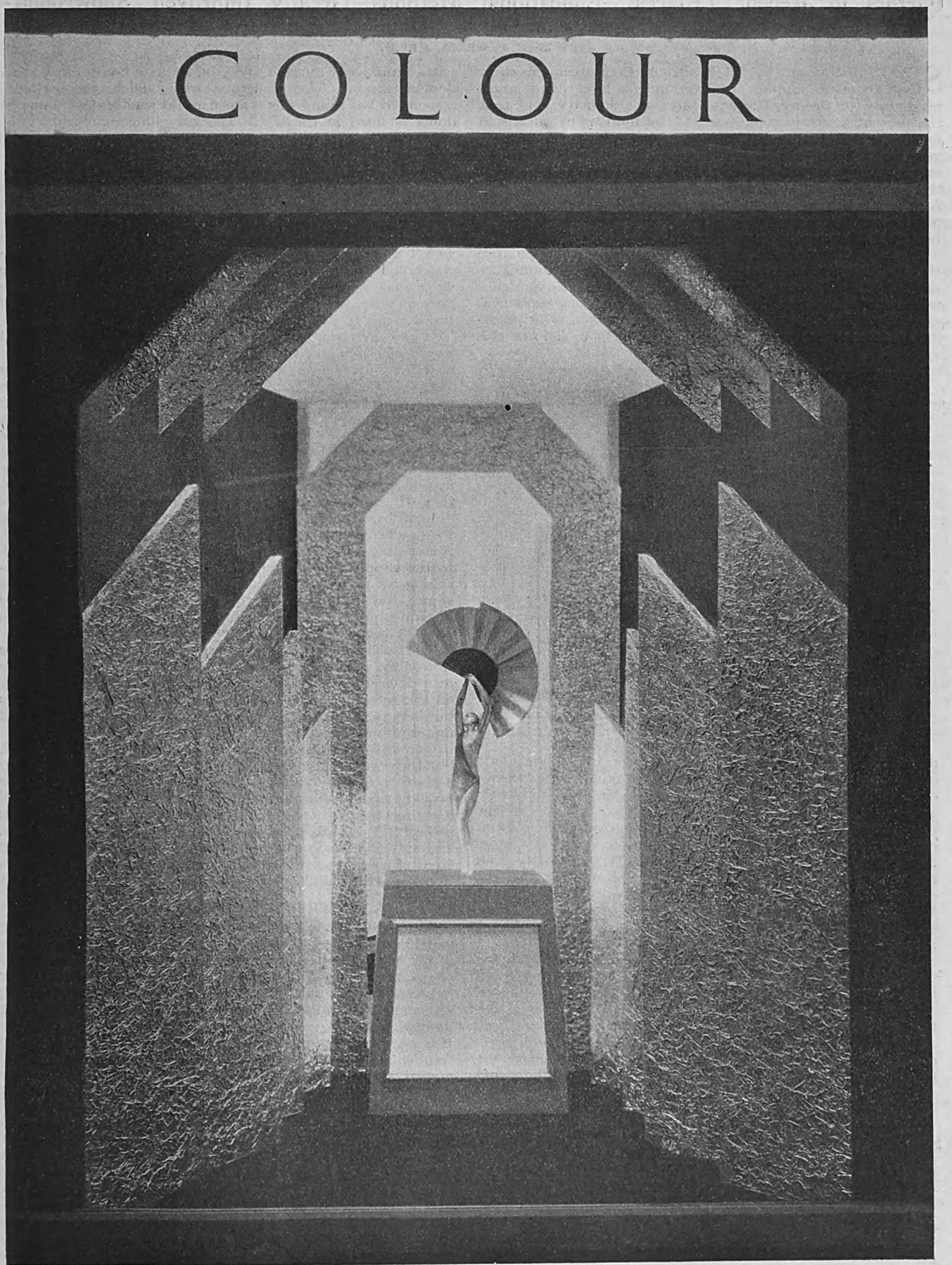
"OUR LADY OF LIGHT."



ONE of the effective features of the Lighting Pavilion arranged by the Lighting Service Bureau of E.L.M.A., in collaboration with the British Electrical Development Association, which has been attracting the attention of thousands daily at Charing Cross Underground Station this month. A pleasing demonstration of the use of colour in decorative lighting.

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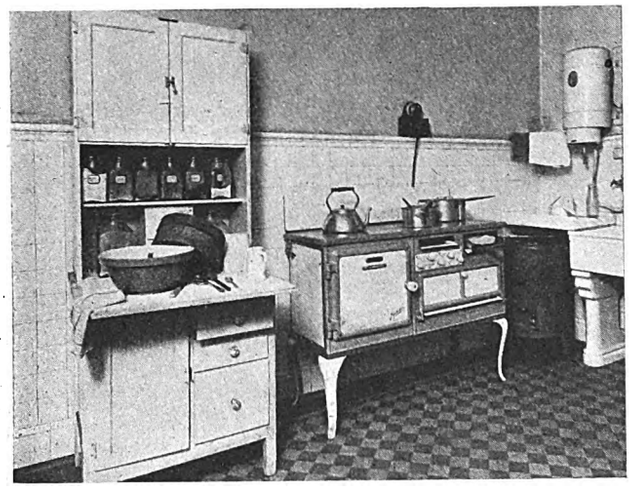
ELECTRIFIED HOMES.

Factors in Recent Progress—Educational Methods—Greatly Improved Showrooms—Tariffs—Better Standard of Installation Work—Domestic Apparatus—Distribution Costs.

By C. F. WELLS, A.I.E.E.

STATISTICS issued by the Electricity Commissioners show that domestic supplies are becoming a larger and larger percentage of the total annual sales of electricity, and that the present figure is about 25%. The number of units sold for domestic purposes has increased threefold in the last six years and the price per unit for domestic purposes shows a substantial decrease of over 40% during the same period; the average for the country is now just over 3d. a unit. Amongst the reasons for this striking development are the low prices and the facilities which are offered to consumers to hire and hire purchase apparatus.

Educational propaganda has of late done much to popularise the use of electricity in the home, and women whose confidence in electrical appliances is growing as the result of experience which has been gained, are demanding labour-saving appliances generally. The Electrical Association for Women, which came into existence five years ago, has done much to help in this direction, and the steps taken to arouse interest in the teaching of electrical methods in girls' schools and domestic science centres should prove of the utmost value. In this good work, supply authorities can assist by giving every facility for the installation of up-to-date electrical equipment at schools and educational establishments in order that women demonstrators may be properly trained. Arrangements have recently been made by Electrical Distribution of Yorkshire, Ltd., for the equipment of three large secondary schools for the West Riding County Council. Each equipment amounts to about 50 kW. In one school the apparatus has been in use for 12 months with very satisfactory results.



An all-electric kitchen showing Jackson cooker, wash boiler, immersion type water heater and sink.

Development in salesmanship has kept pace with the improvements in electrical appliances. Early efforts to sell apparatus were often frustrated by deficiencies in appliances. As the result of co-operation between manufacturers, contractors and supply undertakings, improvements have been rapid and supply authorities and contractors are able to recommend with confidence the products of British manufacturers. The fact that we have to-day several million consumers is some evidence that apparatus in general is giving satisfaction.

A number of showrooms have recently been established which are a big advance on those of a few years ago, and to-day nearly half the authorised undertakers in the country have showrooms. At one time showrooms were little more than a shop window; an improvement in the displays followed and now the modern showroom usually takes the form of an all-electric flat, the apparatus being exhibited in surroundings similar to those under which they will be placed in actual use.

Undertakings with large sparsely populated areas have found exhibitions a convenient and successful way of demonstrating electrical appliances to consumers. The village hall is rented for this purpose or alternatively arrangements made with a builder to furnish and equip a new house for a week's demonstration. The company with which the writer is associated has found this a most useful way of developing the domestic load in its area. The travelling exhibition is beginning to make its appearance and we may expect to see many of these on the road before long.

It is essential that service should be the keynote of negotiations with consumers and that the services of courteous skilled attendants with sound technical knowledge should be available at all times to ensure the continued satisfactory operation of domestic appliances, otherwise we may experience a re-action which will retard progress. The collection of data by those concerned in this work will be found of great value in dealing with consumers enquiries. Above all these men should have personal experience gained in their own homes in the use of the apparatus.

It has often been emphasised that to bring about the general use of electricity in the homes of the people it must be sold at a low price but when we remember that a supply is already available for domestic purposes at 1d. per unit or less in the majority of districts, we must realise that there are other important factors to consider, and that in some areas the price for such purposes is already as low as can be justified. The question as to the best form of tariff continues to receive much attention. The two part tariff is increasing in favour and is leading to the freer use of electricity. Application of this tariff to prepayment consumers still presents difficulties, a satisfactory solution of which will do much to popularise the more general use of electricity in small houses. A two-part tariff framed on sound lines offers advantages both to the supply undertaking and the consumer—to the undertaking by providing a reasonable contribution by each consumer towards standing charges and to the consumer by allowing him to use both lighting and other appliances with one set of wiring.

The revaluation of premises under the Rating and Valuation Act of 1925 has led some undertakings to revise their charges in a downward direction where the standing charge is based on the rateable value, but the Act has also resulted in heavy burdens through the increased assessments placed upon most undertakings.

One still sometimes hears of unsatisfactory wiring work, but the periodical revision of wiring rules combined with the activities of the Electrical Contractors' Association has brought about a better standard of work. Standardisation of materials has also assisted in this direction. Plugs and sockets to B.E.S.A. specification should be used on every installation, and an effort made to minimise the large number of different sized plugs now on the market. Many thousands of installations have been carried out on the surface wiring system.

Inadequate Attention to Lighting

Although the possibilities of electric lighting are to-day more widely appreciated than formerly, it is seldom that the lighting of the house receives the attention it deserves. As a result of co-operation between supply engineers, builders and architects, lighting fittings of decorative value combined with utility are coming into more general use and can be obtained to harmonise with the general scheme of decoration. Because of the scarcity of plug points, portable standards are too infrequently seen. Colour has always possessed a universal appeal and the application of colour lighting in the home enables an impression of cosiness and warmth to be obtained.

Although improvements in the efficiency of incandescent lamps make electricity the cheapest form of illuminant, the cost of lamps to-day in this country compares unfavourably with other parts of the world. This is retarding progress in obtaining and retaining the small class of consumer. This point is particularly important when one remembers that the smaller houses are now the principal non-users of electricity. For this reason assisted wiring schemes are recognised by every progressive undertaking as a necessity and nearly 300 undertakings now have a scheme in operation; the cost of wiring can no longer therefore be regarded as a difficulty in obtaining additional consumers.

Many undertakings have connected 50 per cent. of the premises in their area of supply, and the rate at which new

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consumers are being connected shows a large increase. For the past three years, Electrical Distribution of Yorkshire have added new consumers to their mains at the rate of over 7 000 a year.

Although the design of electric cookers has not substantially altered during the last few years, refinements have been effected in the finish, chiefly by the use of enamelling, both for the interior and the exterior. The solid type plate is reliable

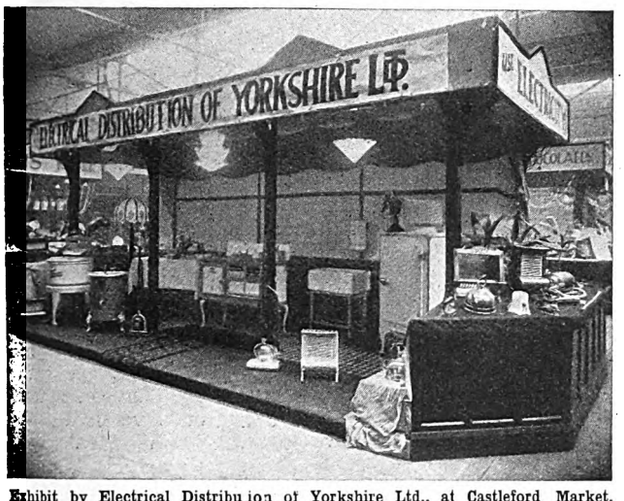


Exhibit by Electrical Distribution of Yorkshire Ltd., at Castleford Market. Princess Mary showed keen interest in this display and spent some time examining the various electric domestic appliances.

and has reduced maintenance costs, but it cannot be regarded as the last word in boiling plates, and it is hoped that research will be undertaken which will lead to further improvements.

Standardisation of cooker parts has recently been discussed by manufacturers, but it is important that this should not take place prematurely, especially as the thermal storage cooker, used extensively in Sweden, has received little attention in this country and may yet develop. There are still two schools of thought on the vexed question of top and bottom *versus* side and bottom heat.

The merits of electric cooking are well established. The saving in the weight of the food cooked is important and enables substantial economies to be obtained over other methods of cooking. The large number of cookers sent out on hire during the last few years is evidence that the prejudice which at one time existed against cooking electrically, has been overcome; there are several undertakings each of which has over 5 000 cookers on hire. Aluminium utensils with specially stiff bottoms are now sold by several manufacturers for use with electric cookers so as to ensure a good contact with the boiling plate; these effect economy in both time and electricity. The boiling of small quantities of water should be carried out in an electric kettle.

Radiators with elements of the solid bar type and also with resistance wire elements are available in large varieties, and each year brings an increase in the number sold. Both the panel and the tubular system of room heating are also receiving attention, but the application of these systems has been confined largely to the heating of public buildings. The portability and the sense of warmth which one experiences from radiant heaters give them a greater appeal, but, although the electric fire is a real labour saver, an improvement in its efficiency must take place before the domestic chimney disappears. A system which will give good results is a combination of either tubular heaters or panel heaters used in conjunction with electric fires. The chief potential load in the house is for heat, and this field offers enormous possibilities.

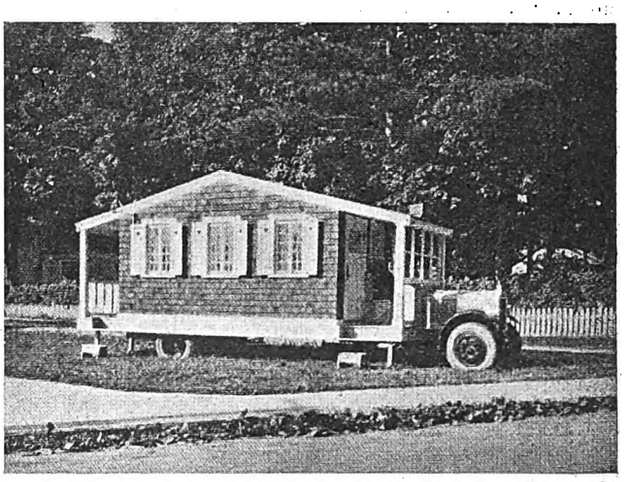
Storage cylinders with automatic temperature control are now being sold in large quantities and with suitable hiring facilities, and the experience which has now been gained, their use should become much more general. The use of an immersion heater or circulator in conjunction with the existing house cylinder is not a very efficient arrangement, but it is comparatively low in first cost and often enables a supply of hot water to be obtained especially during summer months when the kitchen range may be out of use, for a small capital outlay. Further, it does not involve any alteration in existing pipework, and often provides additional facilities for the airing of clothes which is sometimes a difficulty experienced in all-electric houses. Some undertakings are developing a night load by offering a special tariff for off peak water heaters. The instantaneous type of water heater is unpopular with most supply authorities because of the heavy loading which often brings voltage trouble; these heaters however, have not a very wide application. The development of the water heating load merits more attention, and the same facilities as are afforded for the hire of cookers should be more generally extended to water heating apparatus.

Increased Sale of Refrigerators.

The number of refrigerators sold in this country, although not a big figure largely due to their first cost, shows a steady increase. Now that the use of preservatives for keeping food is severely restricted, domestic refrigerators are in greater demand not only for the house but for small shops. The multiplication of bacteria in food is minimised by the elimination of heat, but the ordinary ice box will not give a sufficiently low temperature, *i.e.*, below 50° F. for this and, furthermore, the supply of ice in this country is uncertain and troublesome. There are on the market refrigerators operating on the ammonia absorption system which required some form of heat to cause the circulation of the refrigerant and also a supply of cooling water to abstract this heat. The motor driven compressor type is, however, in more general use, although somewhat higher in first cost.

Many electrical appliances, more especially vacuum cleaners, which have done so much to dispel the spring cleaning bogey, are being sold direct to the consumer by manufacturers as in America. Good business is now being done in wash boilers and washing machines which, with hire and hire purchase facilities, can be obtained at prices within the reach of many householders; thus another household problem is solved by the electrical method. Irons, toasters, fans, hair dryers are in general use and other purposes to which electricity has been recently applied in the home are medical lamps and wireless. "All-mains" sets are fast replacing the older type in which batteries and accumulators require constant attention. It is said that in America to-day, very few receiving sets employing accumulators or batteries are made.

A great deal has been said of late about the reduction in the cost of generating electricity which to-day has, for the most part, reached a high degree of efficiency. The cost of distribution mains, however, forms the major part of supplying domestic consumers, and until a substantial reduction in costs is made in this direction a further fall in the charge of electricity for domestic purposes cannot be anticipated. These



Electric kitchen on wheels used by a Canadian company. Information as to costs can be obtained from N.E.L.A., 420, Lexington Avenue, New York.

costs are felt particularly by the small undertaking, and one looks forward to the unification of our industry when the development of the business is left to large and efficient undertakings able to give efficient service at the lowest prices.

BIRMINGHAM ELECTRIC CLUB.

We regret that in the report of the annual dinner of the Birmingham Electric Club, which appeared in our issue of last week, the name of the Lord Mayor of Birmingham was incorrectly given as Alderman F. Samuelson instead of Alderman W. L. Lancaster.

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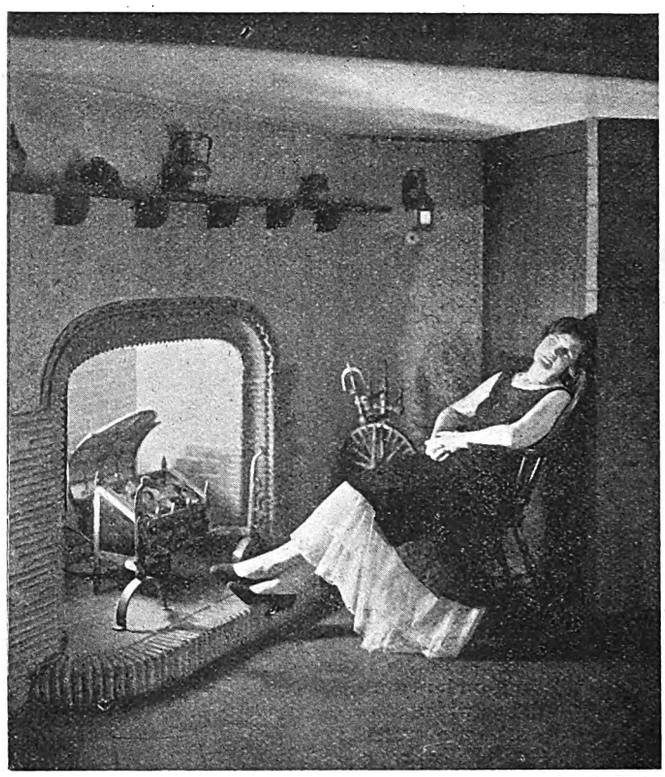
SELLING WOMEN ELECTRICITY.

Sympathetic Imagination—Symbolism or Realism—Demonstration the Most Effectual Salesmanship—Value of Illustration.

By WARWICK HOLMES.

WHAT many salesmen and development engineers take long to realise is that in introducing mechanical appliances and electrical services to non-technical audiences they must think and talk *ob*jectively and not *sub*jectively. It isn't what electricity *is*, it is what it does that matters. A dissertation on the constitution of the tool is subjective; an exposition of the results of its performance is objective. Women read beauty columns of magazines not to learn the chemistry of lipsticks, but to feel more confident about the lure-power of carmine in certain environments. Scientfiic and electrical toys have brought fathers back to the nursery; radio mania has made screw-driver parties of musical evenings, the air is vibrant with volt and amp. prattlings of adolescents; but woman, the traditionally illogical, remains objective. The thought process yields questions of this kind: "What is it for? What will it do for me? What will it cost to use? Will my servants understand it? . . . Above all, "Will it deliver the goods? . . ."

That is why I believe much advertising space and money is being wasted together with equivalent volumes of salesmen's breath by advertising and sales policies which tell, either laboriously or imperfectly, of some process in the manufacture of an article. A verbal close-up of a professor's tenacity in discovering an incorrodible and non-oxidisable resistance wire for culinary application may be thrilling to boys at the polytechnic, but leaves the Eve of any age as cold as Britannia. This supposed advertisement, which is, of course, purely imaginary, is not untypical. Sympathetic imagination and an everlasting desire to know how other people live should activate the grey matter of our directors, our advertising consultants and copywriters—above all, the man who meets the woman face to face—the Man behind the Counter—the Man with the Bag and Book.



G.E.C. Photo.

". . . talk to women like men who know they are very much like themselves. . . ."

It is not because I think the face-to-face salesman any less important part of the plant that I name him last, or because I think advertising policy any more or less important than sales technique. Whether in the board room or the show room, the same set of psychological considerations govern the success of a sales' policy. Audience behaviour study is as important for the originator as for the administrator of sales promotion methods. Sauces have been boiling over for the last hundred years, but did more harm to the open type heating elements of electric stoves than to the robust constitution of their coal-consuming forbears. The answer to "Will it deliver the goods?" is neither the close-up of the metallurgical professor, nor the unconvincing figure of a quite unnecessary *palais-de-danse* housewife, but just a woman like the one you think would use the goods best who might say to you "Spilled sauces won't stop your Dreadnought."

To add another illustration, think of electric lamp salesmanship, much of which I insist is clever and undoubtedly has the desired ratio of effort to result. Would you expect women to open their purses to the research story of a glass works, or to read that "you-find-needles-in-a-bundle-of-hay-with-Superlite," and then order a dozen? The home beautification and becomingness which results from artistic electric lighting is a fine example of selling women electricity. The man who writes "Oil lamps put years on our grandmothers, but Overlux takes them from *you*," knows something of how other people live.

Whether because of a lag behind the rest of Europe in the artistic perception of our mediocrity, or because of a squared-toed British liking for what is called "the real thing," symbolism in advertising and salesmanship is nothing like as popular as on the Continent. In Germany it is very successful and much believed in by sales managers of domestic utilities. There are national advertisers who have spent hundreds of thousands in Great Britain in establishing and maintaining the popularity of some personality. Many now regret it owing to all kinds of difficulties, limitations and inflexibilities which a personality involves. The tendency to model an advertising figure towards some ideal remote from the product, the popularity of which it is intended to promote, is not as uncommon as you might think. With the curious idea that female figures used in connection with advertising domestic appliances to women should be packed with sex appeal, studios have been asked to evolve the most ineffectual "bits." These curious, presumably man-entangling creatures have long silken legs, tiny hands and feet and eyes like an empty room. They manipulate refrigerators, vacuum cleaners and all kinds of appliances without effort, but without conviction. They are a sort of Rhine maiden out of water.

We set out to talk about selling women electricity. Now the kind of woman a woman wants to see using the goods you want her to buy is a woman like herself—or, in less self-sufficient cases, like she'd like to be. Why not illustrate them? Nobody ever does. There *are* women, of course, like the *palais-de-joie*, creatures beloved of advertisers, but they don't get homes, and therefore don't buy vacuum cleaners. If you're going to have realism, why not be square-toed and illustrate advertising with some reference to fact? Anyway, what have our handsome men done? Why always illustrate this domestic appliance, advertising for women with pictures of more women? It is on lines like this that I think there is room for original thought.

All those questions to which an intelligent woman investigating domestic electrification demands an answer are replied to convincingly by demonstration. That is why demonstration is the most effectual salesmanship. That is why I consider model flats, cookery talks and showroom kitchens of the greatest value in propagating the electrical idea. Practical sales people know that demonstration is the sure way for securing orders for electric cookers, heaters, refrigerators, vacuum cleaners and electric laundry appliances. The training of demonstrators and continual interchange of experience by discussion in conference is therefore important. Because I believe in this, I have written often in the home magazines urging women to have everything demonstrated till they are sure they know it backwards. Demonstrators who are showing the same appliances day after day should beware of acquiring actions like conjurers. This legerdemain makes an audience feel that "any fool" could do it until

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they get home and try it by themselves with nothing but a maker's handbook between them and a machine which has neither eyes nor ears and speaks not. Selling women electricity demands the resourcefulness which will allow a " prospect " to start and stop a washing machine herself, to try a pillow case through the ironing machine, to regulate herself the heat of an oven by manipulating the switches.

Readers of home and women's magazines and the home pages of daily and evening papers throughout the country are familiar with the kind of practical article designed to acquaint women with electrical conveniences. These articles are generally contributed by writers as expert as editors are able to find, and illustrated with the best photographs the contributor is able to secure from the manufacturer. The latter can have no idea of being conspicuous in editorial pages through having available for publication really good photographs or they would surely instruct their service agents or someone on the sales staff to secure the kind of photographs which ensure publication.

Few manufacturers in Great Britain get further with the art of illustration than instructing an operator to make some painfully accurate photographs of their goods. These are subsequently painted up to look " too good to be pure " and are reproduced in an oppressive way on a white background. This sort of illustration is useless to editors and stands no chance of publication. Selling women electricity in home magazines demands natural pictorial photography. Genuine domestic backgrounds are wanted. The pictures need healthy composition, intelligent lighting and must combine eloquent and demonstrative qualities. The manufacturer may be forgiven if he cannot suggest where such photographs can be made. The electrical contractor and sales department of supply undertakings cannot be forgiven, for both of them are in touch with the women who buy and use electricity. Such photographs are wanted every day by editors and journalists, and yet they are most difficult to obtain. Manufacturers will willingly spend £40 for a page advertisement, but will grudge £5 for a set of good photographs suitable for illustration of an editorial article for consumer readers. Illustrations of how foolish this is arise every day when I and my associated authors are forced to illustrate articles with photographs depicting goods of manufacturers who are not advertisers. This is because the advertisers' photographs are not suitable for editorial illustration, and those of the manufacturers who do not support the magazine are in every way what the editor wants.

Selling women electricity comes to this: Don't tell them what electrical appliances are, but what they can do; don't have soppy models in your advertising; talk to women like men who know they are very much like themselves; have more and better trained demonstrators; don't be mean and unperceiving about the value of photographic illustration.

E.D.A.'s ANNUAL REPORT FOR 1929.

Marked Progress in All Branches—Gratifying Increase in Membership—Financial Position—Appeal to Non-subscribing Undertakings.

MARKED progress was made in all branches of the Association's work during 1929. There was a gratifying increase in membership, and three additional provincial area committees were established.

During the year 34 additional supply undertakings were enrolled and eight undertakings adopted an increased rate of subscription. This satisfactory development is attributable to the great increase of interest in the Association resulting from the work of the area sub-committees and officers.

Large numbers of visitors attended the Industrial Electric Heating Exhibition organised in Manchester. The sub-committee concerned also organised a section at the Bradford Engineering Society's Exhibition.

The Exhibition Advisory Sub-Committee, in addition to assisting the organisation of a number of electrical exhibitions, undertook the complete organisation of displays at Ealing, Torquay and Brighton, and provided and maintained an exhibit at the North-East Coast Exhibition from May to October. The 1 314 film displays were attended by 49 122 people. Over 200 persons attended the E.D.A. Conference at the British Industries Fair. An impressive display of four stands was provided by the Association at the Manchester Smoke Abatement Exhibition in November.

In the course of the E.D.A. national advertising programme of 1928–29 209 advertisements appeared and 27 932 direct replies were received. Stereos sold for additional local advertising numbered 234, and 345 window displays were sold.

Each month throughout the year the Association issued a sales and publicity programme which provided a valuable link between the national propaganda of the Association and local publicity and selling schemes carried out by suppliers and contractors.

The special committee, appointed in May for the purpose, has been responsible for the E.D.A. Electric Homes (Outlet) campaign launched last September. Well attended conferences were held at the end of that month in London, Birmingham, Leeds, Manchester, Newcastle, Glasgow, Edinburgh, Bristol and Cardiff. Of the campaign programme 4 600 copies were issued. By the end of the year the first edition of 300 000 copies of " The Home You Want " was practically exhausted, and a second edition was placed on the press.

The E.D.A. electric homes national wiring specification has now been adopted by the Council. A number of demonstration houses, wired in accordance with the specification, are in preparation.

It is intended that the E.D.A. Electric Homes (Outlet) campaign shall be established as a permanent activity, or at least be carried out for a number of years.

Record attendances were secured at the first three conferences at the Royal Society of Arts of the 1929–30 session, which fell within the year covered by the report. The editorial press service has been extended. It is estimated that 10 000 persons were directly addressed at the 147 lectures given by Mr. G. S. Francis, of the E.D.A. staff.

The Association has undertaken to investigate and report to the British Indian Electric Committee upon the question of co-operative propaganda suited to Indian conditions. The expenditure is being borne by the Committee.

Membership of the Association at December 31st, 1929, included 349 electricity supply undertakings (+29), and 1 711 manufacturers, contractors and wholesalers (+114), a total of 2 060 (+143). The supply membership now represents 81% of the total output of the country. New members in 1929 were:—

Municipal undertakings: Bingley, Bromley, Buxton, Caerphilly, Clitheroe, Ealing, Eccles, Hammersmith, Heckmondwike, Loughborough, Mold, Rathmines, Rochdale, Spenborough, Swinton and Pendlebury.

Company undertakings: Leicestershire and Warwickshire Electric Power Co., North Wales Power Co., Cumberland Waste Heat Owners Co., Ltd., Electricity Supply Board, Dublin, Electrical Development and Securities Trust, Ltd., Jersey Electricity Co., Ltd., Llanwrst Electric Supply Co., Ltd., Midhurst and District Electricity Co., Ltd., Newquay Electric Supply, South-East Yorkshire Light and Power Co., Ltd., Truro Electric Supply, West Cornwall Electric Supply.

Oversea undertakings: Auckland Electric Power Board, Brisbane City Electric Co., Ltd., East African Power and Lighting Co., Rio de Janeiro Lighting and Power Co., Singapore Municipal Council, Waitemata Electric Power Board, Société Electrique de Production S.A. of Athens.

Undertakings adopting increased subscriptions were: Bath, Birmingham, Oldham, Stafford, British Power and Light Corporation, Northampton Electric Light and Power Co., Midland Electric Corporation, Worcester.

Revenue from subscriptions in 1929 amounted to £31 974, against £37 377 in 1928, the decrease being accounted for by a reduction of special subscriptions towards the factory and workshop lighting and refrigeration campaigns from £7 650 to £1 000. The annual subscriptions totalled £30 974 in 1929, compared with £29 727 in the previous year.

The report concludes with the following statement:—

" The Association is having a very definite effect on public opinion, and is undoubtedly assisting very largely the cause of electrical development and contributing to the prosperity of the industry.

" Every electricity undertaking and firm in the industry are benefiting from this work, whether they are members and subscribe to the funds of the Association or not; non-subscribers are in fact receiving benefits for which others have paid.

" The Council, therefore, make an earnest appeal to all electricity supply undertakings, and all manufacturing, wholesale and contracting firms in the country to support the Association by becoming members and subscribing to the funds on the prescribed scale."

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SAFETY IN DOMESTIC ELECTRIFICATION.*

"Effective," "Ineffective" and "Criminal" Earthing—Distrust of 3-core Flexibles—Case of Appliances with Lampholder Adaptors—Factory Experience—Insulation the True Ideal.

By T. C. GILBERT.

FOR the moment let us assume that our contractor is installing a screwed steel conduit system in his valiant attempt to obtain his completely earthed job. We will follow him a little further along his perilous path. The actual conduit complete and continuous, another difficulty arises, for we will assume that the supply authority is one that will not earth service cut-outs or meter casings. Is our contractor to earth his adjacent main switch-fuse? If he does he is probably laying a trap for some unwary person by providing a convenient earth connection for a possible fault on meter or cut-out, not at all unlikely when we take into account the positions in which such apparatus is often fixed. If he does not earth it, as his inclination will probably be, he will find himself up against his consultant, to say nothing of the disapproval of the Register, and so the trap will be laid as the easiest way out for our harassed contractor.

Improved Earthing.

Three-pin plugs and sockets will, of course, have been fitted throughout the house and all appliances will be earthed, *without* the assistance of the manufacturer, as has been pointed out above. Earthing devices having been improvised on most of the appliances and improved on others, the earthing of them will fall into three categories—effective, ineffective and criminal.

Under the first heading we will put the cooker, geyser or water-heater and similar apparatus, these all being screwed direct to the conduits or to feed-water pipes. (We will not mention the possibility of high resistance between hot-plate and hob, reaching in one instance, quoted by "Megohm" of the "Electrical Times," the value of 100 megohms, as this is not common except where hot-plates have been replaced by other makes.) Under the heading "ineffective" we will place all apparatus connected and ostensibly earthed by 3-core flexibles and further depending upon 3-pin plugs and sockets. Practical experience leads our contractor completely to distrust 3-core flexibles and their connections, and he is confirmed in this view by the foremost earthing advocates, as will be shown later. Messrs. Reyrolle state in their booklet, "The All-Earthed House," that reliance cannot be placed upon 3-pin plugs and sockets, and we must consider that they have full knowledge of this subject. There is thus a double possibility, almost a probability, of failure, and each failure may mean a life, but we will be content to leave the ordinary appliance connected by this means under the heading of ineffective, even if it should happen to be the electric kettle used together with, or in the neighbourhood of, an earthed cooker, when it should rightly come under the heading of "criminal."

Under this latter heading I shall include bowl radiators, toasters, artificial sunlight projectors—in fact, all apparatus with an exposed element or live point with which it is possible to make contact; also earthing the chains and metal work of bowl fittings and the metal case of the h.t. battery eliminator fed from d.c. supply. I would also, in view of my own experiences, include under the "criminal" heading the earthing of all portable medical apparatus.

The proved unreliability of earthing when effected by means of 3-core flexibles and 3-pin plugs should really cause us to place *all* apparatus so connected under the heading of "criminal," as suggested above, especially where reliance is placed upon any wiring system except heavy screwed conduit. I may perhaps be permitted to recapitulate the weak links in the chain: the failure of earth conductor or connections in 3-core flexibles, open earth circuits in 3-pin plugs; the use of unsuitable or unreliable wiring systems; the vital question of workmanship; and the possibility of failure of the main earth connections, which is very common, as all practical engineers know. With all these weak links real protection can only be a happy chance and earthing would appear to be completely unworthy of our serious attention.

This terrible unreliability of earthing is not denied but, in fact, stressed by the foremost advocates of earthing. I may perhaps be permitted to quote one or two of their suggestions for overcoming it.

The able advocate whom I have already quoted, Mr. W. R. Rawlings, A.M.I.E.E., states that earthing by ordinary means with ordinary systems is "a menace and a false security." Mr. Rawlings' utterances on this subject reveal long experience of the difficulty and deep study of the problem. As we know, his remedy for this unreliability is the universal use of the earthed concentric system, concentricity being maintained right down to the lamp and appliance. This I have already dealt with above. Mr. H. W. Clothier, M.I.E.E., in an article on earthing in the "Electrical Review" of March 18th, 1927, makes the following amazing proposal in dealing with the question of the failure of the earth connection:—

> "A simple way of checking its continuity is to use the earthing conductor as a common return for the ordinary electric bell system of the house, coupling one terminal of the remote bell pushes to the end of the earth wire and the corresponding pole of the battery to the nearest part of the cold water system. An accidental break in the earth wire would then be detected by the failure of the bell to ring and, this indication having been given, the break could readily be found because the earth wire is on the surface and the connection to the water pipe visible."

This terrible proposal is repeated in a reprint of the article, included by Reyrolle and Co. in their booklet, "The All-Earthed House," but again no attention is given to the possible extension of the mains voltage on to the electric bell system by this means with all its ghastly possibilities, which has apparently not occurred to the author. It only needs the failure of the connection of the earth wire to the water pipe, or a break on its way there, seeing that it is bare and visible and therefore liable to damage, and a fault to occur on any piece of earthed equipment, to put 230 V a.c. on to the bell pushes, with all its powers of fire and death (Fig. 2). As pointed out by Mr. Clothier, the bells will cease to ring, so that somebody, possibly the householder himself, will commence to tinker with them, and although he may fail to make the house bells ring, I am prepared to gamble that he will be more successful with those in the churchyard! Surely this is a remedy worse than the disease it is intended to overcome, and when we consider the existence of a bell push over the bath I think we should be justified in placing this remedy under our "criminal" heading.

Mr. R. H. Rawll, A.M.I.E.E., another well-known complete earthing advocate, notably in the "Electrical Review" for February 11th, 1927, confesses his complete distrust of earthing in a further interesting article in the same journal (August 16th, 1929) entitled "My Electric House." He states "There are two power-plug sockets in the dining-room and kitchen, and one in each of the remaining rooms, with the exception of the bathroom, which is not so equipped for safety reasons." I quite agree with Mr. Rawll that it is far better not to instal power, or any other plugs in bathrooms, but then I do not believe in earthing as a safety measure, whereas Mr. Rawll does. Surely he has only to earth such portable apparatus as is used in his bathroom and thus achieve safety? As Mr. Rawll himself remarks at the beginning of the article, "It is well known that very few electrical men practice what they preach as regards electricity in the home."

Laying a Trap for the Public.

Mr. W. T. Taylor, M.Inst.C.E., M.I.E.E., author of "Electricity Supply Transformer Systems," in a letter to THE ELECTRICIAN of August 15th, 1929, states:—

> "Wiring installations based on present-day regulations do not provide a cure for the public from circuit hazards and dangers—to have one earth connection at the supply end only and then to earth each fitting independently is not much unlike laying a trap for the public unknowingly and accidentally to fall into at some time or other—it is not a cure and the provisions are not really and truly safe."

At the recent I.E.E. debate already referred to, Dr. Ekström pointed out another serious snag—the difficulty, if not the impossibility, of securing an earth connection of sufficiently low resistance in country houses or farms. In view of the vast rural electrification schemes that are now going forward, this question requires really serious investigation. Here are potential consumers who will shortly be coming on to the

* The first part of this article appeared in last week's issue.

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mains not in dozens, but in thousands. How are we to protect them in the use of their portable apparatus ?

It can, of course, be said that a contractor who holds these curious views can always please himself—where no consultant or other authority is concerned—as the I.E.E. Regulations are not the law of the land and he is not, as yet, compelled to adhere to them. This is perfectly true, but he at once lays himself open to the charge that his work is " not in accordance with the regulation " ; probably the registration authorities will also have something to say on the matter should it come to their notice, as omitting to earth is one of the deadly sins, especially abhorred. Should a consultant or supply authority insist upon the regulations being strictly adhered to, the responsibility will then rest upon their shoulders, but the earthing in the past he has sooner or later fallen down with a bang, and he sees no reason why electrical progress should fall down with him. Hence his welcome to the saner type of accessory.

It is not the easiest thing in the world to persuade clients to accept these accessories, especially when their hearts are set upon some of the fancy metal finishes ; but the fact that the contractor *can* persuade them is, I think, another proof that he is not always seeking the easiest path, but considers his clients' safety even up to the point of selling them something that they are not enthusiastic about.

To be constructive, is it not possible to extend the all-insulated ideal beyond our accessories—to our appliances ? Even if the idea of eliminating *all* metal from our domestic

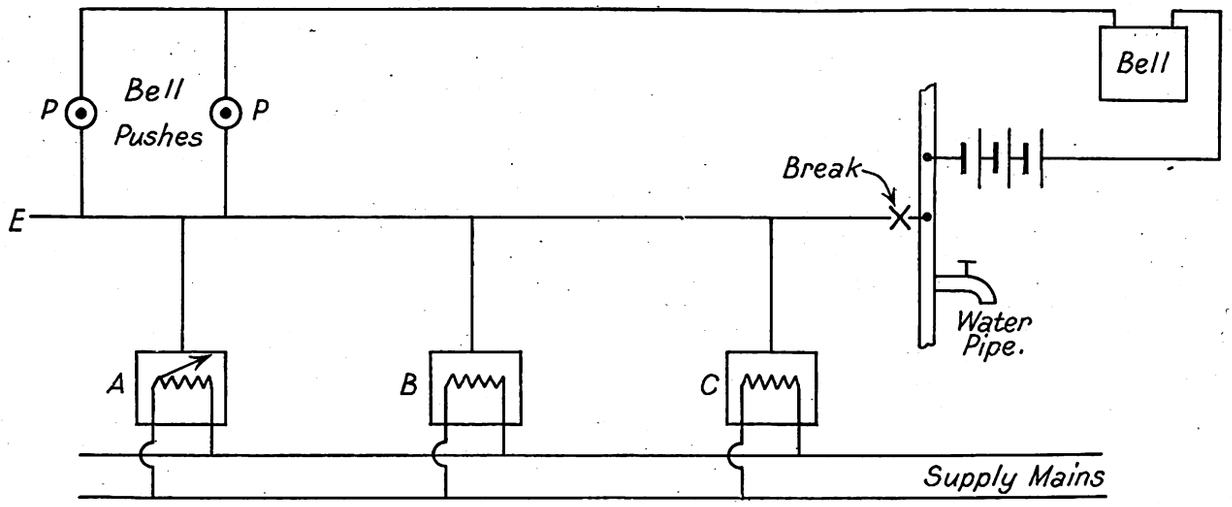

Fig. 2.

A, B and C are appliances connected to the supply mains, with their metal casings earthed to the earth wire E; break in E is shown at X, with simultaneous earth fault on appliance A. Result: The full line voltage exists between the terminals of the bell pushes P/P. Also the metal casings of A,B and C, and of all other appliances connected, are at full line voltage above earth.

contractor will almost certainly be blamed for the failure of any earthing devices fitted, although he may have had no say whatever as to whether they should or should not have been provided.

Appliances Purchased from Stores.

Whatever care is taken by a contractor in his installation, whatever forethought he has expended in consideration of his client's safety from shock or worse, all can be set at nought by the unrestricted retailing, by primarily non-electrical stores, of the various type of electrical appliances that have a popular appeal. The majority of these appliances are fitted with lampholder adaptors, extremely useful although very much abused attachments. It is not possible under present conditions to prohibit the use of the lampholder adaptor, as advocated in some quarters, even if it were desirable to do so, but while it is in existence real earthing continuity can be but a dream. Very few of the appliances that are purchased through stores are ever seen by a contractor until some fault or other develops on them—usually sooner than later, as the electrical qualities of the appliance are not generally the stores' first consideration—so it would appear on the face of things that any steps taken with the idea of promoting a greater degree of domestic safety can only begin with the treatment of the appliance itself, seeing that we have now condemned the external method of protection.

The charge that is so often laid against contractors, that they are indifferent to the question of their clients' safety, is not well founded. This is proved, I think, by the enthusiastic way in which the average contractor has welcomed the advent of bakelite or similar wiring accessories and is using them to a greater and greater degree. This is in spite of the fact that such accessories are almost invariably more expensive than the ordinary metal type, and it is practically certain that in most cases this slight extra cost is borne by the contractor himself. Also, although stock breakages are greater, the contractor is pressing manufacturers for an extension of the range of bakelite accessories to cover practically all his requirements. He knows their complete insulation will ensure the safety that he has so long sought and that it will not be merely problematical ; he knows, too, that when he has relied upon installations—which I have seriously advocated in other quarters and still think possible—is too Utopian (Gilbertian is Mr. Rawlings' word !), cannot we find a sort of halfway house to this ideal and concentrate upon improved insulation ? There is little doubt that contractors would seize upon such improved appliances with as much eagerness as they have exhibited towards the insulated accessory, and even manufacturers seem to be coming round to this way of thinking.

So much so, that I believe a sustained demand from the installation side for appliances in which the first consideration had been insulation and not appearance or price would lead to the development of a new type which would again lead to the solution of our problem. The President of the E.C.A., Mr. Willoughby Ellis, at the recent annual dinner of the Association, made an earnest plea for the supply and use of better appliances and apparatus. If only we could guide this improvement mainly into the channel of complete, or at least improved, insulation, we should be conferring a benefit upon the consumer, the contractor, and above all the electrical industry in general, by completely solving the danger problem.

What signs are there of a move in this direction ? At the I.E.E. debate already referred to I exhibited a hairdryer with its outer casing completely constructed of an insulating composition, and without any external metal such as screws, nuts, etc., whatever : it excited great interest and was apparently new to many engineers present. It was of Continental manufacture, of course, but that will not prevent many of us making it standard for the future, representing, as it does, practically 100% safety. I am certain that our own manufacturers could supply this type of appliance if only sufficient demand were made for it.

Cleaners with Insulated Switches.

One of the best-known firms manufacturing suction cleaners is now supplying its machine fitted with an insulated switch, flexible rubber hand grip and cord protector ; that is, all parts normally handled by the operator are non-metal. Further, they have provided insulating bushes between the body of the machine and the main steel tubular portion of the handle, which should effectively prevent this becoming alive from motor faults. It is practically impossible under ordinary

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conditions for an accident to occur with such a machine, and this arrangement represents a greater degree of safety than any earthing device could possibly provide. Even electric drills are now obtainable with insulated bodies.

If such articles as electric irons were constructed with completely, instead of only partly, insulated handles, and an insulating shield fitted over the top of the iron, we should be getting nearer our ideal. Heating and cooking apparatus, of course, presents the greatest problem for the insulator, but it is almost impossible to obtain a shock from the coloured portion of many electric irons that are provided with the attractive porcelain-enamel finish, or from the many types of vitreous enamelled radiators and cookers. The danger points on these various appliances are the, usually, nickel-plated heads of screws or bolts with which the exterior is fairly well sprinkled, but it should not represent a very great problem to eliminate these.

New Insulating Materials.

In connection with portable heaters and cookers, further developments in insulating materials will probably assist the solving of the danger problem. For instance, Micalex, which is of great electric strength and apparently unaffected by high temperatures, will provide us with a material that may possibly prove to be a substitute for metal in several directions. Although this material as at present available requires a moulding temperature of something around 400° C., yet test results suggest that its application is worth serious study.

I am *not* abandoning my ideal of the complete elimination of all metal from domestic installations, yet for the present I should be satisfied with the halfway house that I have indicated, that is improved insulation and the abandonment of the earthing idea as an ideal, to be retained only for such cases where it may prove to be impracticable effectively to insulate. I firmly believe that manufacturers are developing the insulating mind, and it is up to us to stimulate this development.

Having got rid of all our metal appliances and accessories in our domestic installation, the logical thing to do will be to eliminate our metal conduits with all their disabilities and lack of flexibility when extensions or alterations have to be considered. Luckily we can do this forthwith and quite easily, tough rubber cables forming an excellent substitute for the more cumbersome systems. I believe that it is only the innate conservatism of the average consultant and architect that prevents the great advantages of tough rubber wiring being more generally recognised. Corrosion and vermin proof, this system should prove ideal for our rural electrification schemes, as for farm and similar work there is nothing to equal it for reliability.

With our metal conduits gone, and with service cut-out, meter casing and all accessories constructed of insulating material, we are well on the road to our goal, and only require a range of all-insulated main switch fuse gear to provide a practically safe installation. Rumour, although sometimes a lying jade, states that we shall not have to wait very long for this, which is excellent news for our contractor. The provision of non-metallic standard lamps and other fittings is, of course, a very simple matter.

It is often pointed out to me that if only the earthing clauses of the Regulations were made compulsory for all installations, in the same way that they are compulsory for installations in factories and workshops, all would be well, in the same way that all is well in the factories, presumably. In fact, so persistent is this belief that there is a definite move in one quarter to try and bring this into effect by means of suitable legislation. I am afraid I cannot accept the statement as very convincing when we come to examine the record of accidents in factories. Under the Factories and Workshop Act compulsory earthing has been in force for many years, yet we have to record over 200 fatal, and hundreds of non-fatal accidents in factories and workshops, in 15 years, all on pressures below 250 V. A large proportion of these accidents were due to the failure of earthing devices, and, if these cannot be made reliable in a factory, where everything favours earthing and nothing else has to be considered except safety, then we cannot place much reliance upon them in the domestic sphere, where appearance must be considered to a certain extent and frequent inspection is impossible.

Further, I do not think that conditions in a factory and the conditions in the home can be considered as even faintly approximate: in the factory we have at least semi-skilled operatives handling electrical equipment with which they are familiar from long experience, but in the home we have completely ignorant users of electrical appliances, not forgetting the large amount of apparatus now handled by children.

On top of this, we find the following significant paragraph in the report of the Senior Electrical Inspector for Factories and Workshops for 1927:—

> "The general adoption of lampholders made entirely of insulating material in respect of the external parts would go far towards eliminating lampholder fatalities."

Thus, even in the factory, insulation must be resorted to eventually to ensure absolute safety; it is, therefore, certain that it will prove equally essential for the domestic installation. And of course we all know that the "Home Office" type of lampholder and handlamp is a completely insulated job; let us get down to "Home Office" appliances. Complete insulation cannot, and need not, be seriously advocated for the factory; we are dealing with the domestic installation where undoubtedly the greatest risks exist.

It is further suggested that the education of the public regarding the handling of electrical apparatus would also make for a greater degree of safety; as Mr. L. B. Atkinson said at the Cheltenham Conference, "It was the industry's duty to let people know that they could not play the fool with 250 V when they might be in contact with an earth."

This is perfectly true, but the task is not easy: the public does not want to be educated, and is apt to take fright at the mention of the word "shock" unless the contractor, upon whose shoulders the bulk of this educational work falls, is extremely tactful. I have known cases where people have been perfectly reasonable about the danger question themselves, and take all the necessary precautions when handling portable gear, but they will not permit the use of such apparatus in their nurseries, or anywhere that children are likely to handle it, to the detriment of the industry in general.

It is a very sad state of affairs if, as we advance to the attack upon the great number of unwired houses in this country, armed with a list of advantages of electricity in one hand, we have to carry a red flag in the other. We were told by several speakers at the E.C.A. dinner in January of this year of the vast amount of domestic business waiting to be done. Surely this should be worth the devotion of serious study by the industry directed towards the elimination of the danger menace. With a satisfactory solution we need never mention "danger" again, and any contractor who has attempted to explain to an old lady client exactly what an "earth" is (at the same time trusting to luck that she will not cancel her order for appliances) knows what an inestimable benefit this would confer upon the industry.

Education cannot take the place of fool-proof appliances, and I consider it the duty of the industry to evolve such safe appliances. Many of the articles we are to-day placing literally into the hands of the public—and their children—are flimsy and dangerous; even the best that we can procure do not represent what we *should* be able to get, and *could* get with a change of ideas as to what constitutes safe appliances and what does not. The purpose of this article is to try and elicit what the average contractor and manufacturer really does think about it all.

Revision of Outlook Needed.

The careful reader will have gathered that this is no attack upon our Regulations. I am not advocating the scrapping of any portion of the Regulations, or even an evasion of them, but rather a revision of outlook more in keeping with present-day problems. At the moment the ideal is earthed equipment, with a permissible substitution of insulated appliances or accessories. I want to reverse this and make insulation the ideal, with the substitution of earthed metal equipment permitted *only* in the event of the impossibility of obtaining an insulated pattern. That this would make for practically certain safety is generally agreed; contractors know it, and should strain every nerve to see that manufacturers learn it also. Improved insulation, if complete insulation is impracticable at the moment, should be our ideal, and I have little doubt that before long complete insulation will prove to be easier than has been admitted up to the present.

Earthing is effective and sound in some cases, especially where fixed apparatus is concerned, but there is no reason why we should ride the earthing idea to death and hail it as the only, or at least the most effective, means of protecting the user of portable apparatus. The electrical industry must grapple with this question of domestic safety, and I do most seriously suggest that the matter be considered from what will be, for many, a new standpoint. Earthing has had a good innings, and yet to-day stands discredited in the eyes of the practical man; why not give insulation a trial?

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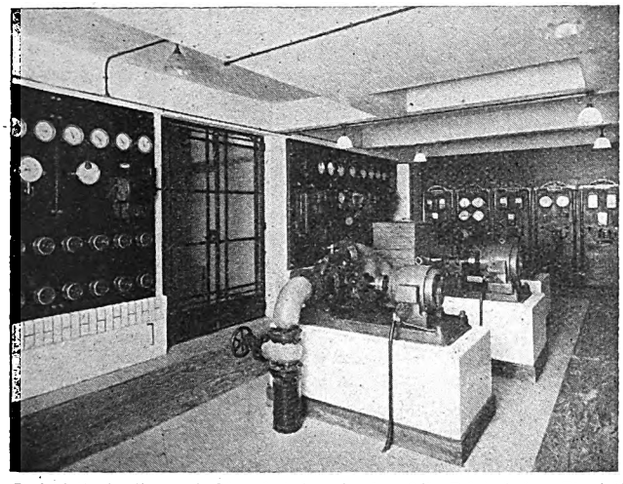
PROGRESS IN ELECTRIC WATER HEATING.

Geysers—Thermostatic Control—Night Storage—Heating of Buildings—Electrode Boilers—Direct Operation from 3-phase e.h.t. Mains.

By PHILIP KEMP, M.Sc., M.I.E.E.

THE earliest attempts to heat water by electricity on a commercial basis consisted of the introduction of resistance coils into water containers of relatively small capacity. By the expenditure of a considerable amount of energy in a short time, the necessary supply of hot water was obtained. The next stage in the development saw larger vessels come into use, and the principle of thermostatic control began to be utilised. The subject of thermal storage now began to attract attention, the prospect of a long-hour night load being particularly welcome to supply undertakings. In spite of the low tariff rates which could be granted for this class of load, however, there was little further development beyond apparatus of 20–30 gallons capacity, until the electrode boiler came into the field as a practical engineering proposition. This type of apparatus is specially suited for the heating of large quantities of water, since it can be operated directly off a high tension supply.

The first type of apparatus may be compared with the gas geyser, and might be described as a local system in which a hot water container, complete with its own heater, is fixed



Part of the heating control board at the extension of the Polytechnic. The full load capacity of the electrode boiler plant is 1 850 kW at 6 600 V.

in close proximity to the fitting which it is intended to serve. There is a great field for commercial development in this direction, in view of the many thousands of small domestic hot water systems already in existence, in which the heat at present is obtained from a range boiler or from a separate gas or coke-fired boiler. In small and compact systems, immersion heaters, each of 2 kW capacity, may be fitted in the storage tank which is probably of 25–40 gallons capacity. The conversion of such systems to electric heating has, however, its own disadvantages. The piping runs are very often inefficient, due to the absence of lagging, and the question of economy is of far greater importance with electric heating than with other methods where the efficiency is so very much lower. Apart from these considerations, a relatively high short-hour load is not one which will warrant the lowest tariff rates. To heat the water for a good bath requires an average of 4 B.T. units, and if the time allowed for running the hot water into the bath is, say, 15 minutes, then a loading of 16 kW must be adopted. Electric geysers can, however, be employed with advantage with wash basins used intermittently. In such cases a 4 kW loading is ample.

The introduction of thermostatic control enabled heaters with a lower rating to be employed. These are kept in circuit all the time until the water temperature attains its maximum value. The thermostat then cuts out the heating elements. When hot water is drawn off, the temperature of the tank falls and the heaters are cut in again automatically. This system differs in certain fundamental points from the geyser principle. In the latter case the heating period is limited to the time during which water is being drawn, and, as this is a very small proportion of the total time, the loading of the immersion heaters must be high. With thermostatically-controlled heaters, the full 24 hours is available for heating, so that the rating of the heating elements is much less. It is not, however, desirable to design the heaters so as to necessitate their being in circuit all the time, as this would render the recovery of temperature very slow after a heavy draught of water had been drawn.

Large blocks of flats are now being successfully supplied with hot water which is electrically heated. The comparison of electric heating in such a case with heating by means of a coke-fired boiler, for example, is entirely misleading, if merely based upon the relative cost of the electric energy and the fuel, since these costs are only a fraction of the total overall costs. The space required by the heating equipment, including fuel storage, chimney, distribution piping, possible annoyance of smoke and dust, labour involved in stoking, and entire dependence upon the efficiency of the stoker are also factors.

In some cases a constant hot water supply is included in the rental of the flat, in which event a group system can be employed, one storage tank supplying a group of, say, twelve flats. The working temperature of these group systems is a matter of importance, and the thermostat should be set for a maximum water temperature of 170° F.

The heating of buildings by means of circulating hot water through pipes and radiators is quite common, but the fact that the water itself can be heated economically by electrical means is not so well appreciated. Small central heating systems may employ the immersion heater to advantage, but there are several important factors which militate against its use in the heating of large buildings. The capital outlay is large as a consequence of the great number of resistance elements required; the wiring of the controls becomes very costly and complicated; and finally, only a low tension supply is permissible. On account of these reasons the immersion heater gives place to the electrode boiler for large installations.

The electrode boiler can only be used on a.c. since electrolysis would be set up on d.c. The liberation of the gases as the result of this action would be highly dangerous. This electrolytic action does not occur on a.c. at commercial frequencies to any noticeable extent, and to eliminate all possibility of trouble due to any small gas bubbles being formed on the electrodes, the water is circulated in the electrode boiler itself, by means of a special circulating pump.

Electrode Boilers and Thermal Storage.

The electrode boiler is eminently suitable for use in connection with a thermal storage installation, taking energy during off-peak hours. The energy is stored in thermal form in large well-lagged water containers, entirely distinct from the electrode boiler itself. A second circulating pump serves to transfer the thermal energy from the boiler to the storage vessels. Such a plant can be operated directly from three phase e.h.t. mains, the boiler shell being efficiently earthed as this forms the star point of the system. As the water in the boiler heats up, its conductivity increases, and steps are taken to ensure that the load shall remain constant.

The storage tanks attain their maximum temperature at the end of a night heating period. During the following day hot water from the storage vessels is circulated around the piping system and the radiators by means of pumps. A portion of the cooled return water is returned direct to the storage vessels, but the remainder is mixed with hot flow water, also from the storage vessels, by means of a mixing valve which is thermostaticallly controlled. By this means the temperature in the main flow pipe is kept constant, and the temperature of the building does not fall as the day wears on. The whole of the temperature drop due to the expenditure of energy is taken by the water in the storage vessels. The thermostat controlling the temperature of the flow water can be set at any figure, within limits, so that the amount of heat expended on the building per day can be varied to suit the external temperature. After a warm day, a saving can thus be made on the following night's run, by adjusting the load on the boiler.

A heating plant of this type can compare favourably on economic grounds with any other modern system, providing electrical energy is obtainable at a reasonable price, but it must be reiterated that to make such a comparison on the basis of fuel costs alone is entirely misleading.

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TRANSPORT FOR CONTRACTORS.

Value of the Small Motor Vehicle—How the 7 h.p. Van can be of Service—Running Costs, Depreciation and Repairs.

By W. A. GIBSON MARTIN.

THE small, utility type of delivery van with a low petrol consumption, and a small initial cost has proved itself an economical and useful commercial vehicle, capable of giving satisfactory transport either as a tender to one or more larger vehicles, or as a service van. Firms operating 15 cwt. or one-ton vehicles frequently utilise their ordinary transport for light loads, merely because there is no alternative and cheaper method: and where maintenance contracts are undertaken, a vehicle much larger than necessary is often pressed into service. In many cases, it is not economical to use a large van; but, apart from this reason, other work may be held up for lack of transport, pending the return of a large vehicle from an urgent job which could have been done more quickly and more cheaply by the smaller type or vehicle.

A 7 H.P. chassis can be fitted with a body adapted for the electrical trades, to carry loads up to half a ton, with a two-cylinder water-cooled engine, giving 40 m.p.g. of petrol, 1 000 m.p.g. of oil, for a total initial cost of £156. Alternative, there are a 7 H.P. and an 8 H.P. chassis with four-cylinder engines, capable of carrying a 5 cwt. load, with about the same running expenses and with an initial cost of about £140. The 7 H.P. is also listed with a body intended to be used as a pay-vehicle, costing £135 10s., and would prove exceedingly useful in the event of large number of men being employed some distance from head office or bank.

Comparison with Larger Types.

The value or otherwise of the small van, however, depends upon the cost of running it: and the running costs, in turn, depend upon the use which the electrical firm has for this type of van. Compared with the 12 to 15-cwt. vehicle, there is a saving in petrol, oil, tyres, duty, and depreciation, while garage, insurance and allowance for repairs are practically the same in both cases. The manufacturers of commercial vehicles habitually quote cost-per-mile figures, but, unless the electrical contractor can form some estimate of his annual mileage, cost-per-mile figures may be very misleading. A daily average five days per week of 20 miles will work out at approximately 5 000 miles per annum. In practice, however, most firms find 40 or more miles on the average for a small van per day, which gives a yearly mileage of 10 000; on this basis, the total running costs including full time driver's wages at £3 per week, work out at £263 per annum. Increasing the mileage to 20 000 (a figure often exceeded by large firms in service work) has the effect of adding approximately £36 to the annual cost.

In the adjoining column are given running costs in detail for 5 000, 10 000 and 20 000 miles per annum. It will be seen at once how the running expenses increase with the mileage, and the standing charges remain the same irrespective of mileage; in other words, the cost per mile for the first group remains stationary, while the cost per mile decreases considerably in the second group of costs as the mileage increases. It is often said that the more a van is used, the cheaper it becomes; this is only half true, for a greater mileage reduces the cost per mile, while it, in reality, increases the total cost. 5 000 miles per annum costs in total £244, which is almost 1s. per mile; if the mileage is increased to 20 000 in one year the total cost is £296, but the cost per mile is brought down to just over 3¼d.

Taking the items in the order given in the running costs schedule, petrol and oil are assumed to be purchased in the ordinary way. If these supplies can be bought in bulk at a cheaper rate, the items under these headings will be slightly reduced. The life of a set of five tyres is assumed to be 15 000 miles; this is a conservative estimate, as many transport operators obtain 20 000 and more from one set. Government duty and insurance are self-explanatory, while the amount of £12 should be sufficient in normal circumstances for the cost of garage. Some contractors do not include this in their running costs, as the vehicle is kept on the premises, the rent or value of which is not increased thereby. To be accurate, however, the motor transport account should be debited with a charge for garage which would have to be met in the event of there being no suitable accommodation on the premises.

Depreciation is, at best, merely a calculation. On the 20 per cent. per annum basis, the van would be written down to nil in five years. In all probability, however, the vehicle would be exchanged after two or three years' use, in which case the commercial vehicle agent would offer approximately three-fifths or two-fifths of the original cost, thus making the exchange allowance correspond with the amount at which the vehicle would stand in the books at the time of exchange.

A sum must be allowed for repairs. During the first year, this should be confined to decarbonising and valve grinding, as the maker's guarantee will be operative during the whole period. During the second and third years, however, repairs must be borne in total by the owners; any balance allowed in the first year and not utilised may be carried forward towards the higher costs of repairs in the following year or years. The allowance under this head has been increased with the mileage, as greater use naturally involves greater likelihood of repairs outside the guarantee being required.

On all three mileages, full-time wages have been allowed. This again is conservative, as it is most likely that the van would be driven by an apprentice or other junior who would be employed in any case where the mileage is only 5 000. In the case of service vans, of course, they may be driven by the electrician, who undertakes the maintenance, and therefore the wage allowance may be deleted. At the same time, it must be realised that to cut costs by permitting unskilled or cheap labour to drive a light van is most unwise, and may possibly lead to greatly increased costs in other directions, chiefly under the heading of repairs.

The small van scores enormously by its ease of handling, its ability to drive right up to the job, its convenience in traffic, and its general speed. It is comparatively cheap to have a special body made for a certain type of work, and to transfer this body from one chassis to another instead of buying a complete vehicle every two or three years. These are all advantages which cannot be expressed in pounds, shillings and pence. Neither can a chart of running expenses allow for the convenience of having a tender to the fleet of one-ton vehicles, or even for the fact that by adding a small van, a single 15-cwt. vehicle is made to be of almost double service to the electrical dealer.

RUNNING COSTS OF 7 H.P. VAN.

PETROL: 40 m.p.g., 1s. 7d. per gallon. Initial Cost, £156.
OIL: 1 000 m.p.g., 6s. per gallon. 20 per cent. Depreciation, £32.
TYRES: 15 000 miles per set of five, £7 16s. 3d. per set.

	Number of Miles Per Annum. 5 000			10 000			20 000		
	Actual Cost.		Cost per mile.	Actual cost.		Cost per mile	Actual cost.		Cost per mile.
RUNNING EXPENSES—	£ s. d.		d.	£ s. d.		d.	£ s. d.		d.
Petrol	9 17 11		·47	19 15 10		·47	39 11 8		·47
Oil	1 10 0		·07	3 0 0		·07	6 0 0		·07
Tyres	2 12 1		·12	5 4 2		·12	10 8 4		·12
	£14 0 0		·66	28 0 0		·66	56 0 0		·66
STANDING CHARGES—	£ s. d.		d.	£ s. d.		d.	£ s. d.		d.
Government Duty ..	10 0 0		·48	10 0 0		·24	10 0 0		·12
Insurance	15 2 6		·72	15 2 6		·36	15 2 6		·18
Garage allowance ..	12 0 0		·57	12 0 0		·27	12 0 0		·18
Depreciation	32 0 0		1·53	32 0 0		·76	32 0 0		·38
Allow for Repairs ..	5 0 0		·24	10 0 0		·24	15 0 0		·18
	£74 2 6		3·54	79 2 6		1·87	84 2 6		·99
TOTAL RUNNING COSTS—	£ s. d.		d.	£ s. d.		d.	£ s. d.		d.
Running Expenses ..	14 0 0		·66	28 0 0		·66	56 0 0		·66
Standing Charges ..	74 2 6		3·54	79 2 6		1·87	84 2 6		·99
Allow for Wages ..	156 0 0		7·48	156 0 0		3·74	156 0 0		1·87
	£244 2 6		11·68	263 0 0		6·27	296 0 0		3·62

THE MARCONI LICENCE.

A booklet entitled "The Marconi Licence," published by "The Wireless and Gramophone Trader," St. Bride's House, Salisbury Square, E.C.4, price 6d., post free, explains in simple terms the benefits conferred in the 19 major patents involved. It is written by a leading patent authority who has been long connected with the radio trade. The booklet guides manufacturers who wish to produce receivers and gives essential information to those whose business includes the resale of manufactured instruments and who may be as liable as the manufacturers themselves in any action for infringement.

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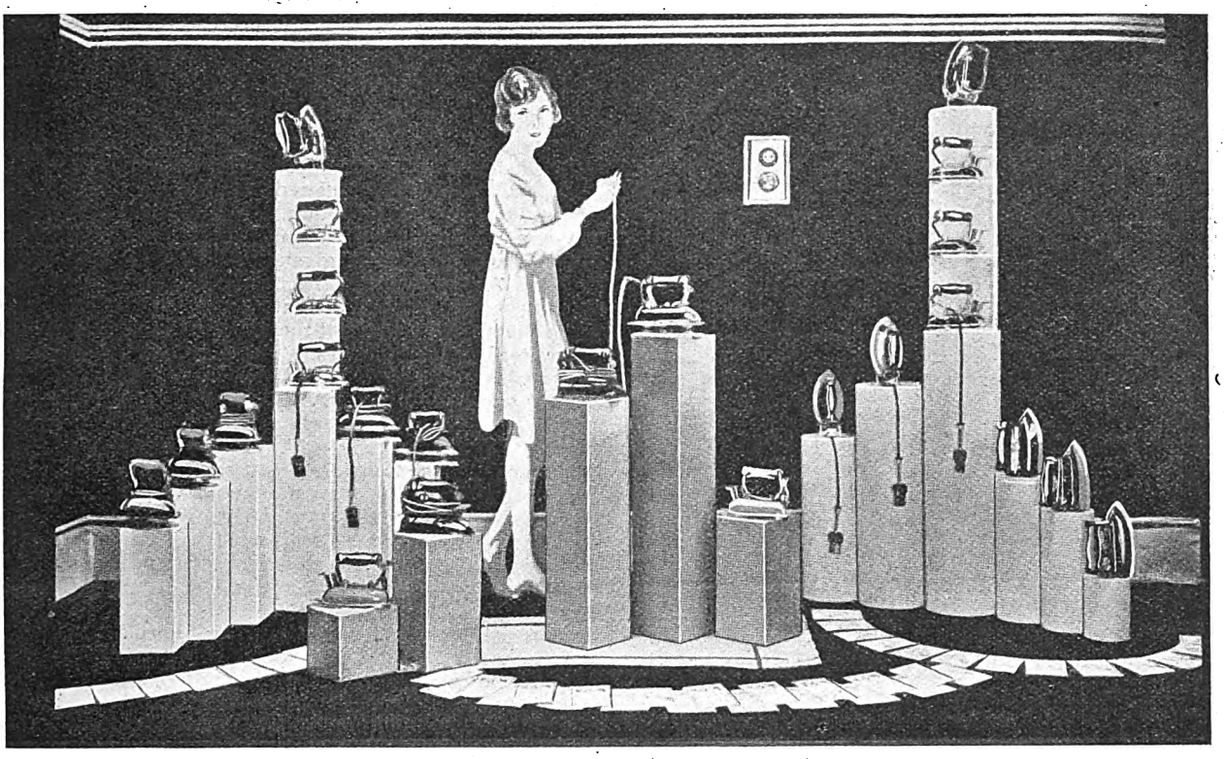
SPRING TRADE PROMOTION.



THE April window display designed for use during the E.D.A. Spring-time Campaign, details of which are given below. A brief list of some of the new appliances developed in connection with spring trade are included in the following pages together with some of the recommendations sent to us by manufacturers of domestic epuipment.

THE end of March proclaims the commencement of spring trade and though the public demand for new fittings, accessories, etc., does not make itself felt until the middle of April, no time should be lost by electrical contractors in arranging stocks and windows in readiness for what should be an unusually successful commencement to the spring and summer demands. Throughout the winter months special propaganda work has been conducted by the Electrical Development Association on the one hand, and the Electrical Association for Women on the other; the Electric Homes (Outlet) Campaign has been active since October last and some thousands of copies of the E.D.A. Electric Wiring Specification have been distributed. Demonstration houses wired in accordance with this specification have been organised in Birmingham, Derby, Bristol, Southport, Burton-on-Trent and Stoke-on-Trent, while special sale conferences have been held each month at all provincial centres.

With regard to the circulation of the wiring specification, which was prepared by the E.D.A. Electric Homes Campaign Committee and recommended for use in the case of small and medium-sized houses, it is suggested that the specification should not be circulated broadcast to the public, but that it should be supplied to anyone making application for it. In the third edition of "The House You Want," which is now ready, the specification is mentioned, and the reader is invited to apply for a copy at the address on the back of the booklet.

The specification, issued by an independent body, should be of definite assistance in this direction. If used by the contractor in quoting for an installation, it should make the consumer realise that the contractor is conforming to a definite standard. On the other hand, the architect or the builder using the specification will feel that this is a convenient method by which to secure tenders on a uniform basis; this will have the result of raising the quality of installation work and securing more adequate wiring. Contractors should note that the association is advertising the specification in architectural and building papers, and will forward a specially bound copy to any architect interested.

Special literature in connection with spring trade has also been prepared, spring cleaning being covered by no less than twelve new publications, washing and ironing by seven similar booklets, and cooking by a further series of five. Window displays also form part of the E.D.A. spring trade campaign and above is reproduced a specimen window devoted to irons. The components used, including the life-size figure, cubes, etc., are all obtainable from the association as well as the poster also reproduced on this page.

Stocks to carry is always a troublesome question at this time of the year and in order to assist readers as far as possible we give on the following pages a number of descriptions relating to new appliances and equipments, in addition to mentioning a number of items which, though not altogether new, have been either improved or extended in range. We do not claim to have covered the whole of the domestic appliances field, for space does not permit of such a comprehensive survey, but the information given will at any rate serve as a useful guide to the contractor anxious to make the most of spring time possibilities.

Electric cooking devices are always popular when the summer months approach, and in this connection may be mentioned the recently introduced "Arora" oven, which cooks a meal for six persons and can be combined with a portable boiling plate and grill. The dimensions of the oven, which weighs 55 lb., are: height, 21½ in.; width, 21½ in.; and depth, 19 in.; the cooking space is 15 in. by 14 in. by 13 in. The 3-heat switch gives consumption at the rate of ¾, ⅜ or ⅛ units per hour. The

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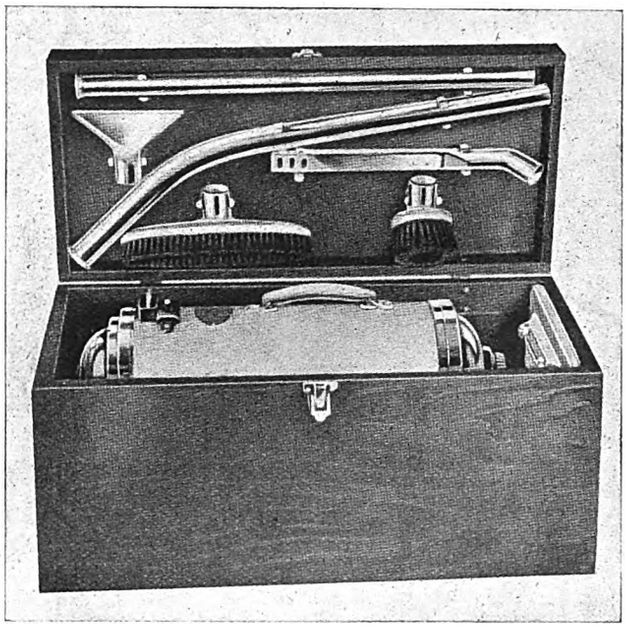
finish is black stove enamel. Similarly finished metal table and metal stand are offered for combining with the oven; a special switchboard, with two fuses, two 3-pin plugs for oven and boiling plate, and an extra plug and switch for controlling any other electrical accessory, can also be obtained. With the oven are supplied two wire grid



The "Vac-Tric" cleaner described below.

shelves, also a solid shelf to allow of the oven being divided into two parts. When using the shelf the top half can be run at low temperature, while the bottom half is at full cooking temperature. The elements are entirely enclosed in metal tubes. In addition to the safety heating tubes, the oven is provided with 3-terminal block with "earth" connection.

The thermometer, when ordered, is fixed to the oven door and marked to show inside temperatures. The following may be taken as an approximate guide to temperature: With the switch at High, 340 deg. F. obtained in 30 mins., or 400 deg. F. in 40 mins.; with the switch turned to Low, a moderate temperature can be held for a considerable time after first heating.

Where the cost of electricity supply is very low and where quick initial heating is desired, the oven is supplied with two extra heating tubes, if required, at slight extra cost, when the initial heating time is halved; but, as offered, the oven may be operated from any existing lighting installation without extra cost of power wiring where an "all in" domestic tariff for lighting and cooking is available. The makers are the ARORA CO., LTD., of Rosebery Street, Leicester.

Tho new "Vac-Tric" cleaner, manufactured by VAC-TRIC, LTD., Waterloo Road, North Circular Road, Cricklewood, London, N.W.2, is of the cylindrical type and built on similar lines to the firm's previous model; many improvements have, however, been incorporated. The motor is mounted on rubber cushions in a cork-lined cylindrical case; it develops approximately ¼ H.P. at a speed of 10 000 r.p.m. The suction produced is claimed to be 20% higher than that of any competitive make of machine and one of its oustanding features is stated to be silence. A comprehensive set of accessories is included.

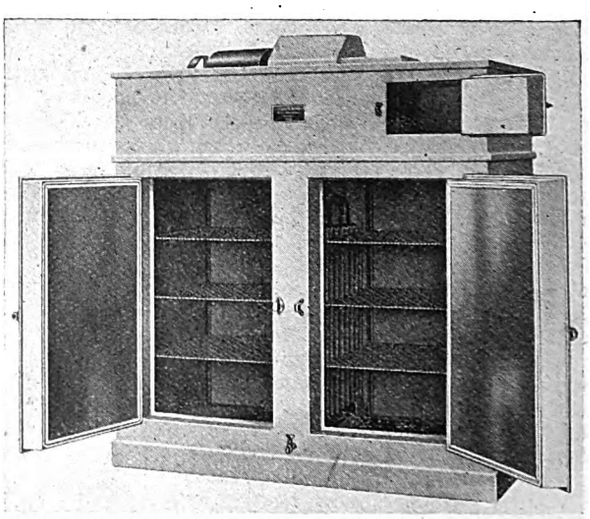
The REVO ELECTRIC CO., LTD. (Britannia Works, Tividale, Tipton, Staffs), announce a new iron known as the "Sovereign." It is chromium-plated, with all the numerous advantages of this finish. Other features include a perfect contact connector, a convenient stand incorporated with the heel of the iron and a bakelite adapter. The iron is guaranteed for five years. The new Revo connector is now fitted to all the firm's irons and kettles. It has special tubular sockets, slotted and supported by a spring steel ring which ensures perfect contact for the whole length of the pins. Large terminal screws are provided for flexible leads to ensure definite contact and a firm grip on the conductor. The flexible covering is firmly gripped by the two halves of the porcelain, while the bell-mouthed spiral spring prevents chafing. The standard Revo iron has been redesigned. It is heavily nickel-plated and the ebonised handle and thumb rest provide a tireless grip.

Another new Revo product is the "Matchless" fire. Its heating element is laid in refractory troughs of parabolical section. The hammered copper reflector is scientifically shaped to project a maximum of radiant heat into the room; and a stout guard over the element serves many useful purposes, such as heating a kettle. The fire is light in weight and is fitted with a convenient handle. A particular feature is the arrangement whereby, when one or more of the three sections of the element is switched on, the heat is evenly distributed over the reflector. The wall plug is arranged to control one section of the element, the remaining two sections being each controlled by a separate switch.

The Sadia table stove, offered by SADIA, LTD., of 22, Newman Street, Oxford Street, London, W.1, has been designed to meet the demand for a cheap and efficient table cooking apparatus. Three-heat regulation is given by a special plug instead of a switch. An aluminium deflector plate prevents the heat from spoiling the table. The body and legs are fire white enamelled, while the boiling plate is of the usual high speed Sadia quality, guaranteed for two years. The stoves are delivered with two yards of flex complete with earth wire.

Four suggestions are made by the BRITISH RESISTOR CO., LTD. (Clare Road, Halifax). The first of these is the new type "Globar" electric grill. The grill is fitted with four "Globar" non-metallic elements, each 14 in. long, connected two in series and the two sets in parallel, and arranged for three-heat control; the total loading is 4 kW. The cooking area is 14 in. by 8 in. Chops or steaks are grilled from the underside. It is claimed that this offers advantages as compared with grilling from the top. The non-metallic elements are unaffected by spilled liquids, fats, etc. The second suggestion is the circular type "Globar" hotplate, fitted with a three-heat switch. It has four 7 in. "Globar" elements, two in series and the two sets in parallel, and can be supplied in loadings from 2 000 to 2 500 W inclusive. The external diameter of the "Globar" hotplate is 9 in., and the depth is 6 in.

The company's third recommendation—an electric heat accumulator—is, let us hope, a rather doubtful suggestion for spring trade, but with the variety of weather we enjoy in this country it may, after all, be as well to prepare for the worst. The item in question is the "Imbery-Whitehouse" heat accumulator, intended to eliminate the disadvantages found in some types of similar apparatus. No refractory container is employed, and no water is used. The principle employed in this warmer—viz., heat accumulation—dispenses with the necessity for any electrical connections to the heater when in



A new refrigerator manufactured by A.-S. Refrigerating Machines, Ltd.

use in bed. The dimensions of the heat accumulator (Type B.1) are 12 in. by 6 in. by 3 in. All parts are interchangeable. Special alloy metals of heat resisting properties are used in the construction of the heater, which is constructed to operate on all voltages from 100 to 250 inclusive. The total watts rating is 500. The elements are stated to be of a special type. The outer container is of welded sheet metal, filled with dried refractory sand to give good heat absorption. The outer container and plug connections are nickel plated. Two yards of special flexible with adaptor are provided as standard.

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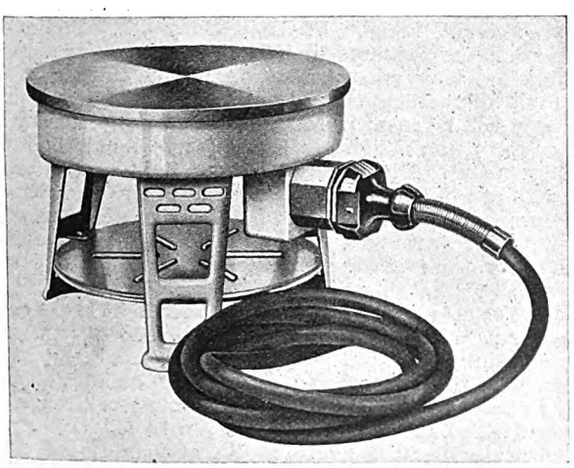
Among their large range of domestic appliances L. G. HAWKINS AND CO., LTD. (30–35, Drury Lane, Kingsway, London, W.C.2), wish to call attention to three lately introduced items—the "Universal" automatic iron No. E9092, the automatic toaster No. E9422, and the new "Universal" cleaner with motor-driven brush and 15 in. nozzle. The iron is designed for a.c., and the current is automatically cut off at 575 deg. F. The toaster is set by a simple lever, the toast being delivered automatically with the required degree of brownness. The device is highly nickel-plated and handsomely chased; the loading is 550 W. The "Universal" cleaner needs no introduction to our readers.

The most noteworthy feature of the No. 1 electric irons produced by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD. (38–39, Upper Thames Street, London, E.C.4), is the lifelong guarantee given to the element—subject only to very reasonable conditions. Considerable care is claimed to have been taken in making this iron comfortable to use; a particular quality is the side entry connector, which prolongs the life of the flex and always keeps it well away from the user's arm. Another useful device is the "Xcel" safety kettle fitted with an automatic cut-out which breaks the circuit at a temperature somewhat above boiling point. The cut-out embodies a bridge contact across two spring terminals, held in position by a fusible nut engaging with a screw in the kettle bottom, which releases the contact bridge when the kettle runs dry. This drops into a well pressed into the kettle bottom, the break being assisted by a spring. A special arrangement is now provided so that the bridge cannot possibly earth to case, and the contact cannot again be made under any circumstances until a new fuse is fitted. A new fuse can be screwed on with the finger and thumb without the aid of any tools, and the kettle is then ready for service again. Each kettle is supplied complete with one spare fuse, and the cost of new fuses is negligible.

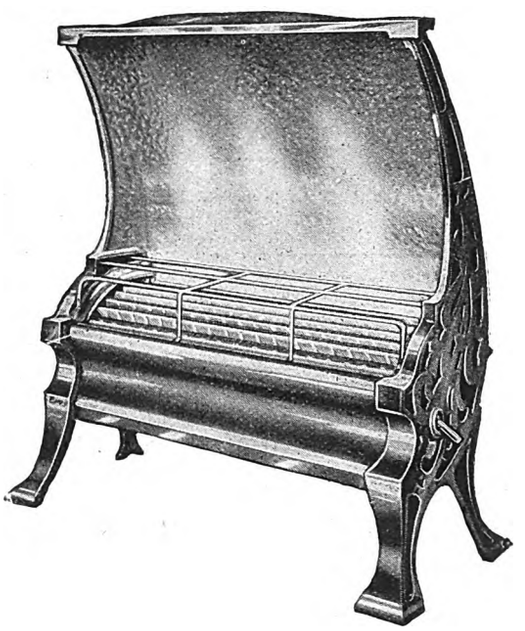
The "Xcel Minor" cooker meets the needs of those whose cooking requirements are limited to from two to four persons, and it will be found extremely economical. The hob is vitreous enamelled, the oven door-front white porcelain enamelled, and the remainder stoved black. For a small extra charge, it can be supplied in mottled enamel. The grill-boiling plate boils efficiently, and will heat the oven or grills at the same time. The spirals are entirely protected by fireclay tubes. When boiling only is required a deflector plate is inserted in the oven to throw the heat upwards. Messrs. Siemens also particularly recommend their electric towel-rails (upright pattern), which are strongly constructed from brass tubing throughout with nickel plated finish. The source of heat is a tubular enclosed element, placed at a convenient height for circulating warm air currents



The table stove introduced by Sadia, Ltd.

through the towels hung over the two top rails. A plug connector at one end facilitates connection to the supply circuit. The rails are fixed by screws through the circular flanged feet. The consumption is 175 W.

A new type of junction box for use with the "Magnet" wiring system has been introduced by the GENERAL ELECTRIC CO., LTD. (Magnet House, Kingsway, London, W.C.2). This junction box, which is moulded from "Wittonite" composition, and fitted with bakelite moulded terminal heads has features in design which make it especially suitable for tropical situations, where the two chief factors to be contended with in the installation of electrical apparatus are insects and condensation. At the same time it should be found efficient for home requirements. Neat in appearance and robust in construction, it is suitable for use with either "Magnet" bond lead covered or C.T.S. (tough rubber) cables. The box is circular in shape with a smooth "Wittonite" cover having a centrally situated recessed thread for screwing to the base. The centre screw of the base is slotted and carries a milled nut so that a bonding wire can be rigidly gripped. There are also four wiring terminals, slotted to facilitate wiring, the terminals themselves being fitted with bakelite moulded heads so as to avoid live points being exposed if the cover is removed. Eight inlets are provided so that eight twin cables up to 3/·036 S.W.G. can be accommodated after removing the guarding webs. Round the top of the base is a channel to take a plastic compound for sealing, if it is deemed advisable to seal the box. Another new product of the G.E.C. is an Osram valve. This is the DA 60, a 60 W power valve developed to meet the requirements of manufacturers of large power amplifying equipments, such as talking pictures, cinema amplifiers, public address systems, etc. It has been designed to be capable of a continuous dissipation of 60 W at the anode, and special attention has been paid to its construction in order to restrict the working anode voltage to a maximum of 400. The valve is fitted with a special type of base, similar to that used for the DET 1 type; when operating it, however, provision should be made for sufficient air circulation to prevent overheating. When two or more of these valves are operated in parallel, separate grid bias should be adjusted at various periods to compensate for slight changes in the characteristics of the valves, and to maintain the anode current at the required figure but care should be taken to switch off the power supply when making alteration to this grid bias, when inserting or removing a valve from its socket, or when any adjustments are made to the circuits. The average characteristics for the DA 60 are as follows: Filament V, 6·0; filament current, 4·0 A; amplification factor, 2·5; impedance, 835 Ω (measured at 400 anode volts with grid bias adjusted to limit the dissipation to 60 W); maximum anode V, 400; maximum anode dissipation, 60 W.



The new "Revo Matchless" fire.

A new range of fixed condensers has just been placed on the market by the MULLARD WIRELESS SERVICE CO., LTD. (111, Charing Cross Road, London, W.C.2), and forms a useful addition to the Mullard P.M. series of radio components. The condensers are of the rolled type with paper dielectric, hermetically sealed into metal containers, and are finished in the company's standard matt black enamel. Three ratings, namely 1, 2 and 4 μF are available. The condensers are designed for working pressures of 250 V d.c., and each is tested at 500 V d.c. between plates, and flash tested at 1 000 V a.c. between plates and case, before leaving the works. The method of hermetically sealing together with special processes in manufacture is claimed to render the condensers immune from damage due to climatic changes.

Two points of value are the provision of substantial solid terminals and soldering tags for connecting purposes, and, secondly, the extension of the base to form two fixing lugs with fixing holes instead of slots.

The popular "Junior Cooker" of the JACKSON ELECTRIC STOVE CO., LTD. (143, Sloane Street, London, S.W.1) has been

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previously described in THE ELECTRICIAN. We are informed that its popularity is steadily increasing, and the makers find a good reason for this in the small size of the modern family. The average number of persons in a family to-day is between four and five, whereas some years ago the number was six or seven. Kitchens are smaller, the butcher is being asked

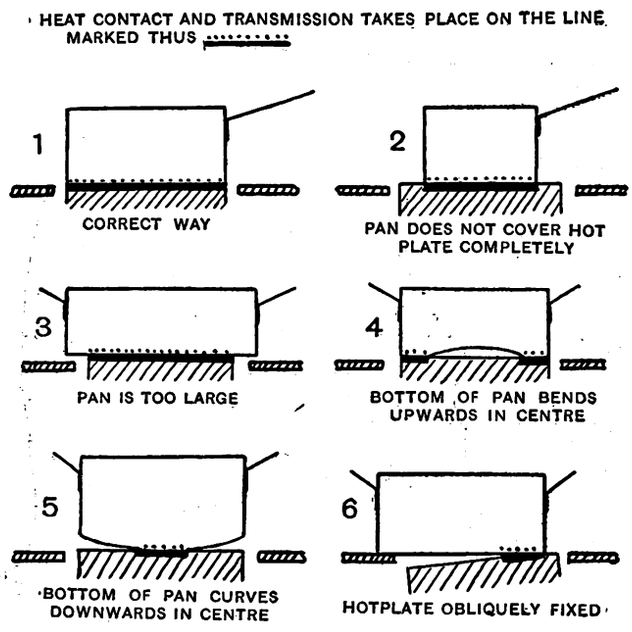

Fig. 1.—Correct and incorrect use of utensils with enclosed boiling plates. (See table below.)

for smaller joints and cooker sales show a decided tendency towards smaller models. With these facts before them, the firm is now offering the " Junior " model in two sizes, Cat. No. 50.J (for two or three persons) and Cat. No. 51.J (for four or five persons). These cookers can now be supplied with marblon mottled enamelled exterior or as small table models.

Though not strictly electrical, supply engineers, showroom managers and contractors will be interested in the " Siginflex " electric cooker utensils made by SIGG, LTD., of 469, Holloway Road, London, N. These utensils have been

TABLE I.

Time and cost chart in respect of the boiling of 4 pints of water with a " Margo " hotplate, size 8$\frac{11}{16}$ in. diam., with a loading capacity of 1 800 W. Assumed cost of electric current : (*a*) 1d. per unit ; (*b*) 1$\frac{1}{2}$d. per unit.

In order to bring 4 pints of water (taken at 65° F.) to the boiling point of 212° F. it requires :				Efficiency obtained	Waste of time and expense, based upon the correct figures shown under illustration No. 1.
Sketch.	Time in minutes.	Consumption of energy in watts.	Cost in pence.	Equal Percentage.	
1	9·5	0·282	*a.* 0·282	¼d. 75	0 (correct)
			b. 0·423	¼d.	
2	10·75	0·322	*a.* 0·322	¼d. 65	13
			b. 0·483	¼d.	
3	13	0·392	*a.* 0·392	¼d. 54	37
			b. 0·588	¼d.	
4	23·5	0·705	*a.* 0·705	¼d. 30	147
			b. 1.06	1d.	
5	22	0·665	*a.* 0·665	¼d. 32	132
			b. 1·00	1d.	
6	16·5	0·495	*a.* 0·495	¼d. 43	74
			b. 0·742	¾d.	

specially designed for use with electric cookers, and in commenting upon their own products the manufacturers state that the use of the correct type of $\frac{1}{4}$-plate machined flat utensils is of the greatest importance to both the consumer of electricity and the supply department, because these utensils safeguard against buckling and warping and heavy current wastages, and also free the department from the statement, so often broadcast, that cooking by electricity is much dearer than by gas. The company has put on the market a standard set of utensils comprising 3 or 4 pint " Leicester " kettle, three useful stewpans, and frypan, the cost of which works out at 42s. These, it is suggested, could be hired with the stove for a nominal charge of 1s. per week, becoming the consumer's property on the fifty-second payment, and showing the 10s. return on each set, or an average profit on capital outlay of 25%. Where it is a question of price, and price alone, Sigg, Ltd., have another range of utensils, also machined flat, which gives $\frac{1}{8}$ in. thick base—and in this case a set of five stewpans, together with a 4 pint kettle of the " Leicester " type can be supplied at 30s. per set. These can be hired at 9d. per week on the same basis, and as the cost works out on an average of 7d. per week, it would show an average profit of 30% on the capital outlay.

The A-S REFRIGERATING MACHINES, LTD., a subsidiary company of the General Electric Co., Ltd., of Magnet House, Kingsway, London, has introduced on the market a new series of standard commercial sectional cabinets, having interior storage capacity ranging from 40 to 80 cubic feet. The standard outside finish is white enamel, but other colours can be supplied if desired. The main compartment has two doors provided with special air-tight gaskets. The fittings are of stainless metal, and three removable galvanised shelves are fitted in each compartment ; hanging rails can, however, be provided, if desired. Ice is made in cans, and it must be noted that the time required for freezing is extremely short (2–2$\frac{1}{2}$ hours). A-S machines can be operated by electricity, gas, oil, petrol or steam engine, water, etc. The condenser housing which rotates in the cooling water contains a small twin cylinder compressor, which is held in position by gravity and a lead weight. Any kind of water can be used as cooling water. It need not be clean or soft. The cycle of refrigeration in the A-S Automaton is : SO_2 is used as cooling medium, and the vapour is drawn from the evaporator through the outer channel of a hollow steel connecting shaft into the compressor. After being liquified, it collects at the bottom of the condenser. The condenser also contains special lubricating oil and the condenser housing rotates. The liquid SO_2 therefore together with the oil are taken by centrifugal force to the top of the housing, where a scoop collects them in the separating chamber. The oil, being the lighter, rises to the top and overflows. This ensures that the compressor works in a continuous oil bath. The SO_2, being the heavier, sinks to the bottom and is syphoned into the SO_2 reservoir, and from there it returns to the evaporator. The arrangement is such that the plant is self-regulating, and only the right quantities of liquid SO_2 are allowed to return to the evaporator. The cycle then starts anew.

Electric vacuum cleaners are suggested by the BRITISH VACUUM CLEANER AND ENGINEERING CO., LTD., of London, S.W.6, particular stress being laid upon the " Goblin-de-Luxe." This is a bagless type of machine the consumption of which is 170 W and weight 7$\frac{1}{2}$ lb.

ILLUMINATION DESIGN COURSE.

Preliminary Details of the Programme Arranged for the 21st E.L.M.A. Course.

ARRANGEMENTS have now been made by the Electric Lamp Manufacturers' Association for the 21st Illumination Design Course to commence at the Lighting Service Bureau, 15, Savoy Street, London, W.C.2, on May 5th. Preliminary details of the programme to be followed have been issued, and Monday, May 5th, registration will commence at 9.30 a.m., to be followed by a reception at 10 a.m. The remainder of the day will be spent as follows :—Lighting yesterday and to-day (10.15 a.m.), lighting terms (11.15 a.m.), light and visibility (noon). During the afternoon light control will be dealt with at 2 p.m. ; electric lamps and their characteristics at 3 p.m. ; and the Lumen method of design at 4 p.m. The programme for Tuesday morning will be : 9.45 a.m., industrial lighting ; 11 a.m., lighting for special industries ; and 11.45 a.m., a factory lighting design. In the afternoon : 2 p.m., light and the shopkeeper ; 3 p.m., uses for light in the shop ; and 4 p.m., electrical advertising. On Wednesday morning a shop lighting design will be dealt with at 9.45 a.m. ; school and office lighting at 11 a.m. ; and the possibilities of home lighting at noon. The afternoon programme will commence at 2 p.m. with light and architecture, to be followed at 3.15 p.m. with architectural lighting. Street lighting and traffic control at 9.45 a.m., special lighting problems at 11 a.m., and new lighting fields at noon, are the arrangements for Thursday morning ; with salesmanship at 2.30 p.m., and lighting service and general discussion at 4 p.m. in the afternoon.

Weymouth Electricity Committee seeks sanction to borrow £10 000 for mains and services.—A new main is to be laid to supply houses proposed to be erected near the Westham playing fields, at an estimated cost of £240.—The Committee has decided that the necessary facilities for improved lighting of the Great Western Railway cargo stage be provided, subject to the railway company paying the cost of the installation and the current consumed.

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THE IDEAL HOME EXHIBITION.

Large Increase in Number of Electrical Exhibits—The Pavilion of Light and the "Daily Mail" Competition.

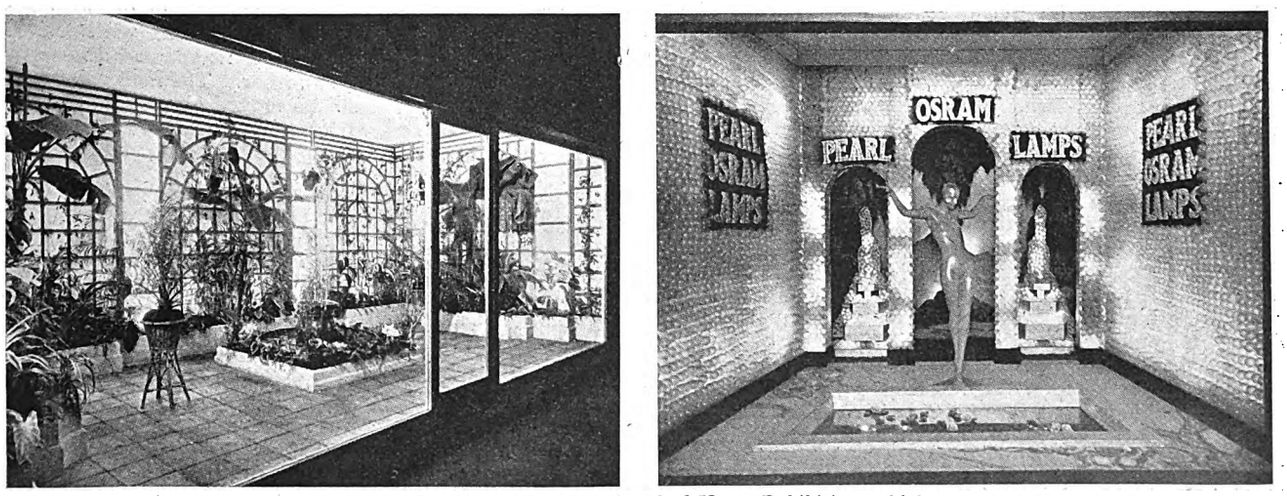
ONE of the outstanding features of the Ideal Home Exhibition, which opened at Olympia, London, on Monday, is a Pavilion of Light, a concrete expression of ideas formulated in connection with the £1 000 competition organised by the "Daily Mail" in conjunction with the GENERAL ELECTRIC Co., LTD. This competition, open to British architects, decorative artists and electrical contractors, was designed to demonstrate the important part which lighting plays in the home and to show its true relationship to architecture, furnishing and decoration. As a consequence, the Pavilion of Light crystallises modern ideas in connection not only with artistic electric lighting, but also with electric heating and other electric applications to the service of the home. The pavilion occupies a prominent position in the central aisle at the foot of the main stairway to the gallery. By means of floodlighting and colour-sprayed lamps operated by an automatic flashing device, the colouring of the façade is brought out to emphasise the appropriateness of the appellation "Pavilion of Light." A suite of six rooms is devoted to the competition referred to, and the winning designs are incorporated. These rooms comprise a lounge, dining room, bedroom, nursery, kitchen and bathroom. The first four are equipped in accordance with schemes drawn up by architects and collaborating artists, and the two latter in accordance with schemes submitted by electrical contractors. Probably the room among those connected with the competition which creates the most lasting impression is the dining room. The extraordinary character of it can to some extent be gauged when it is stated that the walls and the ceiling are of black glass. The centre of the wall at each end of the room has a projecting ornamental feature with cupboards incorporating rose and silver mirrored glass arranged alternately, as well as vertical niches forming part of the lighting effects. A special feature in louvred illumination is introduced at the base of this architectural fixture. The threshold of the doors is lighted from below, and an etched panel, lighted from behind, forms a dado between the two doors. The central feature of the room is a dining table fashioned entirely from glass. The top is illuminated by light which is also projected downwards upon a tank containing gold fish. A circular illuminated fountain is mounted on the table top with two small glass electric lighting table standards of unique design close by it. The bedroom is another original example of the development of artistic utility in electric lighting and heating in the home. Pale blue relieved with a rose tint forms the primary colour. A special concealed lighting unit is set at the top of the drapery of the bed, and a concealed reading unit with the light passing through a diffusing glass panel is effective across the full width of the head of the bed. Illuminated wardrobes are recessed in the walls, and an unusual feature is a combined heating and lighting standard with a heated mirror. The area of the dressing table is illuminated through the floor, a soft light being passed through diffusing glass. From above, a large fitting is suspended and its illumination also covers the area of the dressing table. At the side of the table, lighting fixtures of unusual design and of a portable nature are placed, while the table also carries a heating unit. Convention is adhered to more closely in the lounge where special bracket units, designed for semi-indirect lighting, form an attractive feature, while a domed fixture occupies the centre of the ceiling. This fixture has glass panelling fitting close to the ceiling, whilst its underside is an inverted bowl. Table standards, figure and picture lighting, and an electric fire, designed to suit the room, are other features.

The kitchen is, of course, all-electric, while the bathroom is fitted with electrical appliances ranging from a thermostatically controlled water-heater to an illuminated shaving mirror and a vibratory exerciser. A nursery is another of the competitive rooms and this incorporates everything which may be deemed essential in a children's playroom; it is lighted by a method which shows full appreciation of the circumstances. There is a lay-light above and four recessed lighting units forming wall panels. Another feature is a decorative landscape illuminated from behind so as to give it a daylight effect.

Apart from the sections in the Pavilion which the competition embraces, there are several others of interest. The garden lounge will appeal particularly to a very wide circle, not only on account of its general attractiveness of setting, but also because of the effectiveness of its lighting arrangement. An illuminated fountain forms the centrepiece, and tall palms flank it. Creeper-covered trellis provides the background to the lounge at its three sides (the front is open) and at the foot of the trellis throughout its whole length is a floor border of blooming tropical plants. Four illuminated glass pilasters, flush with the trellis, form a novel method of lighting a picturesque retreat such as this. The salon is another of these non-competitive rooms possessing many attractions, and the special applications of modern systems of lighting it reveals will be found most instructive. Illuminated glass panels are introduced as louvres in a frieze, these forming a particular feature of the lighting effects. The sun parlour is an apartment where artificial illumination approximating to actual sunlight is demonstrated.

One room is devoted to a spectacular display of pearl Osram lamps, consisting of a brilliantly illuminated tableau in which a figure stands by a bathing pool in a pavilion, the walls of which are constructed of thousands of lamps. The colours of these walls constantly change, giving the effect of an iridescent mosaic. Through open archways are seen glimpses of a garden with fountains of pearl lamps playing jets against a background of distant mountains and an ever-changing skyline.

(To be continued.)



TWO of the interior exhibits in the Pavilion of Light at the Ideal Home Exhibition, which opened at Olympia, London, on Monday. On the left is the Garden Lounge, and on the right an Osram lamp display. Details of the Pavilion are given above.

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PARIS AGRICULTURAL MACHINERY SHOW.

Electrical Exhibits—Barrow Motors—Shellers, Root Cutters and Grinders—Universal Farm Mills—Washing Machines, Cream Separators and Egg Graders.

By THEODORE RICH.

MANY of those connected with farming in this country do not realise what rural electrification means, but if they saw the variety of machines arranged for electric drive at the Paris winter show, they would look upon such a service as something more than a passing fad.

Something like 22 000 Communes have been supplied with electricity at their operating centres, of which about 18 000 could be termed predominantly agricultural in character. This does not mean that everybody in the commune can be connected up at once, but those who are responsible for the supply have to run branches to outlying consumers, provided a minimum revenue is guaranteed on the basis of first cost.

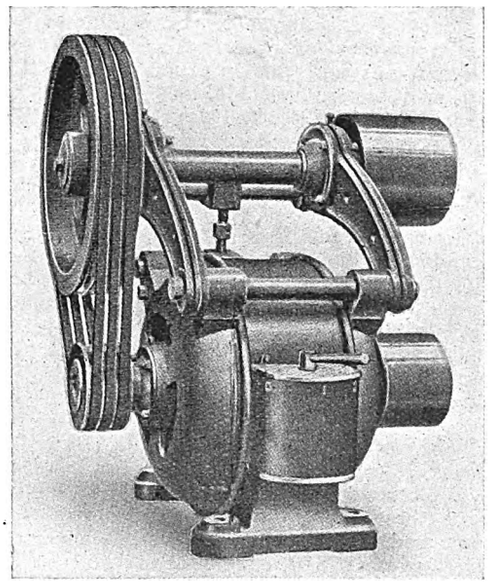

Fig. 1.—Rouillaud "Agror" motor.

Before the fall of M. Tardieu's first Government a programme was drafted for the spending of 300 000 000 Frs. (£2 400 000) during 1930 for rural electrification. It must be remembered that considering the comparatively small amount provided, so far to aid rural communities, the progress made so far has been extraordinary. The French Government believes that the problem of rural electrification lies at the retail end and that given facilities the demand will grow, leaving to existing power supply authorities the right to furnish the energy required, assuming that such undertakings have a staff competent to carry out their duties without bureaucratic interference.

The result of the policy has been a continuous expansion in the use of power for agricultural purposes on the farm. Electric heating is increasing in France, but in general it has not grown as fast as with us in the towns. Electricity has caught on especially at dairy farms. The cream separator, if of large size, takes a lot of starting, the churn, the butter worker, and more recently the milking machine, can all be very conveniently run by electricity, and its use obviates the use of line shafting.

For general farm work the barrow motor is very popular. With it, not merely can dairy machinery be driven, but odd jobs can be done around the farm; practically all have some form of speed reduction and varying gear, and a number have a short belt drive to a counter shaft fitted with step-cone pulleys. Perhaps the most popular barrow motor is the Wisler. It is made from 3 to 8 H.P., is fitted with a gear box that can be clutched on to the main shaft, the box being fitted with six speeds for a range from 40 to 750 r.p.m., a pulley being attachable to any one of six projecting shafts.

The Alsthom Co., the amalgamation of the French Thomson Houston Co. of Paris with the Société Alsacienne of Belfort, makes a barrow motor with a belt reduction.

The geared tripod motor is a development of the last three years. A half-horse power single-phase commutator motor with a geared head is arranged on a tripod adjustable for height. It is designed to operate any machine around a farm usually operated by hand, the connection being by means of a coupling which can be temporarily attached to the shaft of the machine to be driven, and a fork on the low speed shaft of the motor; speed regulation is arranged by brush adjustment. The first of these machines was made by Wisler, of Senlis, Oise. This motor has been used largely for cream separator work, its starting torque being very good. Another type of portable motor is made by the Société Electro-Moto-culture of Carcassonne. The motor is arranged under the fly-wheel of the machine to be driven, running it with the aid of a spring-controlled friction drive, the motor seat being cylindrical, suitable cradles being arranged below the fly-wheels of machines to be driven, so that the motor can be carried about from machine to machine as required.

Messrs. Rouillaud, of Vincennes, for some little time have been making motors for agricultural work. Fig. 1 shows a new type. A starting and regulating rheostat is attached to the motor, to give a high power factor and efficiency at ·4 full load. The motor shaft and countershaft have ball bearings, the adjustment of the triple belt tightness is made by a capstan bolt with reversed screws; the speed ratio is 3·5 to 1. The motor is of the three phase squirrel cage type, and the cage has the double layer winding arrangement originally invented by Buchcrot, the commercial advantages of which have only been recognised during the last year or so; the starting current is therefore low. The reduction arrangement naturally runs very quietly. The motor known as the "Agror" is made in sizes from ½ to 6 H.P., by Charles Rouillaud, of Vincennes, Paris.

A quite new piece of apparatus is the Law electrically-driven universal sheller, root cutter and grinding machine (Fig. 2). The driving part consists of a motor, ·9 H.P., arranged vertically on a tripod. The motor is of the three-phase type arranged for 1 500 or 3 000 r.p.m., the speed change being arranged with a reverse by means of a hand-wheel which is turned in either direction as required. A little ammeter gives an indication of the load. The motor is supported by means of radial fins inside a cylindrical shell, any material to be dealt with falling down outside the motor frame into a drum that is suspended underneath. The machine is arranged so that by putting different discs on to the vertical spindle like gramophone records and arranging suitable changeable housings, the same motor frame can do a number of jobs. With one type of disc and feed device, and an action like that of an impact coal pulveriser, meal can be made of different finenesses from all kinds of grain; grain can also be crushed or shelled. With another type of disc and feeding hopper, swedes, beet-roots and such like can be cut to chunks or chips for cattle food. With a third set of accessories, potatoes can be bruised for cattle food, oyster-shells broken up for poultry, and solidified nitrate of soda broken up for use on the fields, and cyder apples cut up. With a special head, cattle cake can be broken up. The farmer buys the motor, and any or all the accessories he wants. Different heads can be fitted with the aid of pivoted bolts and wing-nuts, so that no spanner is necessary for changing from one duty to another. The motor has a flexible connection, and can easily be moved about a barn to a convenient position, and with the hopper below, which is fixed up with the aid of toggle loops, the spreading of dust is avoided.

M. Wisler's Vision.

This machine was invented by M. Wisler, of Senlis, an engineer with agricultural experience, who after the war saw a future for electricity on the farm and has built up a business intended, almost exclusively, for the making of electrical motors, gears and appliances for use on the farm.

The Belgian Melotte Co. showed some cream separators with built-in motors. Driving a cream separator is not a simple job, careful design being necessary to obtain satisfactory results. There were to be seen 29 makes of cream separators, so the French seem to be anxious to get back the reputation for butter-making they used to have thirty years ago, when Brittany butter was to be found in so many shops at home.

Two German machines were interesting to watch, one being an arrangement for grading eggs. The eggs were first inspected over an illuminated slot as they were passed down a sloping chute, to see if they were fresh—the process is

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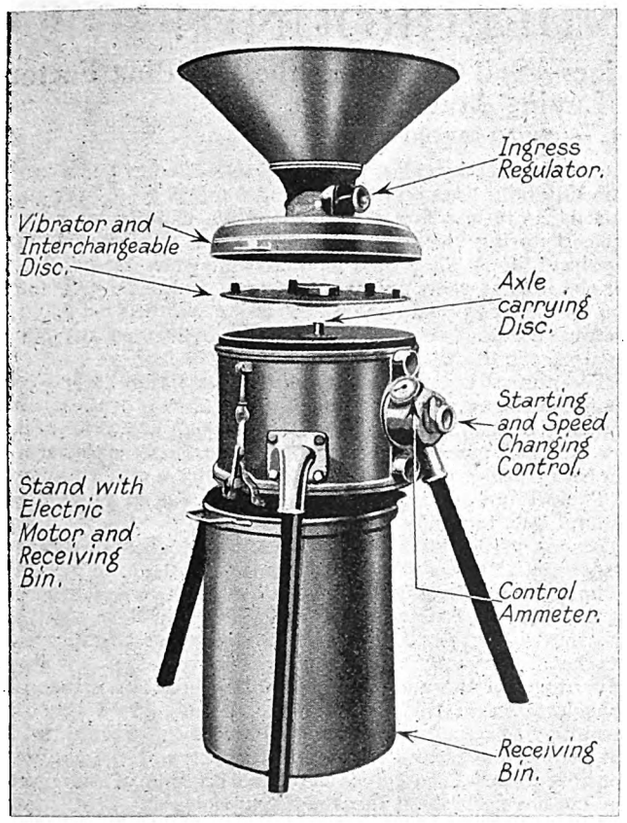

Fig. 2.—Law electric sheller, root cutter and grinder.

usually termed candling. They then roll on to a slowly revolving platform with little traps that tip up according to the weight of the egg. Another machine was like a wire-cut brick machine, in which butter or margarine is extruded by pressure and cut up and packed automatically, with great accuracy regarding weight—both these machines were electrically driven.

Milking machines seem to be popular in France. One maker has supplied 2 800 of one type; when driven electrically they make a very handy unit. Seven makes of milking machines were to be seen at the show.

A material proportion of the arable land in France is devoted to the vine. Cultivation of the ground between the narrow rows has led to the development of miniature motor tractors and special tools. A good deal of scientific work is being done in connection with wine making, and a number of electrically driven wine pumps on barrows, portable and other wine presses and barrows were shown. Material attention is given to cyder making, though French cyder is often poor stuff to British tastes.

As such large areas have now been to a material extent electrified, quite elaborate wine plant is placed on wheels, so that a contractor or co-operative society can take the gear to a number of villages in turn. The motor drive is a convenience because of its cleanliness and absence of fumes as compared with a petrol engine.

The French farmers as a rule have a considerable aptitude for co-operation, and for many years there have been co-operative organisations for the buying of seed-grain, artificial manures, machinery and so on. The existence of electricity in so many thousand villages has made it possible to use the electric motor in lieu of the portable steam-engine for a number of jobs. In England much threshing has been done for years by contract, in France a good deal of threshing is done by co-operative societies. Threshers are usually smaller than with us; in some parts small machines are kept in barns and the grain thrashed in the winter under cover. One difficulty in some rural areas is that a number of small farmers want to do the job on the same stormy day; which gives trouble, if the village transformers are on the small side, to minimise light load losses.

Some co-operative groups own comparatively large threshers, and send them round to the farms of the members and hitch them on to the low tension mains at convenient points.

One trouble with threshing machines is that owing to the high speed of the drum and the weight of the shaking gear a good deal of starting is required, and with unskilled workpeople there has been trouble owing to the overloading of motors when starting up.

This has been got over by a special fool-proof motor designed by M. Dassenoy of Metz (Fig. 3). The stator is of the normal type, the rotor slides on the shaft sideways over a keyway; alongside it is a cylindrical armature. On starting, the current pulls on the armature part and pushes the squirrel cage out of the field against a spring so that there is a differential action. The magnetic cylindrical armature places itself in the field of the stator and presents a very low reluctance; the current flow being limited by the corresponding self-induction, which is high enough not to put a shock on to the network. It must be remembered that in France some of the overhead lines are very light in section and the transformers also small owing to the use of 110/190 V. The rotor commences to turn round with the shaft light; as it revolves the suction of the stator on the magnetic armature diminishes, the rotor slides along the keyed shaft, and by means of a slightly cored clutch the driving pulley, which is loose on the shaft, takes up its job at a point near synchronism.

There is therefore practically no shock on the network, the power factor is high and it is possible to work at the most economical part of the curve close to the overload point. If an excessive load is put on, the excessive stator current pulls on the armature and de-clutches the driving pulley. Despite the heavy mechanical load at starting there is no necessity for a circuit breaker or slip-ring starter, the clutching in and out being operated magnetically. There is not merely the starting up coupling effect but also the automatic throw out, making it practically fool-proof. This type of motor is placed on the top of the thresher frame out of the way. Several hundreds of these motors are in use attached to threshing gear; this fact alone shows the extent to which electro-farming is progressing in France.

There are still in France quite a number of large farms and a number of large barns, many dating back a hundred years and more. A system of crop handling by means of runways and semi-automatic grabs has been developed which will handle crops and dump them where required with a minimum of labour; in many cases barn roof timbering has to be altered to allow clear runs for the trolley apparatus. To avoid complicated reversing gear one way traversing-haulage gear is operated by a weight usually made of concrete blocks. A load comes to the barn, it is lifted by automatic grabs, run along to where it is wanted and then dumped, the weight hauling the grab and trolley back to the eaves for reloading.

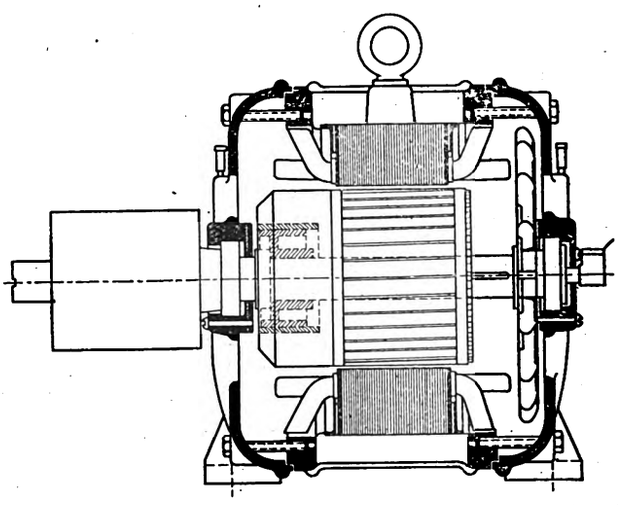

Fig. 3.—Dassenoy threshing motor.

These gears are specially adaptable for operation by electric motors. The winch gear, which is of the friction type, is ingenious and simple.

(To be concluded next week.)

The National Electric Light Association has issued statistics of the electric labour-saving devices in use at January 1st in about 20 million homes in the United States. These include: Flatirons, 18 800 000; suction cleaners, 8 720 000; toasters, 7 420 000; washers, 6 680 000; fans, 5 880 000; percolators, 5 500 000; space heaters, 3 220 000; sewing machines, 3 000 000; refrigerators, 1 880 000; ranges, 880 000; ironers, 580 000; oil burners, 500 000; and dishwashers, 75 000.

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OVERHEAD OR UNDERGROUND?*

Comparison of Costs for Rural Transmission Lines—Soil Conditions the Deciding Factor—Dr. Schramm's Cable Laying Machine.

By ALFRED EKSTROM, B.Sc., M.I.E.E., and VIDAR EKSTROM, C.E.

DURING the last few years the use of underground cables instead of overhead lines for rural transmission has been greatly developed on the Continent. No overhead 11 kV rural transmission lines are built at all in Holland nowadays. There are now over 6 000 miles of 11 kV underground cable in permanent use in that country.

In Germany even 30 kV rural transmission lines are built underground instead of overhead. A special cable-laying machine, by means of which the cost of laying cable in rural areas is considerably reduced, has been constructed by Dr. Schramm, of Saarbrücken, for this purpose.

In an article recently published in THE ELECTRICIAN (November 8th, 1929) Colonel Crompton and I proved, in regard to the 33 kV grid feeders, that there are many districts in England where the soil conditions are so favourable that underground cables could be used to financial advantage.

Even if the service of an overhead line is satisfactory, that of an underground cable will obviously be still more satisfactory, the cable being protected from atmospherical disturbances such as lightning, frost, snow, sleet, storms, etc., and being preferable in a country where aviation is of importance.

At a previous meeting of the Overhead Lines Association it was proposed that rural transmission lines should be standardised at 11 kV, and I am of opinion that this will prove successful in most cases.

In this paper I give some comparative costs for overhead lines and underground cables for rural transmission, restricting myself, on this occasion, to the tension of 11 000 V. The following tables are informative :—

TABLE I. (OVERHEAD LINES.)

Line							
1	Conductor sq. in. ..	0·0225	0·03	0·04	0·06	0·075	0·1
2	Max. kVA at 5% voltage drop	294	388	521	650	765	890
3	Max. amp. cos $\phi = 0{\cdot}8$	15·4	20·4	27·3	34·1	40·2	46·8
4	Cost of O.H. line per mile	£392	£422	£462	£536	£590	£662
5	9·5% of costs 10 × line 4	£372	£401	£439	£510	£560	£629
6	Copper losses × 1 300 hours at 0·6d. ..	44	61	78	80	88	90
7	Losses due to interrupted service ..	10	13	18	22	26	30
8	Total costs	426	475	535	612	674	749

TABLE II. (UNDERGROUND CABLES.)

Line							
1	Conductor sq. in. ..	0·0225	0·03	0·04	0·06	0·075	0·1
2	Max. kVA at 5% voltage drop	294	388	521	650	765	890
3	Max. amp. at cos $\phi = 0{\cdot}8$	10·6	15·2	21·6	27·7	33·4	39·2
4	Cost of cable per mile .	378	456	514	605	702	830
5	Cost of cable boxes and and joints per mile ..	34	34	35	35	36	36
6	6·8% of costs (lines 4 + 5) × 10	£280	£333	£373	£435	£502	£589
7	Dielectric losses 0·22 kW per mile × 8 760 hours at 0·3d. ..	24	24	24	24	24	24
8	Copper losses × 1 000 hours at 0·6d. ..	28	40	53	55	61	63
9	Losses due to interrupted service ..	2	2	3	4	5	6
10	Costs available for cable laying	92	76	82	94	82	67
11	Total costs	426	475	535	612	674	749
12	Capitalised cost per mile cable laying ..	135	112	121	138	121	99

Table I gives data for an overhead 11 kV line, ten miles in length. Line 2 gives the maximum load, in kVA, at the end of a line of ten miles in length, provided that there shall be no drop in voltage above 5%. Line 4 gives the estimated costs of one mile 11 kV lines of varying copper areas, built on impregnated wood piles, at the present price quoted for copper, etc. The capitalised cost of wayleaves is included and assumed to be about £32 per mile. Line 5 gives the annual costs for interest (5%), depreciation (1·5%), and maintenance and upkeep (3%)—a total of 9·5%—on a ten mile overhead line, in accordance with line 4.

The annual cost for interest is calculated at 5% on the first cost of the line. As it is presumed that urban corporations are the authorised undertakings which will have the greatest interest in this supply, we have calculated with an interest as low as 5%. The annual cost for depreciation is calculated at 1·5% on the first cost of the line, assuming that the average life of an impregnated wood pole is 30 years.

The annual cost of maintenance and upkeep is calculated at 3% on the first cost of the line. This figure has been taken, as a reasonable average value, from figures obtained by thorough investigations, made in Sweden a few years ago, on carefully built lines on impregnated wood poles. In regard to this figure it was found that there are usually no costs for upkeep during the first few years after the erection of an overhead line. They then increase somewhat irregularly, and for the first 15 years an average figure of about 2·5%, and for the following 15 years one of about 4% was arrived at. The average annual cost can, therefore, be estimated at from 3% to 3·5% for the whole lifetime.

The annual copper losses in line 6 are estimated to correspond to the maximum load (see line 3 above) of the ultimate capacity of the line at a load factor of 15%, at a price of 0·6d. per unit. Annual losses in income due to interrupted service, shown in line 7, are based on statistics from undertakings.

Table II gives the corresponding data for an 11 kV underground line, ten miles in length.

Line 1 gives the conductor, in square inches, of three-core underground cables of varying copper areas. Line 2 gives the same maximum loads in kVA as for overhead lines. On account of the electric capacity of the cable line, it will be possible to transmit a considerably higher maximum load than with an overhead line with the same drop in voltage. This is an advantage for the underground cable, which is not taken into consideration in this comparison. Line 3 gives the corresponding maximum current in amperes, assuming that cos $\phi = 0{\cdot}8$, and taking the electric capacity of the cable into consideration. Line 4 gives the cost of one mile of underground hessian-covered, lead-sheathed, paper-insulated, three-core cable of varying copper areas, delivered free to the actual place of work. These prices are based on figures received from a British cable manufacturer, and the cable complies with the B.E.S.A. specifications. As the cable is assumed to be laid 4 ft. below the surface of the ground, it is sufficiently protected from damage by farming operations to eliminate the necessity of its being steel-armoured, or covered by bricks. Line 6 gives the total annual costs for interest (5%), depreciation (0·8%), and maintenance and upkeep (1%)—a total of 6·8%—of a ten mile cable line, in accordance with lines 4 and 5. Interest is calculated at 5% on the first cost as in the case of an overhead line. Depreciation is calculated at 0·8d. on the first cost of the line, assuming that the life of a cable is 45 years.

Cable Maintenance Charges.

The annual cost for maintenance and upkeep of an underground cable is calculated at 1% on the first cost of the line. From experience in Sweden a figure of only from 0·1% to 0·2% has been obtained. In Holland 1% is considered as the maximum figure, and we have calculated with the higher Dutch figure.

Cable dielectric losses (line 7) are calculated at 0·22 kW per mile, during 8 760 hours, at a price of 0·3d. per unit, which might be reasonable for a permanent demand. Annual copper losses (line 8) are estimated to correspond to the maximum load (see line 3 above) of the ultimate capacity of the line and 11½% load factor for the losses at a price of 0·6d. per unit. In these calculations we have assumed a load factor of 17%, which can be considered as normal for a supply of this kind.

In order to find the load factor of the copper losses, we have used Prof. Rossander's method and have assumed that the consecutive diagram A of the load complies with the formula :—

$$y = \varepsilon_0 + (1 - \varepsilon_0)t$$

where

y is the load at the time t,
$y = 1$† at the time $t = 0$,
y = the relative minimum load ε_{01} at the time $t = 1$‡,

$$\lambda = \frac{1 - \varepsilon}{1 - \varepsilon}$$

and

ε is the load factor, or the distance IB on the curve.

The diagram of the copper losses will vary in proportion to the line C, as it is proportionate to the square of the load resulting in a load factor as shown by the line ID.

It is obvious that within certain limits the load factor for the copper losses in an underground cable will be smaller than

* Abstract of paper read at the meeting of the Overhead Lines Association on March 19th.

† For convenience the maximum load is taken as 1.

‡ For convenience the 8 760 hours in the year are taken as 1.

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that in an overhead line, as the capacity current reduces the load to a certain extent. Close investigation shows that the load factor of an underground cable or an overhead line can, in this case, be assumed, with sufficient accuracy, to be 11½% and 15% respectively.

Line 10 gives the annual cost available for the laying down of the cable, if the annual cost of the cable shall not be higher than that of the corresponding overhead line (see Table I). Line 12 gives the corresponding capitalised costs for line 10, for the laying of the cable per mile.

The tables above show :—

(1) That if the annual costs for an underground cable are not to exceed those for an overhead line, the first cost for the laying down of the cable must not be more than about £12 per mile, i.e., 1s. 4½d. per yard.

(2) That although the *first cost* of an underground cable line is about 27% higher than that of an overhead line, the *annual* costs are the same in both cases.

Experience has shown that where the cost of laying an underground cable is about 2s. 7d. per yard for manual labour,

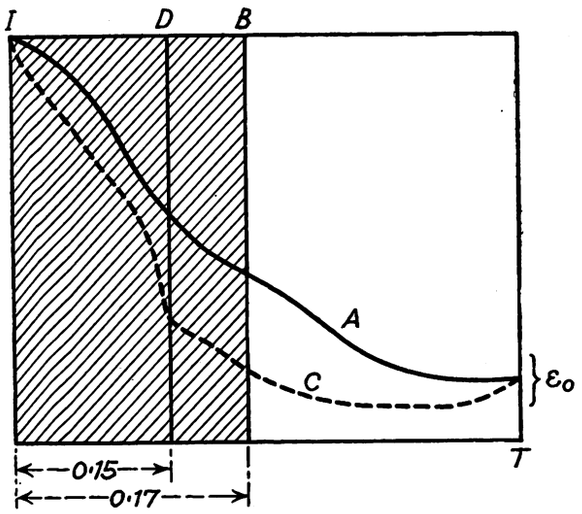

Fig. 1.—Diagram of copper losses.

this cost can be reduced to about 9d. per yard by laying, by machine, wherever the soil is suitable. The wayleaves for machine laying are estimated at about £10 per mile.

Even if it were possible to get the cable prices, mentioned above, reduced—the Continental cable prices are, in fact, considerably lower—these figures prove that the financial advantage of using underground cables instead of overhead lines is largely dependent upon having an efficient cable-laying machine.

We wish, however, particularly to draw attention to the fact that *the condition of the soil is obviously the deciding factor as to whether underground cable should or should not be used.* Where the soil conditions are such that the annual costs for laying cable underground do not exceed those of an overhead line, underground cable should be used ; where this is not the case, overhead lines should generally be built.

The cable-laying machine devised by Dr. Schramm, which has been very successful, is composed of four main parts :—

(1) The ditch digger, which digs a trench 18 in. wide by any depth up to 5 ft. 3 in.

(2) The belt conveyor, which carries the dug-up earth behind the machine, where it is poured into the trench by a swinging spout.

(3) The cable truck, which is drawn by the digger, and which carries the cable ; also serves to roll down the loose earth.

(4) The cable conveyor, carrying the cable from the drum on the cable truck to the open part of the trench behind the digger.

An important feature in the design of the machine is the requirement that it must be able to travel over any rough ground. For this reason both the ditch digger and the cable truck are carried on caterpillars. Arrangements were also necessary to make these vehicles easy to steer when in operation or when travelling along the road.

The weight of the digger, together with that of the attached belt conveyor, is so balanced that the uniform pressure on the earth under the caterpillar tracks is only 5 lb. per sq. in. The machine is driven by a four-cylinder Diesel engine. Eight speeds are available, four for the work of cable-laying and four for travelling. The digger, together with the whole cable-laying machinery thus advances, according to the speed chosen, at the rate of 205, 260, or 304 ft. per hour, and is able to cover 1·6, 1·75, or two miles an hour while travelling from place to place. Back speeds of 190 ft. per hour when in operation, and 1·5 miles per hour when travelling are available. It is, therefore, possible to lay a maximum of, say, 2 450 (1·4 miles) ft. in an eight-hour day.

It should be noted that the digger is capable of excavating unengineered roadways or tightly packed gravel paths, about 24–28 in. thick, with fairly large sized pebbles. Further, very large stones will not hinder the operation of the machine, provided that they are bound together with smaller stones, or are not too close to one another. Some difficulty was found with hard red clay soil. In order to dig this soil it was necessary to fix particularly sharp ripping teeth on to the shovel blades. The teeth are attached to the shovel in such a way that they can easily be taken off and replaced by spares when they become blunt—in the case of such a hard soil, this is necessary within an hour or two. In normal conditions the teeth should be re-sharpened about every four weeks.

Primarily the cable laid down in the trench was covered with protection bricks. It was soon found, however, that these bricks were no protection against axe blows. They are therefore no longer used and the cable is laid 8 in. deeper in the ground, which has proved entirely satisfactory. The cable route is marked by a stone at every bend.

The weight of the loaded cable truck is 11·5 tons, and the centre caterpillar track presses on the earth, which is thrown in front of it by the swinging spout, with about three-fifths of this weight.

In order to avoid too high a capacity earth current of large network, inductive soils of suitable sizes should be inserted in a few points in the district. When laying cable for shorter distances, it is advisable to use the digger alone. The smallest type of such a digger excavates ditches to a width of 12 in. by a depth of up to 4 ft. 8 in., and is particularly useful on account of the easy control. Its medium height enables it to be driven along an avenue quite close to the trees.

The earth is thrown, by the transversal conveyor, behind the caterpillar tracks on either side, so that the loose earth lies just next to the open ditch. Large obstacles are sometimes found near the ditch, e.g., large stones pushing through the ditch walls on either side. When these are seen the digger is automatically brought to a standstill by safety sliding couplings, thus preventing it from being over-strained.

Before the above paper was read the President of the Association (Mr. Theodore Stevens) announced that the Electricity Commissioners, in a memorandum they had framed on the subject of rural electrification, had confirmed the standardisation of 11 000 V for the principal transmission systems for rural work, as advocated by the Overhead Lines Association. The memorandum was in the hands of the printers and would be issued shortly, but, in the meantime, the Council of the Association had been informed that it could use this information and that undertakings in rural areas could also use it in negotiations for bulk supplies.

ELECTRICITY IN WIRRAL RURAL DISTRICT.

In reference to the inauguration of the supply by Birkenhead Corporation to Burton, which we reported in a recent issue, it is interesting to note that with the completion of the Burton and Puddington scheme there will be a public supply of electricity in all the 27 parishes and one urban district in the Wirral area, with the exception of three parishes, whereas under the Wirral Order the Corporation were required to lay compulsory mains in only seven parishes and one urban district (excluding Moreton). The total length of compulsory l.t. distributing mains which the Corporation were required to lay under the Wirral Order amounted to only 11½ miles, but the length of such mains laid by the Corporation in the area amounts to 59 miles. The total length of h.t. mains erected and laid in the district is 27½ miles, and this has all been carried out within three years. The contractors for the overhead lines are W. T. Henley's Telegraph Works Co., and for transformers the English Electric Co. and the Brush Electrical Engineering Co. The consumers in the area number 2 670, and they have been supplied with 565 cookers and 1 614 electric fires and other appliances. Since the supply commenced the charge for lighting has been reduced from 6¼d. to 5d. per kWh.

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BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION.

Annual Meeting—Points from the Report for 1929—Unemployment Committee—New Classification of Electrical Machinery and Apparatus—Standardisation.

THE annual meeting of the British Electrical and Allied Manufacturers' Association was held at the offices of the Association, 36, Kingsway, W.C.2, on March 20th. Lieut.-Col. R. K. Morcom, C.B.E. (Belliss and Morcom, Ltd.), presided, both the chairman (Mr. V. Watlington) and the director being absent owing to illness.

Before moving the adoption of the report, the chairman referred to the great loss the Association had sustained during the year in the death of Dr. Ferranti, and the regrettable retirement from the Council of one of its oldest members, Mr. Nalder.

Referring to the report, the chairman said severe compression had to be exercised by the Council to keep it within reasonable limits. A large volume would not contain a full account of the general activities of the Association during the year. Perhaps the most striking feature of the report was the indication it contained of the excellent position which the Association occupied in the opinion of the best judges, more particularly their good friends "the Press." Their valuable statistical department had brought the Association more into the public eye. They could also feel some pride in their happy relations with government departments and with the other associations.

Mr. M. J. Railing (General Electric Co., Ltd.) seconded, and after discussion, the report was unanimously adopted.

The chairman announced that the following firms had been elected members of the Council: British Electric Transformer Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., Micanite and Insulators Co., Ltd., Nalder Brothers and Thompson, Ltd., and Allen, West and Co., Ltd., and the election of auditors and a vote of thanks to the chairman for presiding concluded the proceedings.

The Year's Work.

The report of the Council for 1929 records the regretted retirement of Mr. F. H. Nalder, who had served on the Council from the foundation, owing to continued ill-health, his place being taken by Mr. A. F. Harris.

Towards the end of last year an Unemployment Committee was set up and appointed four of its members to confer with the Government as occasion might require.

Three Sections of the Association have in preparation applications to the Board of Trade under the Merchandise Marks Act, 1926.

A simple form of intertrading agreement between members has been approved by the Council and is now before the Sections.

The Board of Trade invited the Association's assistance towards a new classification of electrical machinery and apparatus for the purpose of the Census of Production, 1930. The new classification improves on the old, as being more in accordance with the actual conditions of manufacture which modern progress has created.

In regard to the trade position the report states that in many ways the economic position was unsatisfactory during 1929. Orders received for purely industrial installations on home account were less than in any year since 1924. On the other hand, certain compensating elements were present. On balance, the industry was not producing at more than its normal volume for home account. Considering the foreign overseas market as a whole, the most active area was, undoubtedly, Europe, which showed a marked expansion. Owing, however, to the effect of reparations deliveries-in-kind, this market has tended to become more and more a German preserve. It is significant, however, that the British electrical manufacturers, in spite of difficulties beyond their control, have been able to extend quite considerably their range of operations in this market.

The report summarises the past and probable future effect of certain general economic and political movements on the prospects of electrical manufactures, and considers that the almost complete cessation of foreign lending by this country, the adjustment of the reparations in kind difficulty and the change in the attitude of the central bank towards industrial development must have a favourable effect on the prospects of electrical manufacture and serve to adjust the international competitive position. Considering the past year as a whole the Council is of opinion that its most interesting activities have been along the lines of that general development patiently advocated by the Association, and that future production cannot but be favourably influenced by those activities. Prospects on home account are decidedly better than they have been for some time, but competition has become so intense in overseas markets that any considerable expansion of exports would be a matter for congratulation.

Standard Specifications.

The Standardisation Committee have been fully occupied during the year in allocating, reviewing, and co-ordinating the standardising work of the various Sections of the Association and in checking and passing the final proofs of no less than 42 specifications; as they came from the B.E.S.A. for approval. The publication of revised editions of certain important B.E.S.A. specifications marks the completion and consummation of several years' close application on the part of the technical committees of the various Sections. Outstanding among these are oil-immersed switches and circuit breakers for alternating-current circuits (B.S.S. 116), electricity meters (B.S.S. 37), and steam turbines (B.S.S. 132).

The Transformer Section Technical Committee, in preparing memoranda to serve as a basis for the British replies to certain questions put by the International Electrotechnical Commission to all its constituent national committees, have done some very useful creative work. The proposed rules for interturn insulation of h.t. and e.h.t. transformers, and their recommendations on the co-relation of transformer insulation and line insulation will undoubtedly receive serious international consideration.

The American Institute of Electrical Engineers awarded to a member of the Standardisation Committee, Mr. A. B. Field, their first Lamme gold medal.

At the close of 1929 there were 243 students in members' works. The countries sending the largest numbers were India, Africa, Egypt, Australia, New Zealand, China and South America. Efforts made by the Education Committee to discourage applicants with indifferent qualifications, or none at all, have been so frequently frustrated by the uninvited arrival in England of such men that the tendency now is not to consider any recommendation unless made or *viséd* by the members' branch offices abroad. These observations particularly apply to Indian students.

On a report from the Department of Overseas Trade, submitted by the Export Committee during the year, describing the propaganda of foreign industries in the British colonies, the publicity department was given carte blanche to engage in similar propaganda, and is now so engaged.

During 1929 the economic and statistical department was specially active in correlating statistics and information bearing on the British electrical industry, and the results of its labours during the year were incorporated in the most important economic publication yet issued: "The Electrical Industry of Great Britain." This monograph was published on November 28th and had a remarkably favourable reception.

Arrangements are being made for British participation in the Second Plenary World Power Conference to be held in Berlin in June. The Council considers that this will be one of the most important international engineering conferences ever held.

BAY OF FUNDY TIDES.

President Hoover's request that Congress appropriate $45 000 to defray the cost of a joint investigation by the United States and Canada into the probable effect on fisheries of damming the Passamaquoddy and Cobscock bays in Maine and New Brunswick, relates to a proposal to generate electricity by utilising the great tidal rise and fall of the Bay of Fundy. An American company which proposes to develop power from the movement of the tides in those bays is unable to obtain authority to construct dams because of protests from the fisheries. At Passamaquoddy Bay, with an average spring tidal range of 23·2 ft., it is estimated that from 500 000 to 700 000 H.P. could be generated.

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NEWS IN BRIEF.

Television Broadcasting—A New Accumulator—Whitworth Society's Commemoration Dinner—Canadian Hydro-Electric Development.

GRADUATE assistants in mechanical and electrical engineering are required by the Newcastle-upon-Tyne Education Committee at Rutherford Technical College.

Czecho-Slovakian imports during January last included electrical machinery and apparatus valued at 26 million crowns, compared with 42 million crowns in January, 1929.

Imports into the Irish Free State during January, 1930, included electrical goods valued at £50 095, compared with £40 804 in January, 1929. Exports of machinery and electrical goods in January of the present year were valued at £55 389, compared with £6 784 in January last year.

Bournemouth Corporation has ordered the erection of 24 police telephone boxes.

Buckinghamshire Constabulary are now equipped with electric torches giving a red or white light for night signals to road traffic.

A telephone service from all parts of Great Britain and Northern Ireland to Kaunas and Klaipeda, in Lithuania, has been commenced.

A three-act play, "The Red Arrow," was produced at Boldon Colliery Miners' Hall this week by the author, Mr. T. Louden, an electrician at the colliery.

An eight-valve wireless set, with headphones to each bed and three loud speakers, has been presented to the East Park Home for Infirm Children by members of the Glasgow Radio Circle.

It is reported that two men who gagged and bound three women in a house in Park Street, London, W., last week, and stole therefrom property valued at £1 000, were disguised as electricians.

The transmission of sound television will take place from the London transmitters at the end of this month between 11 and 11.30 a.m. weekdays, excluding Saturdays and Sundays, and from midnight to 12.30 a.m. on Tuesday and Fridays. Sound will be transmitted on 356 metres and vision on 261 metres. The Baird Television Co. is responsible for the quality of the transmissions, the B.B.C. merely acting as agents.

The French railways have given orders to a British firm for a new type of electric accumulator. The new accumulator is manufactured by the "Young" process, the principle of which has not been divulged. It is said to effect a useful saving of weight and to eliminate sulphating. It is claimed that the accumulator can be fully charged in an hour and a half, instead of the usual ten hours, and that it has resisted drastic tests, such as continuous short circuiting.

The executive committees of the engineering trade unions had a combined meeting in London on March 19th, Mr. J. T. Brownlie presiding, and rejected the suggestion of a joint inquiry into working conditions and costs of manufacture in foreign countries. The Electrical Trades Union, and one or two other unions that have abandoned hope of the success of a combined wages movement and have withdrawn from the joint conference, were not represented at the meeting.

The seventh Annual Commemoration Dinner of the Whitworth Society was held on Tuesday, March 18th, with the president, Mr. W. H. Fowler (Manchester) in the chair, and 60 Whitworths were present. The president presented a copy of "The Whitworth Book" to each of the Whitworth Scholars of 1929. Sir Henry Fowler, C.B.E., chief mechanical engineer L.M. and S. Railway, has accepted nomination as the next president, and has invited the Society to visit Crewe next July. The committee decided to make another donation to a technical college in the present year.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of March 27th, 1880, stated that Dr. Werner Siemens had been granted permission to construct an electric railway between Wedding Platz and Belle Alliance Platz, Berlin, without any intermediate stations.*

It was announced that the works of Mr. W. T. Henley at North Woolwich had been taken over at the beginning of the month by W. T. Henley's Telegraph Works Company, Ltd., in which Mr. Henley retained a considerable interest.

An official proposal was brought forward that the Society of Telegraph Engineers should change its name to the "Society of Telegraph Engineers and Electricians."

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of March 31st, 1905, a generator of 5 750 kW installed by the Shawinigan Water and Power Company, Quebec, was described as "the largest electric motor-generator ever built."*

A proposal to connect Tasmania with the Australian mainland by wireless telegraphy was made by the Commonwealth Postmaster-General.

Electric welding apparatus was shown in operation at the Paddington Electricity Exhibition, also an electric light bath for treating various complaints.

At a luncheon of the I.S.B.A., at the Hotel Cecil, London, on April 4th, Mr. Barrington Hooper will give a Publishers Views of Trade Press Advertising. Mr. Thos. Bell will preside.

Marchese Marconi, on Wednesday, switched on 3 000 lights in the town hall at Sydney, N.S.W., by wireless impulses transmitted from his yacht "Elettra" and relayed via Dorchester and Grimsby.

An estimate has been prepared for a new administration building and showrooms for the electricity department in New Street, Hull. If a free hand is allowed in the design of the building, it is estimated that the cost will be £85 000. The Finance Committee is to consider and report on the matter.

Walsall Corporation requires an electric showroom attendant.

Cheshire C.C. has voted £1 000 for the provision of traffic light signals on the roads.

Hastings Corporation has decided to instal a refrigerator plant at the White Rock Pavilion, at an estimated cost of £330.

A teacher of electrical engineering and a teacher in the engineering department (mechanical and electrical engineering) are wanted at the Oldham Municipal Technical College.

London County Council wants assistant masters to teach in the electrical departments at the Poplar School of Engineering and Navigation and the Hackney Technical Institute.

Bombay Corporation has asked the Bombay Electric Supply and Tramways Co. to switch off the light throughout the city at 8.21 p.m. every day, for about three seconds, as an indication of the correct time.

"The Perfect Servant who Rules the World," "Where the Money Goes," "Country Currents" and "History of Electricity" were the titles of four films shown at the last of the present session of E.D.A. North-West Area Sales Conferences.

The Dominion Water Power and Reclamation Service of the Department of the Interior of Canada Ottawa, has issued its annual review (Bulletin No. 1361) which shows that at January 15, 1930, the total water-power resources of the Dominion were estimated to be 20 347 400 H.P. under conditions of ordinary minimum flow, or 33 617 200 H.P. ordinarily available six months of the year. The total hydraulic development amounts to 5 727 162 H.P., an increase of about 378 000 H.P.

Mr. R. Ogilvie Buchanan read a paper before the Royal Geographical Society on Monday on hydro-electric power developments in New Zealand. Since the war, he said, this development had increased from 49 000 to 149 000 H.P. in 1927, and the first stages of two new stations, adding a further 90 000 H.P., had been put into operation during the last two months. The electricity produced was equal to 0·17 H.P. per head of population, which was only exceeded by Norway, Sweden, Canada and Switzerland. The total water power available was estimated at 4 870 000 H.P.

The annual general meeting of the North-East Coast Branch of the Electrical Association for Women at Carliol House, Newcastle-on-Tyne; a luncheon at Tilley's, Blackett Street, Newcastle-on-Tyne; and a visit to the Lemington Glass Works, by invitation of the General Electric Co., Ltd., will take place to-day, March 28th. The annual general meeting will take place at 11 a.m., the luncheon, for which the charge is 5s., at 1 p.m., and the visit to the Lemington Works at 2.30 p.m. The speakers at the luncheon include Miss Haslett, Mr. D. Maxwell Buist (Central Electricity Board), and Mr. R. P. Sloan.

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IN PARLIAMENT.

Committee Approves Bournemouth Corporation's Trolley Vehicle Proposals.

THE House of Commons Committee, dealing with this Bill last week, consented to the clauses authorising the Corporation to substitute electric trolley vehicles for its existing tramways, and to run trolley vehicles on 14 new routes, and protecting Corporation services against competition. Mr. A. R. Fearnley said he considered trolley vehicles particularly suited to towns of medium size, and they had a slight advantage over omnibuses in the matter of running costs.

Electrical Fire Risks.

The Cardiff Corporation Bill, which was before a House of Commons Select Committee last week, includes a clause authorising the Corporation to make by-laws refusing to supply electricity to houses which do not conform with requirements framed for the purpose of preventing fire. Mr. G. Morley New said there had been two unfortunate fatalities in Cardiff in 1927 due to faulty electrical fittings. The fittings were outside and were made without the knowledge of the department. After the second inquest the coroner had written to the Corporation suggesting that unless the municipality had greater power, such unfortunate fatalities might occur again. The by-laws would, of course, be subject to the consent of the appropriate Minister. The Committee approved the clause.

Metropolitan Railway Extension.

A House of Commons Committee last week passed the Metropolitan Railway Bill authorising a new railway line between Stanmore and Wembley. The capital involved is £500 000.

Replies to Questions in House of Commons.

Of the railways in the Tyneside area, 68 miles of running track have been electrified.

Around the coasts of England, Scotland and Ireland there are in operation 10 wireless beacons on shore and three in light vessels.

The sum recently advanced to the Perak Hydro-Electricity Co. by the Government of the Federated Malay States is £850 000. It carries interest at 5 %.

Grants of 60% are made to local authorities for the erection of approved automatic traffic signals. Every effort is made to encourage the use of British apparatus.

Licences granted under the Wireless Telegraph Acts are not inclusive, and the Postmaster-General cannot pledge that he will refrain from entering into commercial competition with those to whom he grants them.

To a considerable extent, the automatic telephone exchanges in London are new exchanges which meet growth of work. The general growth of work is such that no reduction of telephone staff has taken place or is at present anticipated.

At Poplar in 1928 the average price obtained for electricity for lighting and domestic supplies was 2·63d. and for power 1·23d., while at Notting Hill the average for lighting and domestic supplies was 4·7d., and for power 1·52d.

Subject to the assent of the Legislative Assembly, the Government of India intends to purchase the property of the Indian Broadcasting Co. and to carry on experimentally for a year the service hitherto conducted by that company.

When the time comes for fresh wireless legislation, the question of obtaining powers to deal with occasional cases of interference with broadcast reception by the operation of electrical plants in cinemas and business premises will be considered.

Wireless telephone calls to Canada pass through New York and calls to South America are routed via France or Germany. The Communications Co. have asked the Government to lease them their stations in order to provide a direct service to four Dominions, including Canada, and to the Argentine.

No exclusive right to operate wireless telegraph services has been granted to any company, although the Post Office beam stations were leased to the Imperial and International Communications Co. for 25 years, and the Imperial wireless services worked from those stations were transferred to the company.

Under existing legislation the provision of wireless apparatus on cargo or fishing vessels of less than 1 600 tons gross is not compulsory. The President of the Board of Trade will make inquiries as to the possibility of making it compulsory for one ship in a trawler or drifter fleet to carry wireless, in order to give information regarding storms to the rest of the fleet.

In reference to a statement by Col. Howard Bury that the greatest experts in wireless, including Senatore Marconi, have stated that the larger aerial is the best, and a suggestion that the various systems of wireless telephony should be tested by an independent committee, the Postmaster-General says the views of Senatore Marconi were heard and submitted to independent experts, and the test which was immediately practicable was made about last May.

The area of supply of the Wessex Power Co. has been divided into three main portions. A scheme for the first portion has been approved and is being carried into effect. A scheme for the second portion, comprising North Berkshire and other areas, has been submitted, but the Commissioners have asked for amendments and extensions, which are at present under discussion. The Central Board are keeping in touch with the company in the matter.

In reference to a statement that the County of Lordon Electric Supply Co. charges 5d. per kWh for lighting and ¾d. per kWh for current supplied under the all-in tariff, in addition to the quarterly standing charge, while the unit charges are 6d. and 1d. respectively in Romford, the Minister of Transport says the question of securing greater uniformity of charges and tariffs throughout the district of the London and Home Counties Joint Electricity Authority is being investigated by the Authority, but it is understood that they are not at present in a position to make any report on the matter.

The number of gas-lighted coaches included in British steam worked railway rolling stock in November 1st, 1928 was about 30 000, or 50% of the whole. Since that date further progress has been made with the conversion to electric lighting in the normal course. The following proposals (which are additional to the ordinary programme) involving expenditure under this head have been included by the companies among the works which they are undertaking in fulfilment of their obligation to the Government in connection with the repeal of the Railway Passenger Duty: Great Western Railway Co., £80 000; London, Midland and Scottish Railway Co., £208 840; and London and North Eastern Railway Co., £56 000. It is understood, however, to be uncertain whether the last item will be proceeded with. In addition, the L.M. and S.R. Co. have obtained a grant under the Development Act in respect of the expenditure, estimated at £287 500, involved in the substitution of electric lighting for gas in a further 1 250 coaches. The practice of the railway companies is to equip all new passenger stock with electric lighting equipment, with the exception of certain restaurant cars in which gas is utilised.

PERSONAL.

MR. C. W. Ford, of the St. Helen's Cable Co., Slough, is a candidate for the forthcoming elections for the Slough Urban District Council.

Mr. S. G. Monk, head of the electrical engineering department at the Technical College, Devonport, has been elected to the Council of the Plymouth Rotary Club.

Mr. T. Medcalf, passenger transport manager with Swindon Corporation, who has retired after 27 years' service, has been presented by the staff with a silver salver and an expanding bookcase.

At the meeting of directors of Yorkshire Electric Power Co., Mr. George Herbert Peake, deputy-chairman, was appointed chairman to fill the vacancy caused by the death of Mr. Arthur Greenhow Lupton.

Mr. G. C. Hadfield, of Southport, has been appointed showroom manager and salesman by Nottingham Electricity Committee. Mr. Hadfield at present holds a similar position with Southport electricity undertaking.

Croydon Electricity Committee reports that Mr. B. C. Ward, distribution superintendent, has been appointed deputy engineer and manager of the Bermondsey Borough Council's electricity undertaking, and has appointed Mr. L. Gripper, distribution engineer, to fill the vacancy at the grade scale.

Mr. Walter Donovan, Jun., after four years in the United States, has resigned his position on the engineering staff of Messrs. Cutler-Hammer Incorp. of Milwaukee, Wis., with whom he has been engaged for some three years, and has joined the firm of Donovan and Co., where he will take charge of the automatic and a.c. control section of that business.

At the annual general meeting of the Batti Wallahs Society at the Hotel Cecil, London, on March 18th, the following officers were elected for the ensuing twelve months:—PRESIDENT: Mr. Wm. McClelland; HON. SECRETARY AND TREASURER: Mr. M. Whitgift; COMMITTEE: Messrs. A. E. Apps, G. M. B. Hilton, H. S. Jacob, W. Lang, H. S. May, and A. E. Mohring. The office of Vice-President was abolished.

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BUSINESS ITEMS.

THE GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, London, W.C.2, has received an order from the Union Construction Co., Ltd., for electrical equipment for the new high-speed tramcars they are constructing for the Uxbridge Road services of the London United Tramways. The order comprises 94 high-speed motors of 70 H.P. on the one-hour rating, 500 V, 96 cam type controllers and 48 sets of line switches with overload release. The motors are of unusually high capacity for the small diameter of driving wheel to be used—viz., 28 in.

A contract for a new passenger liner has been placed by Furness, Withy and Co., Ltd., with VICKERS-ARMSTRONGS, LTD. The ship will be 576 ft. long by 76 ft. 6 in. beam, and is designed to accommodate about 850 first class passengers. The liner, which will be of about 23 000 gross tons, is intended for the New York–Bermuda service, and will be electrically propelled. The whole of the electrical machinery and control gear is being manufactured by the GENERAL ELECTRIC CO., LTD., the turbo-alternators which will supply the power to the propulsion motor and for auxiliary purposes being of G.E.C.–Fraser and Chalmers' construction.

The ELECTRIC FURNACE CO., LTD., of 17, Victoria Street, London, S.W., has received an order for an Ajax-Northrup high-frequency furnace of 25 cwt. capacity from a French steelworks, which had previously installed two smaller furnaces of the same type. This furnace will have an output of over one ton per hour. Since the first commercial sized high-frequency furnace was installed in Sheffield about 2½ years ago, the Electric Furnace Co., Ltd., has installed, or has under construction, 27 Ajax-Northrup furnaces of a total capacity of 5 350 kW, in addition to 78 laboratory-sized furnaces of the same type, which have also been supplied. This company has also recently received orders for a 3½ ton Héroult furnace for Spain, and for 64 tube heaters and 24 frame heaters for a French firm.

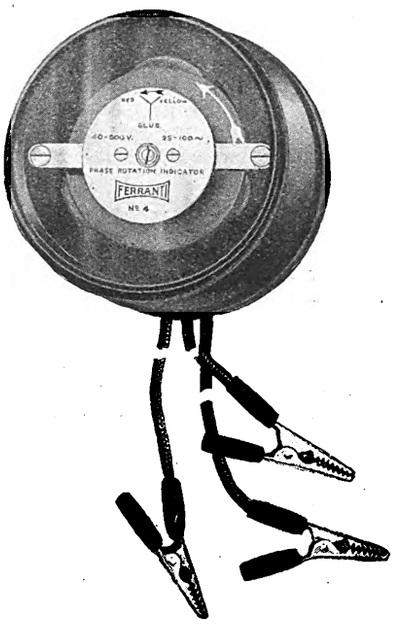
A novel service scheme has been initiated by WALKER BROS, Quality House, Temple Street, Birmingham, for domestic users of electricity. Essential features of the scheme are as follows: Three times per annum a qualified electrical engineer will call at subscribers' residences with the necessary testing instruments, and will test the electrical installation for leakages; examine the installation for defects; make any adjustments, and do any repairs to lights or bells which do not make the total time spent more than one hour per visit; discuss with and advise the subscriber regarding any electrical difficulty or proposed scheme of electrification. The inclusive charge for this service is one guinea per annum. It is stipulated that no material shall be used on any of the service visits for this fee, and if any is required, it will be charged for at the normal rates.

As agents for the ENGLISH ELECTRIC CO., LTD., London, the contract has been placed with SIEMENS (AUST.) PTY., LTD., by the Hydro-Electric Department, Tasmania, for the water-driven turbo units and automatic switchgear for the Shannon River power station. The new station will contain two 7 250 H.P. reaction turbines, direct coupled to three-phase alternators, each set being provided with a direct coupled exciter, as well as an auxiliary generator for operating the switchgear control circuits and automatic devices. The switchgear for controlling these two units will be entirely automatic in operation, with the exception of the actual starting up and synchronising, and the station will run unattended. The station will normally operate in parallel with the existing Waddamana station, about six miles separating them. As is well known, the latter station receives its water supply from the Great Lake, but when originally constructed, it was not at that time considered economical to make full use of the total head of water available. Thus a head of approximately 300 ft. remained unutilised. The purpose of the new station is to make use of this loss of head, the water passing through the Shannon station before being used at Waddamana. The turbines will be of the single-discharge, overhung type, and each will be rated as follows: Net head, 244 ft.; quantity of water, 300 cu secs.; output, 7 250 H.P.; speed, 500 r.p.m. The rating of each alternator is: Output, 5 800 kVA; pressure, 6 600 V; frequency, 50 cycles. The water turbines and alternators, including main valves, governor gear, etc., will be of "English Electric" design, and will be manufactured partly at the English Electric works in England and partly by the Clyde Engineering Co., Ltd., Sydney. The switchgear will be designed and manufactured by the English Electric Co.

NEW PHASE INDICATOR.

Portable Instrument for Indoor or Outdoor Use.

A RECENT addition to the range of testing instruments manufactured by Ferranti, Ltd., is a phase rotation indicator which is a very useful portable instrument for workshop or outside testing use and is fitted with leads terminating in clips to facilitate its rapid connection to the circuit to be tested. It consists of a miniature 3-phase induction motor, the disc of which rotates in a direction corresponding to the phase rotation of the circuit to which the instrument is connected. The instrument leads are coloured red, yellow and blue, and an arrow on the disc indicates the direction of disc rotation (counter clockwise) when the instrument is connected to a circuit having the B.S.S. phase rotation of red, yellow, and blue. The voltage range is 40–500, and the frequency range 20–100 cycles. The instrument case is 2⅞ in. in diameter and is of black moulded insulating material. The complete indicator, which weighs only 8 oz., is supplied in a leatherette case, which can be conveniently carried in the pocket.



The new phase rotation indicator by Ferranti, Ltd.

THE SOCIAL SIDE.

THE G.E.C. Choral Society's season culminated with a concert at Magnet House on March 14th, which was without doubt the most successful which they have so far given. The main programme consisted of the well-known "Hiawatha's Wedding Feast," in which the part of Chibiabos was taken by Mr. Alec John, and, the more unusual and possibly more interesting "Deacon's Masterpiece," with words by Oliver Wendell Holmes set to music by Percy E. Fletcher. The rendering of these two works was extremely effective,

The annual dinner and dance of the Batti-Wallahs' Society was held at the Hotel Cecil on March 21st, with its usual great success. This is the last function of the Society to be held at the hotel. In future the luncheons, etc., will take place at the Hotel Metropole, Northumberland Avenue, W.C.2. Mr, F. W. Purse made a short speech proposing the toast of the Society and its President, Mr. H. L. Howard, and expressed the hope "that your radiant light may never grow dim." The President made a surprise presentation of a gold watch to Mrs. M. Whitgift.

The second dinner of the Association of Ex-Siemens' Men was held on March 20th, at Gatti's Restaurant, London, W.C., when Mr. G. Palgrave Simpson occupied the chair. When the toast of "Chairman" was proposed, a great point was made of the spirit of comradeship that kept the old members of the Siemens' organisations together, and that the chairman represented a link with the old days when this co-operation developed.

The Manchester Electro-Harmonic Society held the concluding concert of the present season on March 21st. Mr. J. A. Robertson, president, occupied the chair, and in one of his characteristic speeches, reminded the company that he was retiring from the presidency of the Society—a position which he had held for some seven years. He then made the announcement that Mr. H. C. Lamb, the chief electrical engineer of Manchester, had accepted the invitation to be the next president.

On the invitation of the directors, the employees of A. P. Lundberg and Sons, Ltd., Liverpool Road, N.7, took part in a social evening at Rawdon Hall, Holloway, N., on March 15th.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

AYLESBURY CORPORATION.—Twelve months' supply of (section A) paper insulated, lead-sheathed steel taped and armoured cable; (B) overhead material; (C) galvanised ironwork for overhead mains and service work; (D) insulators; (E) a.c. meters; (F) joint boxes, cut-outs, pole boxes, compound switches and meter boards. Specifications from Mr. W. A. Turnbull, Electricity Works, Exchange Street, Aylesbury.

EAST AND WEST MOLESEY URBAN DISTRICT COUNCIL, March 28th.—Supply, etc., of small electric lighting plant for sewage works, with wiring and fittings for 12 points. Further particulars from the Surveyor, Council Offices, East Molesey.

Transformers.

LIVERPOOL CORPORATION, March 28th.—Supply of 12 step down transformers. Specification, etc., from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

WAUNARLWYDD WELFARE HALL, SWANSEA, March 28th.—Electrical installation. Specification can be seen on application to the Secretary.

BIRMINGHAM CORPORATION, March 29th.—Manufacture and supply of 1 400 tons of grooved steel girder rails and fishplates. Specifications, etc., from the General Manager, Tramway and Omnibus Department, Council House, Birmingham.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, March 29th.—Six months' supply of electrical fittings, etc. Forms of tender from Mr. C. L. Addison-Smith, 19, Heriot Row, Edinburgh.

PATRINGTON GUARDIANS, March 29th.—Electric lighting installation at Patrington Poor Law Institution (120-130 points). Specification can be seen at the Institution.

RHONDDA URBAN DISTRICT COUNCIL, March 29th.—One year's supply of ordinary and prepayment a.c. meters, cable, joint boxes, compound cut-outs, etc. Specifications and forms of tender from Mr. J. M. Bowman, Electricity Works, Porth, Glam.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, March 31st.—Supply and erection of one 1 000 kVA and two 500 kVA three-phase transformers. Specification, etc., from Mr. David J. Keep, town clerk; deposit £2 2s. Technical inquiries can be made of Mr. H. W. Couzens, 9, Old Queen Street, London, S.W.1.

CENTRAL ELECTRICITY BOARD, March 31st.—Supply and erection of metering equipment required in the area of the North-West England and North Wales Electricity Scheme. Specification (N.W.E.-G.M. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CONGLETON CORPORATION, April 1st.—High tension and low tension switchgear, transformers, kiosks, h.t. cables, l.t. cables and l.t. overhead distribution. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

BINGLEY DISTRICT SUB-COMMITTEE, April 1st.—Electric light installation at Crossflatts Council School and schoolhouse. Specifications from Mr. B. Leah, Education Offices, Bingley

WATFORD CORPORATION, April 1st.—Wiring of lighting and heating points in dwelling houses. Specifications, etc., from the borough electrical engineer, Mr. A. W. Barham, Cardiff Road, Watford.

BEXHILL CORPORATION, April 2nd.—Laying and jointing of about 1 600 yards of 0·5 sq. in., three-phase, paper insulated, lead covered and armoured, 11 000 V cable of British manufacture. Specification from the Borough Electrical Engineer.

NANTWICH RURAL DISTRICT COUNCIL, April 3rd.—Wiring and supply of lamps for electric lighting of Council houses in Alpraham, Haslington, Shavington and Walgherton. Specifications, etc., from Mr. H. Crabtree, 21, Pillory Street, Nantwich.

PORTSMOUTH PIER, April 3rd.—Re-wiring and wiring of bandstand. Specification, etc., from the Manager, South Parade Pier, Portsmouth.

ST. PANCRAS (LONDON) BOROUGH COUNCIL, April 3rd.—Supply of e.h.t. switchgear. Specifications, etc., from the Electricity and Public Lighting Department, 57, Pratt Street, Camden Town, London, N.W.1; deposit £2.

ST. PANCRAS (LONDON) BOROUGH COUNCIL, April 3rd.—Supply of l.t. switchboards. Specification, etc., from the Electricity and Public Lighting Department, 57, Pratt Street, Camden Town, London, N.W.1; deposit £2.

GREAT WESTERN RAILWAY CO., April 4th–24th.—Supply of electrical cables and wires (list 20) and telegraph ironwork (list 21). Specifications with forms of tender from the Office of the Stores Superintendent, Swindon (form of tender for list 20 on and after April 14th). Tenders for list 21 by April 4th and for list 20 by April 24th.

SHEFFIELD CORPORATION, April 4th.—Supply of one wheel press, with electric motor, for the tramways and motors department. Forms of tender from Mr. A. R. Fearnley, general manager, Division Street, Sheffield.

CENTRAL ELECTRICITY BOARD, April 7th.—Supply and erection of 66 kV and lower voltage transformers, in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.-G.T.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

STOKE-ON-TRENT CORPORATION, April 9th.—Supply and erection of e.h.t. and l.t. overhead transmission lines. Specification, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

DUNDEE CORPORATION, April 10th.—Supply of e.h.t. and l.t. paper insulated, lead-covered and double steel tape armoured cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

COVENTRY CORPORATION, April 14th.—Electrically-driven pumping machinery, for Whitley pumping station. Specification (£10) from Sir Alexander Binnie, Son and Deacon, Artillery House, Artillery Row, London, S.W.1.

LONDON COUNTY COUNCIL, April 14th.—Manufacture and supply of h.t. and l.t. cables; and reconstruction of existing l.t. cables. Specification, etc., from the General Manager of Tramways, 23, Belvedere Road, London, S.E.1; deposit £2.

BATTLE URBAN DISTRICT COUNCIL, April 16th.—Electrically-driven borehole pump, at Powdermill Lane pumping station, and two sets of electrically-driven boosting pumps at Starr's Green booster station. Plant to be of British manufacture and complete with electrical equipment and cable connections. Specification, etc., from Messrs. J. Taylor and Sons, Caxton House, Westminster, S.W.1; deposit £5.

CENTRAL ELECTRICITY BOARD, April 16th.—Construction of site works and foundation works for the transforming stations at Ribble (Preston) and Lancaster. Specification (N.W.E.—P.F.1) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s. 0d.

DUNDEE CORPORATION, April 23rd.—One year's supply of stores and materials to the tramways department. Specifications, etc., from the General Manager, Transport Office, Dundee.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., LTD., March 28th.—Transformers for power, lighting and signalling in connection with Madras Improvements—Electrification. Specifications (10s.), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

JOHANNESBURG MUNICIPALITY, March 29th.—Supply of metallic filament traction lamps (contract No. 351). (Reference B.X. 6 246.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays, for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

INDIAN STORES DEPARTMENT, March 31st.—One year's supply of lead sheathed cable (order No. N.10 899), (Reference B.X. 6 259.)

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NEW ZEALAND POSTS AND TELEGRAPHS, March 31st.—Supply of spare parts for B.P.O. dial No. 10. (Reference B.X. 6 097.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 1st.—Supply of submarine cable (schedule C. 561). (Reference B.X. 6 070.)

CAPE TOWN MUNICIPALITY, April 2nd.—Supply of five sets of electrically-driven pumps and accessories, including motors, switchboard, etc. (specification No. 485/29). (Reference A.X. 9 096.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, April 3rd.—Supply of eleven 4-ton electric cranes for Durban Harbour. (Reference A.X. 9 119.)

PORT ELIZABETH MUNICIPALITY, April 10th.—Supply of electric cable and overhead line material (specification No. 40). (Reference B.X. 6282.)

VICTORIAN ELECTRICITY COMMISSION, May 5th.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000 V circuit (specification No. 30/19.) (Reference B.X. 6 226.)

POWER SECURITIES CORPORATION, May 15th.—Works and materials in connection with Pykara hydro-electric scheme, including transmission line towers (specification E2; price 22s. 6d.); (insulators E5; 7s. 6d.); steel-cored aluminium ductors (E6; 4s. 6d.); steel earth wire (E7; 4s. 6d.); guying materials (E13; 4s 6d); generating plant (E14; 37s. 6d.); crane (E16; 7s. 6d.), and transformers (E18); 7s. 6d.). General conditions, 3s. 6d. Specifications, etc., from Messrs. Balfour Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22nd.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc. (Reference A.X. 9 212.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of cable clamps, for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators; for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

Tenders Accepted.

CANNOCK URBAN DISTRICT COUNCIL.—English Electric Co., Ltd., switchgear.

MANCHESTER CORPORATION.—Revo Electric Co., Ltd., supply of electric cookers.

HULL CORPORATION.—Tangyes, Ltd., two centrifugal pumps, a.c. motors, etc., £512.

LEEDS GAURDIANS.—Marshall and Reilly, electric light installation in six children's homes, £60.

AYR CORPORATION.—Darroch and Espie, electrical work at 80 houses at Newton Glebe, £339 1s. 10d.

CROYDON CORPORATION.—Commercial Electric Co., supply of electric fittings and appliances for six months.

LONDON COUNTY COUNCIL.—E. Showell and Sons, Ltd., supply of controller segments, fingers, tips, etc. £663.

PERSHORE RURAL DISTRICT COUNCIL.—Abel and Smith extension of electric light installation at the Sanatorium.

QUEENBOROUGH CORPORATION.—W. J. Hounsell, overhauling and re-wiring lighting system at Town Hall, £28 2s. 6d.

BURTON-ON-TRENT CORPORATION.—Ferguson, Pailin, Ltd., supply of switchgear for Curzon Street sub-station, £967 2s.

ILFORD CORPORATION.—D.P. Battery Co., Ltd., supply of battery for Orwell electric vehicle, £167 18s. (Recommended.)

COLCHESTER CORPORATION.—Electroflo Meters Co., Ltd., supply and erection of measuring and recording instruments, £1 015.

ARMAGH COUNTY EDUCATION COMMITTEE.—C. R. Craig, electric lighting installation at Armagh new public elementary school, £398.

KENSINGTON (LONDON) BOROUGH COUNCIL.—Bate Electrical Co., Ltd., supply of electrical fittings for 12 months. (Recommended.)

BANGOR (CO. DOWN) CORPORATION.—Edison Swan Electric Co., Ltd., steel electric lamp standards, with lamp brackets, street lanterns, etc.

BOMBAY CORPORATION.—Balmer Lawrie and Co., renewing wiring at municipal buildings, using Johnson and Phillips materials, Rs. 1 195.

DURHAM COUNTY EDUCATION COMMITTEE.—Embleton and Barker, Ltd., electric light installation at Grove Estate School, Consett, £73 12s. 4d.

BRIGHTON CORPORATION.—A. Reyrolle and Co., Ltd., e.h.t. switchgear, £743; George Ellison, l.t. switchgear, £543. (Both recommended).

OSSETT CORPORATION.—Electrical Distribution of Yorkshire, Ltd., supply of fittings, £12 14s.

COWDENBEATH CORPORATION.—A. Rolland and Co., electrical work in connection with erection of 32 houses, £171.

HALESOWEN URBAN DISTRICT COUNCIL.—Robinson Bros., wiring houses on Long Lane Estate, £26 7s. 4d., and houses at Colman Hill, Cradley, £244 7s. 6d.

HERNE BAY URBAN DISTRICT COUNCIL.—Herne Bay Electricity Co., Ltd., supply of 28 Flambeaux lights for use in connection with central windscreen, £29 15s.

Meters and Transformers.

PLYMOUTH CORPORATION.—British Electric Transformer Co., Ltd., supply of transformers; Ferranti, Ltd., and Smith Meters, supply of meters. (All recommended.)

HASTINGS CORPORATION.—Crompton Parkinson, Ltd., switchboard, £115 13s.; British Thomson-Houston Co., Ltd., oil switch unit, £116 2s. (Both recommended.)

WORKSOP RURAL DISTRICT COUNCIL.—R. B. Isle and Co., electic wiring of 26 houses now being erected at North Carlton, near Worksop, wiring only parlour type £6 7s. 3d., non-parlour type £5 17s. 3d.; power or heating (one point), parlour type £1 10s., non-parlour type £1 10s.

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS.—H. E. Harrison and Co., electric lighting works at Stationery Office, Beggars Bush Barracks, Dublin; Irish Free State Electricity Supply Board, conversion of gas lamps to electric, and supply of h.t. cables, at Papal Nuncio's residence, Phœnix Park, Dublin; Brooks, Thomas and Co., Ltd., conversion of gas plant to electric drive at Phœnix Park pumping station.

LONDON COUNTY COUNCIL.—Electrical Installations, Ltd. installation of electrical fittings and wiring in connection with erection of Streatham Vale Elementary School, £699. (Recommended.) Also tendered: G. H. Denne and Son, Ltd., £739; A. Dean and Co., Ltd., £754; J. Briggs (Electric Contractors), Ltd., £796; T. Clarke and Co., Ltd., £827; A. Hawkins and Son, £839; Pinching and Walton, £844; Smethurst and Co., (London), Ltd., £856; Berkeley Electrical Engineering Co., £1 037.

METROPOLITAN ASYLUMS BOARD.—Alpha Manufacturing and Electrical Co., Ltd.: electric light installation at casual ward, Lambeth, £162 (recommended). Also tendered: H. Lewis and Co., £163; T. Clarke and Co., Ltd., £173; A. Hawkins and Sons £175; Phillips and Sons (Chiswick), Ltd., £193; K. Hedin, £206; Toy and Winslow, £213; the Telephone and Electrical Maintenance Co., £216; Read and Partners, Ltd., £218; S. Reed and Sons, £220; C. Rickards, Ltd., £232; Piggott Bros., and Co., Ltd., £242; General Installation Co., £340.

WIMBLEDON CORPORATION.—Sub-station equipment and transformers: G. Ellison, Ltd., l.t. switchgear equipments, £2 158; English Electric Co., Ltd., h.t. switchgear equipments, £1 022: A. Reyrolle and Co., h.t. switchgear equipments £2 626; Metropolitan-Vickers Electrical Co., Ltd., one 2 000 kVA 10 000/2 000 V transformer, £635; British Electric Transformer Co., Ltd., 20 200 kVA (outdoor) transformers, £1 990; Foster Engineering Co., Ltd., one 200 kVA (outdoor) transformer, £119; and Johnson and Phillips, Ltd., four 1 000 kVA (outdoor) transformers, £1 400.

GENERAL POST OFFICE.—Cabling, Peterborough-Market Deeping, Siemens Bros. and Co., Ltd.; Canterbury-Seabrook, Standard Telephones and Cables, Ltd. Electric Lifts—Terminus (London, W.C.) Telephone Exchange, J. Bennie, Ltd.; Birmingham Head Post Office, Smith, Major and Stevens, Ltd.; Telephone Exchange Equipment, Crawley (Sussex), Automatic Telephone Manufacturing Co., Ltd.; Holborn and Tandem, Automatic Telephone Manufacturing Co., Ltd.; Telephonic Repeater Equipment, Torquay, The General Electric Co., Ltd.; Guernsey (Channel Islands), General Electric Co., Ltd.

GLASGOW CORPORATION.—Re-conditioning of 300 tramcars, total £208 147: Motors, General Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.; controllors, English Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.; roller bearing axle boxes, Ransome and Marles Bearing Co., Ltd., Hoffman Manufacturing Co., Ltd., and Skefko Ball Bearing Co., Ltd.; air brake equipment, Consolidated Brake and Engineering Co., Ltd., and Electro-Mechanical Brake Co., Ltd.; magnetic track brakes, Metropolitan-Vickers Electrical Co., Ltd., and Electro-Mechanical Brake Co., Ltd.; truck forgings, Brush Electrical Engineering Co., Ltd., and P. and W. MacLellan, Ltd.; upholstered seats, Bennet Furnishing Co.

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ELECTRICITY SUPPLY.

Hydro-Electric Scheme for the River Elk—Lanark Farmers and Rural Electrification—Westmorland and South Cumberland Lighting Order—Ulster and the Shannon Scheme—Electrical Development in Northern Ireland—Extensions to Newton Abbot Power Station.

SHOREDITCH (London) B.C. has decided to borrow £100 000 for electricity purposes.

Bolton electricity department is to lay mains in Victoria Road, at a cost of £1 500.

Glasgow Electricity Committee has authorised mains extensions at a cost of £2 116.

Mains extensions, at a cost of £6 184, have been authorised by Sheffield Electricity Committee.

It has been decided by Lerwick T.C. to make inquiries regarding a grant for an electricity scheme for Lerwick.

The use of overhead cables by the County of London Electric Supply Co. for a supply of electricity to Eastwood has been approved by Rochford R.D.C.

Shoreditch (London) Electricity Committee has voted estimates for providing certain feeder mains (£4 764), distributing mains and services (£9 408), and meters (£10 000).

An intimation has been received by Torrington T.C. from the Bideford and District Electric Supply Co. that the extension of the supply to the borough is to be proceeded with at once.

Braunton P.C. has entered into a new agreement for public lighting with the Braunton Electric Light Co. The charge is to be the same as for private lighting, which represents an increase of 1d. per kWh.

Aberdeen T.C. has decided to apply for a Special Order to authorise the extension of the Corporation area of electricity supply to include the parishes of Banchory-Devenick and Maryculter.

South Stoneham R.D.C. has decided to offer no objection to a scheme put forward by Southampton Corporation for extending the supply of electricity to Thornhill, Netley, and part of Hamble, by means of overhead cables.

The Ontario Provincial Government contemplates the further extension of its rural hydro-electric power distribution services by the re-adjustment of the service charge and provision of loans for farm installations and permanent equipment.

Mr. J. M. Andrews, Minister of Labour for Northern Ireland, recently said he did not think there was any great foundation for a rumour that Ulster was being offered supplies of electricity from the Shannon scheme. He would strongly oppose the taking of any such supply.

Montreal City Council has approved hydro-electric power development works to cost $2 500 000, the power station to be constructed at the foot of the Lachine Rapids. The power from the new station will be used by the City for its own needs, including the lighting of streets, etc.

Buckie T.C. has sent to ratepayers a circular stating that the Council will not proceed with any electricity scheme costing ratepayers anything on the rates. The charge for energy is to be 8d. per kWh and wiring will be done on a cash or deferred payment basis at consumers' option.

It was reported at last week's meeting of the Kent Rural Community Council that friendly relations had been established with the Central Electricity Board, who were prepared to consider sympathetically the recommendation of the Committee with regard to the routes of the pylons for overhead transmission lines.

The Lanark County Executive of the Farmers' Union has been investigating the possibility of having an electricity supply for rural areas in the county, and has asked the Board of Agriculture to outline a scheme for them at economic rates. Farmers in the area are being asked to state whether they will be prepared to take a supply.

Sheffield Electricity Committee is seeking grants in respect of works proposed to be carried out in acceleration of normal development, comprising the change over of existing single- and two-phase mains to three-phase mains in various districts, and the extension of mains in anticipation of future development, at a total estimated cost of £88 489.

East Ham Tramways and Electricity Committee has passed estimates, amounting to £635 and £1 860 for the alteration and extension of the lighting feeder cables in Shelley Avenue, and from Nelson Street to Stamford Road, and £3 504 for the laying of distributor cables in Bendish, Holme, Laurence, Malvern, Temple, Stamford and Oakfield Roads.

East Grinstead U.D.C. is negotiating with the Weald Electricity Co., Ltd., for a bulk supply of electricity. The Consulting Electrical Engineer advises the Council to ask for nothing less than a 200 kW supply, and as there is a possibility of an agreement being entered into for a term of years, an increase of 100 kW per annum should be allowed for.

Hastings Electricity Committee is to improve the street lighting, at a cost of £434, and to supply electricity to Crowhurst Park, at a cost of £362, and to St. Mary's Estate, Bexhill Road, where the Bexleigh Estates, Ltd., is to erect 106 houses. The cost in the last case will be £840.—The Committee seeks sanction for a further loan of £10 000 for house services.

The East Kootenay Power Co. proposes to apply to the Provincial Water Controller at Victoria, British Columbia, for the right to dam the Elk river at a point about 10 miles below the town of Elko, and to erect a hydro-electric plant for the generation of between 15 000 and 20 000 H.P. A dam impounding the waters of the river at Phillip's Canyon will be constructed.

Torquay Corporation has decided to purchase and instal at the Newton Abbot generating station, at a cost of £34 540, two water-tube boilers and auxiliaries, as part of the £100 000 scheme which has been sanctioned by the Electricity Commissioners for the installation of a 7 500 kW set. The present plant has a capacity of 16 000 kW and is not considered sufficient to meet next winter's demand.

Shipley U.D.C. is to apply to the Unemployments Grants Committee for a grant with respect to the scheme for the change-over from the d.c. to the a.c. system in the centre of the town.—The stall-holders are to be circularised in regard to a scheme for the electric lighting of the market stalls. The charge proposed is 1s. 6d. for each night when required, the stall-holders giving a guarantee to take a 12 months' supply.

The Westmorland and South Cumberland Electric Lighting Order is being promoted by the Cumberland Waste Heat Owners' Co. It is proposed that the Order should give powers to supply electricity in considerable areas in the counties of Westmorland, Cumberland and Lancashire, the rural district of Sedbergh, and the parishes of Thornton-in-Lonsdale, Ingleton, Burton-in-Lonsdale and Bentham, in the Settle rural district.

The Northern Ireland Government has appointed Mr. J. M. Kennedy, of Messrs. Kennedy and Donkin, to report upon electrical developments in Northern Ireland. He has already presented an interim report. Since 1922 the output of electricity in Northern Ireland has increased from 40 000 000 to 71 750 000 kWh per annum, and of this quantity 65 500 000 kWh are provided by the Belfast Corporation. The Belfast supply is being extended to Lisburn, with the possibility of future development to Portadown and Dungannon.

The Minister of Transport (Mr. Herbert Morrison) opened the "Beautiful England" campaign at the Guildhouse, Eccleston Square, London, last Sunday. The development of electricity, he said, was vital to the beauty of the lives of the housewives. There must, therefore, be generating and transformer stations and overhead transmission lines. He was encouraging the employment of competent architects to secure designs for stations which were appropriate to the neighbourhood, and he agreed that care should be taken to secure that the masts were not unsightly and that routes should be carefully chosen.

The electricity supply to Holywood, co. Down, was inaugurated on March 19th. The supply is taken in bulk from Belfast Corporation's 22 000 V transmission line, and is stepped down to 6 000 V in a sub-station in Holywood. The current was switched on by the Duke of Abercorn, Governor of Northern Ireland, in the presence of Ministers of the Ulster Government, the Lord Mayor of Belfast, the chairmen and officials of public bodies of the Northern Counties, and apparently the entire population of Holywood. Coloured festoons and fireworks supplemented the striking effect of the change which was brought about by the electric lighting of all street lamps in the town. Messrs. Johnson and Phillips, Ltd., were the contractors for the distribution system, and the undertaking is under the management of Mr. Pryce Jones.

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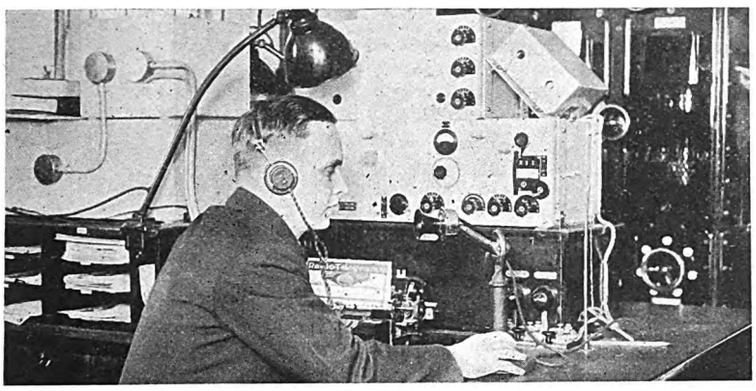
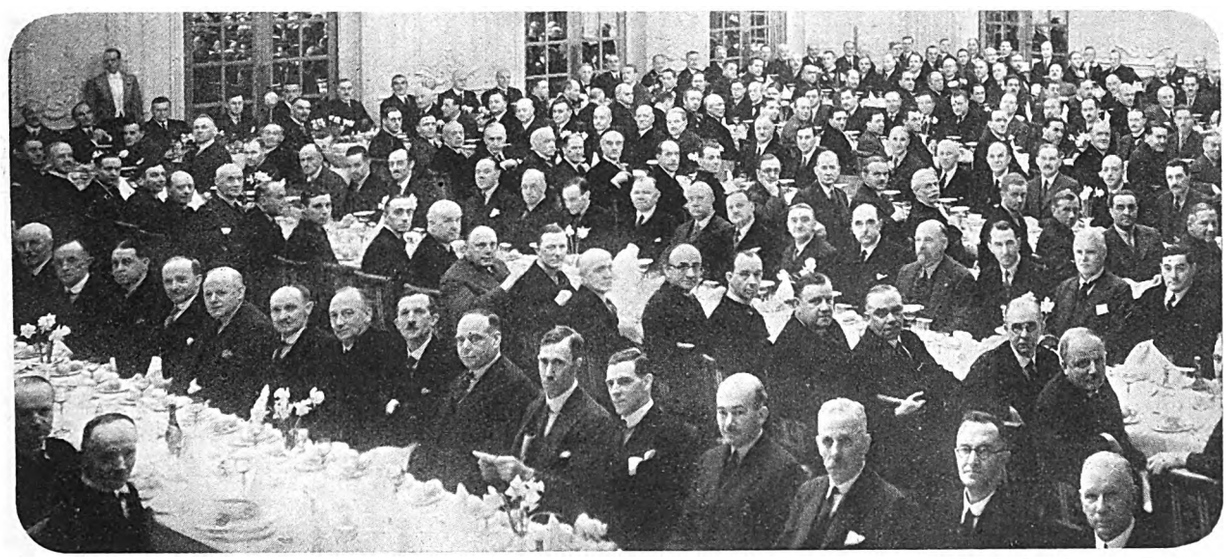
ELECTRICAL PICTURES OF THE WEEK.

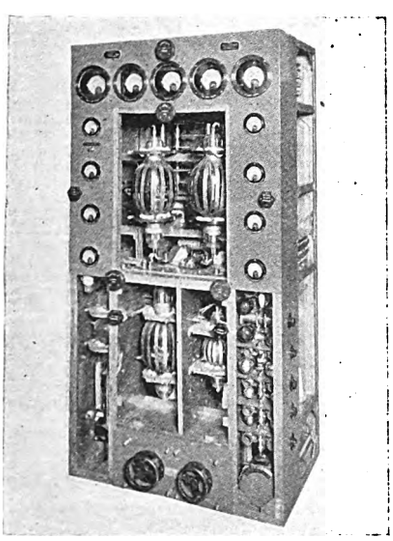


The wireless cabin on board the "Europa," the new North German Lloyd vessel which holds the Blue Riband of the North Atlantic. The equipment allows of long and short wave transmission and is capable of handling heavy "traffic" without delay.

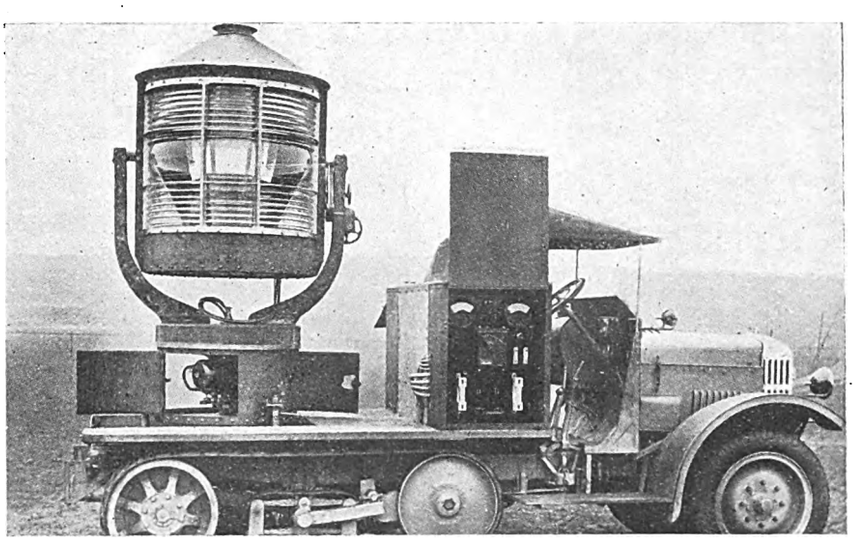
A novel manner of demonstrating, at the Ideal Home Exhibition, the suction powers of the new "Tellus" vacuum cleaner. The exhibition opened at Olympia, London, on Monday.



Members of the Electrical Development Association at the annual luncheon held at the Savoy Hotel, London, on Friday, with Mr. Herbert Morrison as the guest of honour. A report of the speeches is given on page 387, while extracts from the annual report appear on page 393.



The short wave wireless transmitter used by Marchese Marconi last week for carrying on telephone conversation between his yacht "Elettra" in the Mediterranean and Sydney, N.S.W.



One of the ground lights made by Chance Brothers, of Birmingham, for the Air Ministry, for use at the landing grounds on the Cairo-Karachi air mail route. The lights have been erected on specially constructed lorries arranged with self-contained generating plant. The equipment may be used as a beacon, searchlight, signalling lamp or flood, ample control of the beam being provided.

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FINANCIAL INTELLIGENCE.

Principal Features of Accounts of Electricity Supply Companies for 1929—Recent Market Quotations—Dividends and Yields.

By "AUDITOR."

BANK RATE (1929–30).

1929.		1930.	
Feb. 7	5½%	Feb. 6	4½%
Sept. 26	6½%	Mar. 6	4%
Oct. 31	6%	Mar. 20	3½%
Nov. 21	5½%		
Dec. 12	5%		

The following tables, which show the principal features of the accounts of certain electricity supply undertakings for the 1929 financial period, afford a comparison of the figures with those relating to the previous year :—

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Total Connections	739 355 H.P.	716 678 H.P.
Profit	£876 351	£819,456
Net Profit	687 784	614 785
Preference Dividend	181 948	181 878
Ordinary Dividend	240 461	184 961
Depreciation and Contingencies Reserve	930 437	761 359
Plant Renewals and Improvements Reserve	41 703	51 920
Capital Expenditure	7 255 929	7 012 449
7% Cum. Pref. Shares	1 500 000	1 500 000
5% Pref. Shares	1 538 952	1 538 952
Ordinary Shares	4 007 681	4 007 681
4½% Cons. 1st Mort. Deb. Stk.	2 110 908	2 110 908
6% 2nd Mort. Deb. Stk.	1 250 000	1 250 000
Loans (secured)	414 030	426 610
Loans (temporary)	45 759	45 396
Creditors	407 414	397 498
Debtors and Cash	571 847	368 911
Carried forward	96 028	80,653

At the price of 19s. 9d. the 5% pref. yield 5 1/16%, and at 104 the 6% second debentures return 5⅛%. The ordinary shares are quoted at 23s. 9d., yielding 5¼% (dividend 6%).

SCOTTISH POWER CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Profit	£213 218	£116 659
Net Profit	132 530	79 927
Preference Dividend	16 800	16 800
Ordinary Dividend	104 565	58 515
General Reserve	420 000	156 000
Investments in Subsidiaries	2 791 847	1 421 547
Advances to Subsidiaries	648 326	176 405
Cash	220	396 409
Debtors	110	4 523
Creditors	34 043	36 307
Amounts Owing to Subsidiaries	48 245	36 208
Bank Loan	118 413	—
6% Cum. Preference Shares	350 000	350 000
Ordinary Shares	2 350 000	2 350 000
Carried forward	6 710	3 399

At 30s. the ordinary shares (dividend 8%) yield 5⅓%, and at 22s. the preference shares yield nearly 5½%.

CLYDE VALLEY ELECTRICAL POWER CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Sale of Current, etc.	£793 755	£750 732
Net Profit	354 495	304 297
Preference Dividends	58 000	58 000
Ordinary Dividends	129 485	96 000
Contingency Fund	1,280,000	1 067 500
6% Cum. Preference Shares	300 000	300 000
8% 2nd Preference Shares	500 000	500 000
Ordinary Shares	2 100 000	2 100 000
Carried forward	88 288	84 586

At 36s. the ordinary shares (dividend 8%) yield 4⅙%, and at 23s. 3d. the 6% preference return £5 3s. 3d.%. At 27s. 6d. the 8% preference shares yield £5 16s. 6d.

ANALYSIS OF RESULTS OF CERTAIN SUPPLY COMPANIES WHOSE 1929 ACCOUNTS HAVE ALREADY BEEN SUBMITTED :—

1929 Accounts	Brt. Forwd.	Profit, 1929	Total	Crd. Forwd.	Ann. Div.	Price	Yield	Remarks
	£	£	£	£				
Adelaide Elec. Supply	31 902	331 534	363 436	32 030	—	—	—	In September, 1929, the debenture debt was increased by the issue of £250 000 6% "D" consolidated stock. A resolution was passed at the annual meeting for the conversion of all shares into stock. Stocks are interchangeable, London Adelaide registers.
" " 5% Deb.	—	—	—	—	—	105	4 19/21	
" " 5½% Cons. Deb.	—	—	—	—	—	100	5½	
" " 6% Cum. Pref.	—	—	—	—	—	20/6	5 35/41	
" " 6½ "C" "	—	—	—	—	—	21/–	6 1/21	
Aldershot Gas, Water, & Dis. Light	7 323	60 428	67 751	6 451	—	—	—	Recent offer for sale by tender of £100 000 5% perpetual debenture stock, the yield of which, at the minimum price of 93, would be 5⅜%.
" " 5% "A" Stock	—	—	—	—	6 7/86	—	—	
" " 3½% "B" "	—	—	—	—	4 17/80	—	—	
" " 5% "C" "	—	—	—	—	5	—	—	
Charing Cross Elec. Supply—West End	79 706	174 231	253 937	87 584	—	—	—	The company is allowed to charge prices sufficient to cover all its expenses, including certain ordinary share dividends and reserve funds for the repayment of capital at par in 1971. The ordinary shares of the City undertaking are held by the West End.
" " " 4% Deb.	—	—	—	—	—	79	5 1/16	
" " " 4½% Cum. Pref.	—	—	—	—	—	17/–	5½	
" " " Ord.	—	—	—	—	8 20/102	26/–	6⅛	
Charing Cross Elec. Supply—City	18 227	122 472	140 699	—	—	—	—	
" " " 4½ Debs.	—	—	—	—	—	88	5 1/18	
Chiswick Elec. Supply	2 653	34 174	36 827	3 828	16	55/6	5⅜	There are no debentures.
Electrical Distrib. of Yorkshire	21 905	96 482	118 387	23 657	9	35/–	5¼	Subject to provisions of London Electricity (No. 2) Act, 1925.
Kensington & Knightsbridge Elec. Light	10 664	36 650	47 314	2 123	1/7·18	27/–	6	
" " " 4% Deb.	—	—	—	—	—	77	5¼	
" " " 5% Second Pref.	—	—	—	—	—	4¼	6	
Kidderminster & Dis. E. Light & Traction	446	3 806	4 252	577	—	—	—	
" " " 5% Cum. Pref.	—	—	—	—	2½	5¼	2 8/21	
London Elec. Supply Corp.	25 437	161 284	186 721	46 832	9	26/3	6 37/40	The London Electricity (No. 2) Act, 1925, provides for the transfer of this undertaking to the London and Home Counties Joint Electricity Authority in 1971, and for the adoption by the company of sliding scale of dividends and prices.
" " 4% Deb.	—	—	—	—	—	95	4 1/19	
" " Pref.	—	—	—	—	—	5½	5 5/20	
Melbourne Elec. Supply	22 444	99 009	121 453	236	10	170	5 17/35	The Melbourne and Geelong undertakings are being taken over by the State Electricity Commission as from September, 1930, on the basis of the book value, less depreciation. The £22 444 brought forward from previous year includes £21 287 from reserve.
" " 5% Deb.	—	—	—	—	—	93	5 33/93	
" " 5% Cons. Deb.	—	—	—	—	—	93	5 33/93	
" " 6% Mort. Deb.	—	—	—	—	—	100	6	
" " 8% Cum. Pref.	—	—	—	—	—	5½	7 2/11	
Metropolitan Elec. Supply	87 149	348 200	435 350	84 746	10	37/6	5⅓	Recently there was a new issue of 1 share in 3.
" " 4½ Mort. Deb.	—	—	—	—	—	88	5⅛	
" " 7½ Extension Deb.	—	—	—	—	—	105	7⅛	
" " 4½ Cum. Pref.	—	—	—	—	—	17/–	5¼	
Midland Counties Elec. Supply	5 676	211 079	216 755	4 578	7	28/–	5 1/16	Further extensions are in progress.
" " " 5% Deb.	—	—	—	—	—	95	5¼	
" " " 6% Cum. Pref.	—	—	—	—	—	22/–	5½	
Newcastle & Dis. Elec. Light	15 564	68 361	83 925	15 055	7	—	—	£5 020 2nd mortgage debentures and £59 700 3rd mortgage debentures were redeemed during the year.
North Metro. Elec. Power Supply	28 202	400 225	428 427	28 146	10	—	—	On February 25th last, resolutions were passed for the creation and issue of further cumulative preference shares and debenture stock.
Northampton Elec. Light & Power	9 690	64 455	74 145	9 770	10	45/–	4½	The sale of current provided £190 917, as compared with £158 487.
" " 5% Deb.	—	—	—	—	—	96	5¼	
St. James & Pall Mall Elec. Light	112 377	75 339	187 716	100 462	7·894	26/–	6	In 1931 the standard rate of 7% will come into force.
" " 3½% Mort. Deb.	—	—	—	—	—	70	5	
" " 7% Non. Cum. Pref.	—	—	—	—	—	24/–	5⅝	
Shropshire & Worc. & Staff. Elec. Power	—	180 520	—	—	8	28/9	5⅝	A Bill giving the company powers to extend its area of supply, and to raise further capital, is being promoted.
" " 5½% 1st Deb.	—	—	—	—	—	102	5⅜	
" " 6% Cum. Pref.	—	—	—	—	—	22/–	5½	
Smithfield Markets Elec. Supply	2 508	8 572	11 080	2 781	8	—	—	Concession extended to 1972.
Tees Power Station	750	60 290	61 040	2 794	5⅞	—	—	Share capital was increased to £1 012 978 in 1929.
West Gloucestershire Power	—	11 351	—	—	—	—	—	Debit balance has been reduced.
Westminster Elec. Supply	29 022	161 292	190 314	25 574	8·8	25/3	7¼	There are no debentures.
" " 4½% Pref.	—	—	—	—	—	17/6	5⅛	
Yorkshire Elec. Power	78 234	341 084	419 318	81 413	8	32/9	5	The company has been authorised to supply a new area in Derbyshire.
" " 5½% Deb.	—	—	—	—	—	101	5 5/20	
" " 6% Cum. Pref.	—	—	—	—	—	23/9	5	

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COMPANY NEWS.

Improved Quotations for Electrical Securities—Newcastle Company's Increased Demand from Collieries—British Insulated Cables Meeting—New Companies.

THE market for electrical shares—supply, transport and equipment—has fully participated in the all-round advance in prices of investments which followed the lowering of the bank rate last week. The leading cable-manufacturing shares, in particular, have been strong, Callender's and Henley's ordinaries each rising 6s. 3d. to 77s. 6d. and 127s. 6d. respectively, while British Insulated at 77s. 6d. are 3s. 9d. up, and Enfields at 97s. 6d. are half-a-crown to the good. Associated Electrical Industries shares have jumped from 25s. to 29s. Automatic Telephone Manufacturing shares have improved from 37s. 6d. to 38s. 9d.

The stocks of Cables and Wireless, Ltd., have maintained their improvement in spite of some profit-taking, and the "B" and 5½% cumulative preference have continued the recovery. Buying of American Telephone and Telegraph stock has sent the price up 10 points further to 255; but Radio Corporation of America shares are easier at about 52. International Telephone and Telegraph stock, at 65½ has also lost a couple of dollars. Small increases are shown by several British cable telegraph undertakings. Marconi International Marine shares have improved from 43s. 9d. to 45s.

Electric railway debenture stocks are, for the most part, a few points higher; and District ordinary has jumped from 72½ to 77, while Metropolitan, at 65, has put on 2½ points, and Central London at 75, two points. Underground Electric Railways ordinary shares have put on 1s. and are quoted at 23s. 6d.

There is a long list of rises, also, in the electricity supply section. Central Electricity Board 4% stock is up 3 points at 82½. Clyde Valleys, at 38s. 9d., show a rise of 3s. 9d. compared with a week ago; Bournemouths and Metropolitans have each put on half-a-crown, to 62s. 6d. and 41s. 3d. respectively; and Midland Counties are up from 27s. to 29s. Among "foreigners," Calcutta Electric Supply ordinary have risen 2s. 6d. to over 48s., and Victoria Falls Power ordinary are nearly 59s. 6d.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	" " "C" Cum. Pref. ..	21/-	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	62/6	60/-	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	48/1½	45/7½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	82½	79½	81	77½
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	25/6	25/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	38/9	35/-	44/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	46/10½	45/-	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(*g*)	Electric Supp. Corp. Ord. ..	45/7½	45/7½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	33/9	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " " 4½% 1st Mt.Deb.Stk.	87	87	92	80½
—	Hydro Electric Securities.. ..	48½	46½	87	20
—	International Holdings	6½	6½	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/-*	26/6	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	27/6	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	28/6	27/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	99	97	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	38/9	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/-	18/3	16/3
7	Mid. Counties E.S. Ord.	29/-	27/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	32/6	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord..	24/4½	23/9	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	26/6	26/-	28/6	23/6
8	Scottish Power Ord.	30/-	29/6	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6	27/-	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	95	94½	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	59/4½	57/6	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	91½	91½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	129½	124½	152	116
7·67	" " " " 6% Pf. Stk.	120½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	75	73	74½	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	81	77	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	80	76½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	79	42½
4	" " " " 4% Pf. Stk.	73	71	77	68
4	" " " " 4% Deb. ..	81	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	" " " 5% Deb. ..	67*	70½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	65	62½	81	54½
3½	" " " 3½% Pf. Stk. ..	63	60½	76	60½
3½	" " " 3½% Deb. ..	71½	68	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77	72½	81½	52½
4½	" " " 4½% 1st Pref. ..	80½	78½	84	74½
6	" " " 6% Perp. Deb. ..	115½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	87½	86½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
8	Underground Electric Rlys. Ord.	23/6	22/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	4/3	4/3	16/-	3/-
4½	" " " 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	29/-	25/-	58/6	26/3
8	" " " 8% C.P.	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	38/9	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	73/9	99/4½	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/6	23/3	24/9	19/7
7	" " " 7% Deb.	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	77/6	71/3	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
12	Consolidated Signal Ord.	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	24/4½*	22/6	27/-	14/-
6	" " 6% Cum. 2nd Pf.	17/-*	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	" " 7% C.P. ..	18/9	18/9	22/9	20/-
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	97/6	95/-	112/6	60/-
7½	" " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	86	86	103½	86
6	" " Conv. Deb... ..	65½	65½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/-	17/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	28/9	28/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/3	46/3	81/3	26/6
6½	" " "A" C.P.	23/-	23/-	26/-	22/-
7½	" " "B" C.P.	25/6	25/6	27/9	22/9
7	" " 1st Mt. Deb. ..	102	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	127/6	121/3	136/10½	69/3
10	International Auto. Telephone Ord	37/6	37/6	50/6	35/-
10	Johnson & Phillips Ord.	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	23/9	23/9	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	25	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	255*	245	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk.	102½	101½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	22/6	22/6	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	64½	64½	90½	73½
—	"B" Ord. Stk.	33½	29½	104	33
—	5½% Cum. Pref. Stk. ..	99	96½	99	90
3½	Eastern 3½% Pref. Stk.	65½	63½	70½	58½
4	" 4% Deb.	78	77	82½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	31½	30½	43½	26
—	International Teleph. & Teleg. ..	$65½	$67½	161½	48½
15	Marconi Int. Mar.	45/-	43/9	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	100½	100½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	52	54½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	78	77	82	73

(*a*) 19/16d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2½d. per share. (*h*) 88s. 2·136d. *Ex dividend.

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Directors' Reports, etc.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Fin. div. of 1s. p. sh., less tax, makg. 8% for year (same as previous year) is announced.

NORTHERN OHIO POWER AND LIGHT CO.—Regular qrtrly. divs. of 1½% and 1¾% on 6% and 7% pfd. respectively, will be payable on Apl. 1.

QUEBEC POWER CO.—Gross rev. for 1929, $3 543 795, agst. $3 198 487; net rev. $1 502 526, agst. $1 199 725. Div. totalled $1 162 974, agst. $901 985, surplus $339 552, plus surplus brt. fwd. $163 869. To res. $100 000. Blce. $403 421.

DIRECT SPANISH TELEGRAPH CO., LTD.—Divs. of 10% on pref. shs., less tax, and 8% on ord. shs., tax free, for year 1929 are recommended. Half-year's div. on pref. shs. to June 30, 1929, and intm. div. of 4% on ord. shs. were paid on Oct. 1, 1929.

SCOTTISH POWER CO.—Credit blce. for 1929, includg. £3 399 brt. fwd., £154 009. Int. on loans, £18 079; to res., £7 853; div. on pref. for year, £16 800; div. on old ord. for year and new ord. on instalmts. paid during year at rate of 8% p.a., less tax, £104 565; fwd. £6 710.

CAMBRIDGE ELECTRIC SUPPLY CO., LTD.—Blce. of net rev. acct. for 1929, after providg. for int. and income tax and includg. amt. brt. fwd., £39 914. Intm. div. of 3% was paid in Nov. last. To gen. res., £10 000; writg. off blce. of cost of increased cap. and premium on debs. redeemed, £4 222; fin. div. on ord. shs., 5%; to staff benevolent fund, £1 500; fwd.; £4 848.

YORKSHIRE (WEST RIDING) ELECTRIC TRAMWAYS CO., LTD.—Net income for 1929, £26 854, agst. £28 133, after provisn. for deb. int. Pref. div. for year, £11 102 (same), to reconstructn. of tramway, £1 040; provisn. for expired cap. outlay, £14 962, agst. £11 144; fwd., £760, agst. £1 010. Receipts show decrease of £6 381, attributed to depressn. in trades in area served.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—Gross operatg. rev. for 1929, $28 017 878, agst. $26 126 194. Net operatg. and non-operatg. rev. $10 392 708, agst. $9 221 162. Surplus, after provisn. for fixed charges, and pfd. and common divs., $3 359 072, agst. $2 359 072. Total surplus $13 357 011. Common divs. were at rate of $3 p. sh. p.a. to Sept. 30, 1929, at $3·60 p. sh. after that date.

WESTINGHOUSE ELECTRIC AND MANUFACTURING CO.—Gross earngs. for 1929, $216 364 588, agst. $189 050 302, net mfg. pft., $21 992 601, agst. $18 182 332, plus other income $2 323 743, agst. $4 146 991, net income available for divs. and other purposes, $27 062 611, agst. $20 814 940. Divs. of $1 p. sh. on both classes of stk. were paid for each of first three qrtrly. periods of year. In Dec. directors declared qrtrly. div. of $1.25 p. sh., thus placing pfd. and common stks. on regular annual div. basis of $5 p. sh.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—The directors have authorised an issue of cap. stk without par value at an issue price of $50 p. sh. and the offer of such stk. to the stkhldrs. for subscriptn. by them in ratio of one sh. for each eight shs. without par value registered in their name. On or about April 4 warrts. will be mailed to such stkhldrs. evidencg. their subscriptn. rights. Subscriptn. rights must be exercised on or about May 1, 1930. Offering letter to stkhldrs. was mailed March 14. A regular qrtrly. div. of 50 cents p. sh. will be payable April 15.

WASTE HEAT AND GAS ELECTRICAL GENERATING STATIONS. LTD.—Net pft. for year ended Jan. 31, 1930, £30 566, agst. £28 470, plus £17 614, agst. £15 044 brt. in. Div. 8% (same), includg. intm. of 2½% already paid; fwd. £22 580, agst. £17 914. There has been no expenditure on cap. acct. durg. year. Amts. received as hire purchase instalmts. have been invested in 5% conversn. loan, Central Electricity Board 4% stk. and Treasury bills. Weardale power statn. has been handed over to Newcastle-upon-Tyne Electric Supply Co. Output from the other power statns. was satisfactory and showed increase over previous year.

AMERICAN WATER WORKS AND ELECTRIC CO.—Gross earngs. for 1929, $54 119 003, agst. $51 044 689, operatg. exes., taxes, etc., $27 182 287, agst. $26 027 658, leavg. $26 936 716, agst. $25 017 031, gross income. After providg. for int. and amortisation of disct. of parent company and subsidiaries, $9 661 486; pref. divs. of subsidiaries, $5 292 919; minority int., $23 305; and allocation to res. for renewals, etc., $4 137 525, blce. for divs. and surplus was $7 821 478, agst $6 209 495. Consol. net income, after 1st pfd. divs., was equivalent to $3·50 p. sh. on 1 432 163 shs. of common stk. outstandg.

Company Meetings.

NEWCASTLE AND DISTRICT ELECTRIC LIGHTING CO., LTD.—Col. F. R. Simpson, presiding at the meeting last Friday, referred to the noticeable development in the use of electricity for domestic purposes during 1929. An expenditure of £30 974 had been incurred on mains during the year to cope with the increasing demand. The development was being encouraged by special low tariffs. With regard to the North-East Electricity Scheme, he stated that the Central Electricity Board proposed to enter into temporary arrangements with the company for the operation of its station. The company was under an obligation to supply the board with electricity in such a manner as they might direct, and the board would be obliged to supply the company with the electricity required for its undertaking. This would not affect the earning capacity of the company. The cost of the change-over from 40 to 50 cycles would be borne by the board. No statement had yet been received about the findings of the recent public inquiry into electricity charges in Newcastle. The report was adopted, and the dividend of 7%, less tax, for the year approved.

MERSEY POWER CO., LTD.—Mr. G. H. Cox, presiding at the meeting on Tuesday, said the year under review had shown a gratifying increase in output, amounting to 10%, but the fact that under the Local Government Act, public utility services were not derated (relieved of 75% of their rates), as were other industrial undertakings, deprived their profits of the entire benefit of the augmented sales. Not only did they secure no such relief, but owing to the transfer of the burden of rates, their assessment was now made on £37 600, whereas it used to be made on £3 800. The result was that whereas they paid £2 426 in rates in 1928, they paid £13 942 in 1929, and they estimated a payment of £20 500 this year, unless they obtained a more favourable assessment through the appeal now pending. It is a heavy and a most undeserved burden which must ultimately fall on the consumer. Sales of electricity for the year had been 79 000 000 kWh, The total area of supply was 97 square miles, against 76 in 1920. The working profit, with interest received, was £94 230. It was proposed to pay a dividend of 5% on the ordinary shares, to place £25 000 to depreciation reserve, and carry forward £17 660. The report was adopted.

ERICSSON TELEPHONES, LTD.—Mr. W. M. Crowe, presiding at the meeting on March 19th, said the net profit for 1929 was £64 087, compared with £31 011. They were now manufacturing several complete automatic totalisators for the Racecourse Betting Control Board, for erection on racecourses in this country within the next few months, and they had every hope of securing further contracts in the near future. Their automatic telephone department continued to make healthy progress. Although some progress was made, this country still lagged behind in the telephone field, and our position remained tenth among the world's users. We had 3·9 telephones per 100 inhabitants, compared with 16·5 in the U.S.A.; Canada, 13·7; New Zealand, 10·3; Denmark, 9·2; Sweden, 7·9; Norway, 6·5, and so on. Despite the striking disparity between ourselves and America, our Government proposed to spend £10 500 000 on development this year, against £140 000 000 by America. It was obvious from these facts that more energetic expansion must take place in this country if we were to enjoy the full benefits of an efficient, extensive, and rapid method of communication. The first two headings on the assets side of the balance sheet, comprising land, buildings, plant, fixtures, etc., together amounted to £221 482, against £222 271 in the previous year. Stocks at £357 558 compared with £234 688. The increase reflected the greater volume of contracts in hand. The undistributed profits were equal to six-and-a-half years' net preference dividend. He was sure these facts justified the shares being priced considerably higher than the present market quotation. The report was adopted, and a dividend of 8% was declared.

DAVIS AND TIMMINS, LTD.—In the absence of Mr. F. Le Neve Foster (chairman) owing to illness, Mr. G. E. Timmins (managing director) presided at the meeting on March 19th, and read Mr. Foster's address, in which he stated that the accounts for the past year showed a profit of £26 069, compared with £23 417 for the previous year, after providing for depreciation and commission to managers. The net profit, including £21 317 brought forward, was £47 385. After payment of the interim dividends on the preference and ordinary shares, the balance was £38 535. The directors proposed the payment of six months' dividend on the preference shares and a balance dividend on the ordinary shares of 12%, making 20% for the

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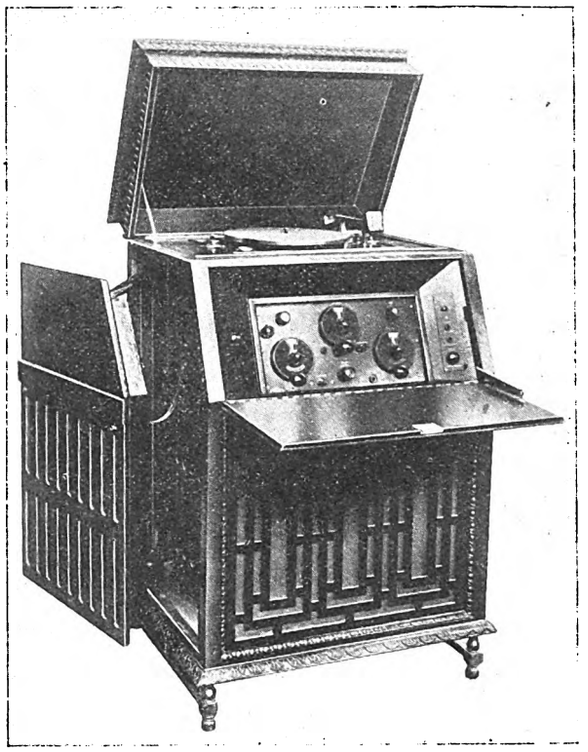
year, less tax, and it was also proposed to transfer £4 912 to general reserve account, leaving, after transferring £1 154 to income tax account, £20 819 to be carried forward. They had established superannuation schemes both for that company and its subsidiary. Already more than 50% of eligible employees had joined and were contributing. So far, the benefits of the derating scheme only affected the company for a quarter of last year, but the total reduction in the amount of rates payable by the company and its subsidiary, compared with the full year prior to the Act, amounted to something in the neighbourhood of £1 900. So long as the Government did not take from industry with one hand what they had given with the other, he believed this relief would be a factor in the restoration of the industrial prosperity of the country. Since last they met there had been a serious world slump in raw commodity values, which had inevitably caused a general slackening up of trade. If this fall were permanent, after they had passed through the dislocations which were incident to so heavy an adjustment of values on the inventories of stocks, etc., it appeared to him that the conditions which should result should certainly tend to the advantage of this country, whose interests were so predominantly manufacturing. The company's results so far this year on sales showed a slight increase over the sales for the corresponding period last year, although competition for orders appeared to be certainly keener. The report and accounts were adopted.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—In the absence of Mr. D. Sinclair (chairman), Mr. G. H. Nisbett presided at the meeting last Friday, and read the speech prepared by Mr. Sinclair, in which he said the cost of electricity, at £179 196, showed an increase of £10 393, which was almost balanced by additional sales. Two years ago he stated that in the early years of purchasing electricity it was expected the cost would be slightly higher than the cost to that company to produce, and last year he reported that they had neither lost nor gained much by the change. In the year under review, however, the cost per unit purchased was distinctly higher. This was due to the fact that each of the undertakers who were taking supply from the West Midlands Joint Authority anticipated an increase in load last winter, and asked for additional supplies. The authority spent over £600 000 in new plant, but the industrial load fell rather than increased, and the sinking fund charges on the new plant had to be met by an increased charge for current. The directors saw no reason to modify the statement made two years ago that ultimately the authority would supply current cheaper than the company could generate for itself. The sum of £44 675, transferred from credit balances, largely represented the excess of the purchase price over the balances remaining on the books in respect of assets sold. They would have preferred to retain the areas sold, but their rights would have expired in 1940, and in the meantime the supply was being developed in the areas on a system that was not entirely suited to the purchasing authority. They therefore agreed to stand aside, so that it could develop the supply in such areas in conformity with its existing system, and a price was agreed that was fair and reasonable to both parties. A further £30 324 had been transferred from profits, and the reserve account now stood at a total of £100 000. The net profit of £151 365 was £3 000 less than the profit of the previous year, but when it was borne in mind that they paid substantial increases on the cost of electricity and rates, and did not increase their charges, the result could be considered as satisfactory. A final dividend of 5½%, making 8% for the year, was approved.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.—Mr. R. P. Sloan, presiding at the meeting on Tuesday, said it might be remembered that at the last annual meeting he expressed disappointment at the decrease in the amount of electrical energy they were called upon to supply to collieries during the previous year. Whilst the position as a whole did not change to any extent during the past year, it was satisfactory to note that additional colliery supplies—which included the supply to six new pits—went a long way towards making up this setback. The consumption of electrical energy in shipyards and engineering works showed a distinct improvement compared with the previous year. There also was an increase in their supplies of electrical energy to the iron, steel and general engineering trades. He referred at the last annual meeting to the question of charges for ordinary lighting and domestic supplies, and stated that they had decided to issue revised tariffs, both for domestic and shop consumers. These revised tariffs became effective in the case of shops as from January 1st, 1929, and in the case of domestic supplies as from April 1st, 1929. The sum represented by these concessions to consumers was about £50 000 per annum. Within a week or two of their first publishing these tariffs, a number of local authorities within the area applied to the Minister of Transport for an Order reducing



THE "Neutrosonic-de-Luxe" radio gramophone set shown by the Igranic Electric Co., Ltd., at the Ideal Home Exhibition. A description of the company's exhibits will be given in our next issue.

their statutory maximum prices by such an amount as would represent a substantial reduction in the charges which they had just announced. As a result of this application, the Electricity Commissioners held an inquiry in Newcastle, in December last. The company strongly opposed this application, on the grounds that their then charges were reasonable, and pointed out that if they were compelled to reduce these charges below their present level it would result in their having to limit, if not discontinue, development of supply to the smaller class of consumer. They had not yet received the award of the Minister. The year's profit showed an improvement of £56 895, which he thought might be considered satisfactory, bearing in mind the effect on their profit of the substantial reductions in the charges to domestic consumers to which he had just referred. The directors recommended the payment of a dividend on the ordinary shares at the rate of 6%, leaving £96 029 to carry forward.

INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD.—At the meeting on Monday, Sir Alexander Roger, chairman, said the net profit for the past year was £135 849, compared with £130 823 for the previous year. The directors recommended a final dividend at the rate of 6¼% per annum on the ordinary shares, making 10%, less tax, for the year, plus a bonus of 2½%, less tax; and a dividend of 10%, less tax, for the year on the deferred shares, with a bonus of 2½%, less tax. Out of the Automatic Telephone Manufacturing Co.'s works, and through their alliances and associations, they were able to place at the disposal of their customers all the advantages of pooled research and development, and of technical and financial assistance, and the economies consequent on the ability to purchase bulk supplies. After some years of strenuous work, they had made many valuable alliances and connections with the result that they were now a prominent link in an important chain of companies covering the U.S.A., Great Britain, and Germany and elsewhere, who together undertook engineering, construction, management and operation of complete telephone installations; examination, negotiation, and acquisition of telephone concessions, and the financing of

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telephone operating properties and extensions to existing plant. The International Automatic Telephone Co., and the Automatic Telephone Manufacturing Co., with other important British interests, had agreements with American associated companies, operating principally through the Cable, Telephone and General Trust, as a result of which control of telephone operating companies was secured, long term credits arranged, and equipment sales facilitated, all for the purpose of creating tied-house business for the manufacturing units to be divided in agreed proportions. Members of their group also had arrangements with interests outside the group itself; all these arrangements were generally co-ordinated with their group activities. The number of patents owned and available through the associated companies was over 7 000, while the group to which they belonged spent annually on telephone developments and research a sum approximating to £250 000. If the sister branches of telephony—namely, cables and wireless—were included, the amount would probably be in the neighbourhood of £500 000 per annum. The report and accounts were adopted.

Automatic Telephone Mfg. Co., Ltd.—Sir Alexander Roger, presiding at the meeting last Friday, said the profit for the past year was £122 703, after applying £50 000 to depreciation. It was proposed to repeat last year's final payment of 6¼% on the ordinary shares, making a total of 10% for the year, and a bonus of 2½%, less tax. During the year four new director exchanges—Metropolitan, National, Hillside Park and Hendon—were completed, while good progress was made in the installation of Amherst and Primrose Hill. Metropolitan and National exchanges were both 10 000-line equipments, housed in the same building, which would ultimately accommodate a third 10 000-line exchange, to be known as "Empire," making 30 000 lines of Strowger director equipment under one roof. There were now 24 automatic exchanges in the Greater London area, and a like number were due for construction during the next few years; they were assured that a fair share of the work would accrue to that company. In Manchester installation was well advanced on the new director exchange at Blackfriars, while special indicator positions were being equipped in Central and City exchanges. Other completed contracts included Strowger exchanges at Dringhouses and Haxby, in the York area, together with extensions at Leeds, Newport, Cwmbran and Epsom. In the Nottingham area work was proceeding on new Strowger exchanges at Beeston and Bulwell, and extensions were being added to Central, Arkwright Street and Sherwood. They had recently been awarded a contract for equipping the Bristol area for Strowger operation. The scheme embraced ten exchanges, totalling nearly 20 000 lines. There were now in operation, in this country alone, 163 automatic exchanges, of which that company had been responsible for 49. A substantial contract had been awarded to the company by the Racecourse Betting Control Board, and they were manufacturing totalisator equipment for Newmarket, Cheltenham, Leicester, Folkestone, Pontefract, Wolverhampton, etc. In connection with the Central Scotland Electricity Scheme, a contract had been placed with the company for supervisory apparatus, indicating at a central control station from 15 power distribution centres such factors as voltage, current, power, steam pressure. The Telephone Development Association had spent, during the past five years, nearly £70 000 on advertising the telephone service, and they were satisfied that there had accrued to the British telephone industry new business to the value of over £6 000 000. The Xcel electric domestic appliances business overseas was increasing, and they had shipped consignments of these products to Australia, New Zealand and South Africa. The report was adopted.

BRITISH INSULATED CABLES LTD.

Increased Profit—Benevolent Fund for Workpeople—Overseas Railway Electrification—New Work in Hand—Plant Extensions.

Mr. D. Sinclair was unable to preside at the 34th ordinary general meeting last Friday owing to indisposition. Sir Alexander Roger presided, and read Mr. Sinclair's speech, in which it was stated that the company had made a profit of £685 980, compared with £617 951 for the previous year. After bringing forward the balance of £250 089, and paying directors' and trustees' fees, debenture interest, preference and interim ordinary dividends, a disposable balance remained of £745 806. Allowing £100 000 for depreciation of property and plant, and transferring £198 333 to reserve account, £447 473 remained available for dividends. A further dividend of 10% on ordinary shares was recommended, making, with the interim dividend already paid, a total distribution of 15% for the year. This left £280 806 to be carried forward. The item "dividend equalisation account" appeared for the first time in the balance sheet, a sum of £300 000 having been set against it. Hitherto provision had been made to cover contingencies such as exceptional taxation and liabilities that could not be exactly estimated. It was now considered that £300 000 could not be required for such contingencies, and the board had decided to utilise it for founding a dividend equalisation fund.

Referring to the £50 000 set aside last year as a compassionate fund for workpeople, the interest on which was to provide allowances for the company's workpeople and dependents, the Chairman said this sum had been invested in British Government securities, and had given relief to many deserving cases.

Investments stood at £1 263 753, compared with £909 562 a year ago, the increase being primarily accounted for by the acquisition, in conjunction with another company, of practically the whole of the share capital of a cable manufacturing company of considerable size. The results had justified expectations, from the point of view both of business and of earnings on the investment.

A tour of the Near East had been made on the company's behalf by Sir Alexander Roger and Mr. Johnstone Sinclair, who reported that the company's name for good work stood high in the East. As a result of their visit the company was hoping for a still larger volume of business. They had practically completed, during the year, the track electrification of the main line of the Great India Peninsula Railway, to the entire satisfaction of the consulting and railway engineers. This work, with the Bombay suburban electrification carried out for the same company a few years ago, constituted the most important railway equipment work yet carried out in the British Empire. Bearing in mind the important similar work they had done in Australia and South Africa, the Chairman remarked they believed their experience to be unique, and such as to enable them to undertake similar work on the largest scale for the British railways when their conversion to electric traction took place. This, they thought, could not now be much longer delayed.

They had practically completed the Scottish overhead "grid" system, and many of the lines were in use. They believed the work had given entire satisfaction to the Central Electricity Board.

New work in hand included a large extension of the supertension cable work for the London Power Co., an underground trunk telephone line for the Post Office from Manchester to Chester, and an overhead connecting link between the national "grid" system and the new Clarence Dock power station for Liverpool. Large contracts were good to have, but they liked best the aggregate of everyday orders, as being the most profitable, because of the fact that mass production methods could be applied to them. Their factories were generally well employed, with a volume of orders in hand in excess of last year. A large number of process improvements had been introduced, and considerable extension of plant had been made for the production of aluminium wire, while extensions for the making of condensers and enamelled wire were in progress. Plant was being put down for the manufacture of "Rockbestos" wire, for which they had obtained world rights outside the two Americas. This was a conductor insulated with a special preparation of asbestos in such a way as to be especially suitable for use in situations where permanence in high temperatures was a desideratum, such as for heating and cooking apparatus and winding wires for generators and motors.

The report and accounts were adopted.

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NEW COMPANIES.

S. SCHOFIELD AND CO., LTD.—Cap., £8 000. Electricians, etc. Reg. Office: 41, King Street, Huddersfield.

R. S. MACE, LTD.—Cap., £500. Dealers in electrical fittings, etc. Reg. Office: Lichfield Chambers, Upper Priory, Birmingham.

HIGHWAY APPLIANCES, LTD.—Cap., £500. Electrical and general engineers, etc. Reg. Office: 47, Victoria Street, London, S.W.1.

GEORGE C. BOOTH, LTD.—Cap., £3 000. To acquire business of electrician, etc., carried on by George C. Booth at Silver Street, Whitby.

J. A. MCCREA AND SONS, LTD.—Cap., £5 000. Electrical, lighting and mechanical engineers, etc. Reg. Office: 55, Brown Street, Manchester.

ALLDIS AND BROWN, LTD.—Cap., £1 000. Electricians, electric welders, etc. Solicitor: H. Wallace-Copland, 6 and 7, Market Street, Stafford.

E. M. ROBINSON (NOTTINGHAM), LTD.—Cap., £500. Electrical, wireless and general engineers. etc. Solicitors: J. J. Spencer and Son, Nottingham.

STEELE BROS. (LONDON), LTD.—Cap., £750. Electrical and laundry engineers, etc. Reg. Office: Victoria House, Southampton Row, London, W.C.1.

S. SARGENT AND SONS, LTD.—Cap., £100. Electricians, wireless engineers, wireless component suppliers, etc. Reg. Office: 23A, Bride Lane, London, E.C.4.

R. F. PEACHEY AND SONS, LTD.—Cap., £1 000. Contractors, electrical engineers, etc. Reg. Office: 20, Brownlow Mews, Guilford Street, London, W.C.1.

F. J. BAYNES AND CO., LTD.—Cap., £100. Heating, ventilating, electrical and general engineers and contractors, etc. Reg. Office: 99, St. Paul's Road, London, N.1.

CHURCH AND COLLIS, LTD.—Cap., £2 000. Electrical and mechanical engineers, etc. Solicitors: Kimbers Williams and Co., 79, Lombard Street, London, E.C.

ADVANCE RADIO CO., LTD.—Cap., £2 500. Manufacturers of and dealers in wireless sets, apparatus, etc. Solicitors: Garton and Co., 21, Maddox Street, London, W.1.

ARISTOPHONE AND PERFECTION RADIO, LTD.—Cap., £100. Radio engineers, radio valve and apparatus manufacturers, etc. Solicitors: Symington and Blair, 94, Hope Street, Glasgow.

BAILEY AND INCLEDON (1930), LTD.—Cap., £2 000. To carry on business of electrical and general engineers as formerly carried on by Bailey and Incledon, Ltd., at 34, Duke Street, St. James's, London, S.W.

ST. HELEN'S BAY ELECTRICITY SUPPLY CO., LTD.—Cap., £6 000. Electric light and power supply company, etc. Solicitors: J. D. Langton and Passmore, 71, Powis Street, Woolwich, London, S.E. 18. (Public co.)

EDWARD PRIOR ELECTRIC CO., LTD.—Cap., £3 000. To acquire business of an electrical engineer carried on by Mrs. L. Prior, at 30, Church Road, Burgess Hill, Sussex. Reg. Office: 30, Church Road, Burgess Hill, Sussex.

CRAVEN ENGINEERING CO., LTD.—Cap., £2 000. Electrical and mechanical engineers, manufacturers of electric washers and other electrical devices for household or trade use, etc. Solicitors: R. W. Wrench, Devonshire Street, Keighley.

MONMOUTH ELECTRICITY CO., LTD.—Cap., £25 000. Electric light and power company in all its branches. Reg. Office: Magnet House, Kingsway, London, W.C.2. (Public co.)

FRANCO NEON, LTD.—Cap., £1 000. Electrical and general engineers, makers of, and dealers in, illuminated and other signs, etc. Reg. Office: 25, Oxford Street, London, W.1.

WARRENPOINT ELECTRICITY SUPPLY CO., LTD.—Cap., £3 000. To acquire benefits of Warrenpoint Electricity Special Order, 1929. Reg. Office: Electricity Works, Warrenpoint.

TOLWORTH ELECTRICITY CO., LTD.—Cap., £1 000. To carry on any operations in relation to marketing electric light, cooking, heating, power and other electrical fittings and equipment, etc. Secretary: T. B. Lane, 17, Ambleside Gardens, Ilford.

PORTABLE X-RAYS, LTD.—Cap., £100. To adopt an agreement with Portable Radiographs, Ltd., and to carry on business as radiographers, radiologists and electrotherapists, etc. A first director: E. A. Titley, Doebank, West End Lane, Pinner.

R. KING AND SONS, LTD.—Cap., £5 000. To acquire business of electrical and mechanical engineers and machinery merchants now carried on at 5A, Speedwell Street, Oxford, by R. King, W. G. King, H. A. King and W. E. King as "R. King and Sons."

ADAMSON AND OLIVERSON, LTD.—Cap., £1 000. Manufacturers of and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, motors, magnetos, valves, telephonic and telegraphic instruments and apparatus, wireless goods, etc. Solicitors: Titley and Paver Crow, 6, Princes Square, Harrogate.

THE LEAD MARKET.

According to James Forster and Co., the market has been subject to control during the week, and prices have shown little change from day to day. The American price remains at 5.50 cents per lb. Closing prices, on March 21st, were:—£18 12s. 6d. for March, £18 13s. 9d. for April, and £18 15s. for May and June, 2s. 6d. per ton higher to unchanged on the week.

ELECTRICAL TRADE MARKS

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

EMKABER.—506 793. Class 8. Instruments, apparatus and parts thereof for use in wireless telegraphy and telephony. Emkabe Radio Co., Ltd., 47, Farringdon Road, London, E.C.1; manufacturers and importers. October 10th, 1929.

TENCELITE.—508 553. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including electric cables, and not including any goods of a like kind to electric cables. Berry, Wiggins and Co., Ltd., Tensulam House, Water Lane, Stratford, London, E.15; manufacturing chemists. December 7th, 1929. To be associated with No. 508 552 (2 705) iv and another.

MIHALOR.—506 806. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Telehor Aktiengesellschaft, Hindersinstrasse, 14, Berlin, N.W.40; manufacturers. October 10th, 1929.

AREGA.—509 376. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Cheetham and Trevithick, 8, Clarendon Road, Edgbaston, Birmingham; engineers. January 10th, 1930.

CUTAX.—508 623. Class 13. Electric switches and circuit breakers, all being metal goods. Dr. Paul Meyer Aktiengesellschaft, Lynarstrasse 5-6, Berlin, N.65; manufacturers. December 9th, 1929.

MOSTYL.—498 608. Class 8. Wireless telephonic apparatus, gramophones and talking machines and parts thereof. Gramostyles, Ltd., Camden Gramophone Works, Camden Street, Birmingham; manufacturers. January 2nd, 1929.

MADRIGAL.—508 988. Class 8. Wireless telephonic and telegraphic instruments and apparatus and component parts thereof. Radio Instruments, Ltd., 12, Hyde Street, London, W.C.1; manufacturers. December 20th, 1929.

PHILLIMA.—505 339. Class 13. Electric lamps and electric lighting fittings consisting mainly or wholly of ordinary metal. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Emmasingel 13d, Eindhoven; manufacturers. August 16th, 1929. To be associated with No. 505 340 (2 698) xv.

OPALAX.—508 952. Class 50. Finger plates, door fittings, covers and bases for electric switches and bells, electric light fittings and plugs; containers, buckles and clasps; bathroom fittings; picture frames and mouldings; lamp shades, ceiling and the like roses; and vases; all being goods, not included in other classes, made from compositions in which cellulose predominates. Arthur Willy Kanis, 66, Aldersgate Street, London, E.C.1; manufacturer. December 19th, 1929. To be associated with No. 508 951 (2 706) xxxix and another.

CHORISTER. 508 413. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. H. J. Fletcher and Co., Ltd., Bridge Works, 134, New North Road, London, N.1.; merchants and manufacturers. December 3rd, 1929. To be associated with No. 470 878 (2 522).

NOCTOPHONE. 509 474. Class 8. Apparatus for use in transmitting voice sounds or images and scenes to a distance by telegraphy. Baird Television Development Co., Ltd., 133, Long Acre, London, W.C.2; manufacturers.—January 14th, 1930. To be associated with No. 478 273 (2 564), and another.

HYRONIC. 509 901. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Lissen, Ltd., Lissenium Works, Worple Road, Isleworth; Middlesex; manufacturers. January 30th, 1930.

ACADEMY. 509 597. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. The Johnson Talking Machine Co., Ltd., 96, Clerkenwell Road, London, E.C.1; manufacturers. January 17th, 1930. To be associated with No. 393 635 (2 208) and others.

WOTAN. 505 177. Class 13. Electric lamps (ordinary) and electric lighting fittings, being metal goods not included in other classes. Osram Gesellschaft Mit Beschrankter Haftung Kommanditgesellschaft, the responsible partner of which is Osram Gesellschaft Mit Beschrankter Haftung, Ehrenbergstrasse 11 to 14, Berlin, O.17; manufacturers. August 9th, 1929. (By consent.)

THOR JUVENATOR (sign). 504 817. Class 49. Electric apparatus for use in physical training exercises. Hurley Machine Co., 22nd Street and 54th Avenue, Cicero; manufacturers. July 26th, 1929. Registration of this trade mark shall give no right to the exclusive use of the word "Juvenator."

DIOLITE. 505 146. Class 6. Electrical machinery and parts of such machinery. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2; manufacturing electrical engineers. August 8th, 1929. To be associated with No. 505 147 (2 710) xiii and another.

VOLEX. 500 577. Class 8. Electric dry cells, electric dry batteries and electric accumulators, not for medical purposes. Ward and Goldstone, Ltd., Sampson Works, Frederick Road, Pendleton, Manchester; manufacturers. March 2nd, 1929. To be associated with No. 326 380 (1719) xiii.

TRIDURITE. 500 911. Class 8. Insulated electric cables. British Insulated Cables, Ltd., Prescot, Lancashire; manufacturers. March 13th, 1929. To be associated with No. 429 988 (2374).

"REX." 507 801. Class 8. Electricity meters. Société des Compteurs de Geneve, 8, Rue des Vieux-Grenadiers, Geneva; manufacturers. November 13th 1929.

METAL AND CHEMICAL PRICES.

TUESDAY, March 25th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£76 5 0	5s. 0d.	—
Electro Wirebars .. .. .. ,,	£84 5 0	—	—
H.C. Wire, basis .. .. .. per lb.	11⅛d.	—	—
Sheet .. .. ,,	11 ⅛d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. .. per lb.	1s. 2⅛d.	—	—
Brass (60/40)—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet ,, ... ,,	10⅛d.	—	—
Wire ,, ... ,,	10⅛d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 10 0	—	5s. 0d.
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. ,,	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£20 0 0	—	—
Foreign or Colonial .. .. ,,	£18 15 0	5s. 0d.	—
Tin—			
Ingot .. .. per ton	£169 15 0	—	£8 17s. 6d.
Wire, basis .. .. .. per lb.	2s. 3½d.	1d.	—
Aluminium Ingots .. .. .. per ton	£95 0 0	—	—
Spelter .. .. ,,	£19 2 6	£1 2s. 6d.	—
Mercury .. .. per bottle	£22 17 6	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2⅞d.

Sodium Bichromate—Per lb., 3⅛d.

Rubber—Para fine, 8½d.; plantation, 1st latex, 7½d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CATLOW, Henry A., 153, Tyldesley Road, Atherton, wireless expert. £41 14s. February 14th.

CESTRIAN ELECTRICAL CO., Northgate Street, Chester, engineers. £43 15s. February 18th.

COHEN, Mrs. Aida, 16, Woodstock Road, Golders Green, (late trading as ELECTRICAL FITTINGS CO.), electrical engineer. £11 4s. 6d. January 7th.

FENNEMORE AND CO., Market Square, Sandy, electrical engineers. £15 11s. 8d. February 19th.

FOOT, K., 26, New Road, Chingford, wireless goods manufacturers. £19 8s. 6d. February 10th.

LEAKE (Harold) AND SON, back St. Annes Road West, St. Annes-on-Sea, electrical engineers. £21 6s. 1d. February 14th.

PILKINGTON, Mr. T. E., 151, Acombe Street, Moss Side, Manchester, radio engineer. £16 15s. 6d. January 9th.

ROYCE, Mr. J., c/o S. H. Nicholson, 105, Gower Street, W.C., wireless dealer. £14 7s. 4d. February 11th.

SHILVOCK, G., AND SONS, 38, Regent Street, Rugby, electrical engineers. £13 4s. 5d. February 10th.

SUMMERS, Mr. E., The Parade, Perranporth, electric light and power engineer. £10 5s. 2d. February 13th.

SUTTON, Mr. A., Corner House, Chase Road, Epsom, electrical contractor. £11 5s. 10d. February 18th.

Deeds of Arrangement.

ANDERSON, HENRY WILLIAM, 2, Causey Buildings, Causey Street, and 32, Ashfield Road, Gosforth, electrician. Dated March 18th, filed March 19th. Trustee, J. C. Graham, 5, Higham Place, Newcastle-on-Tyne. Liabilities, unsecured, £587; assets, less secured claims, £50.

WILSON, Walter Douglas, trading as ELECTRICAL ENGINERING CO., Oxford Street, and residing at 4, Berwick Street, Workington, electrical engineer. Dated March 15th, filed March 22nd. Trustee H. J. Rigg, 13, Bridge Street, Workington. Secured creditors £66; liabilities unsecured £1 860; assets, less secured claims, £443.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

AEONIC RADIO, LTD., London, W. Registered March 13th, £4 500 debenture to J. L. Gottlieb, 10, Hillcrest Avenue, N.W.; general charge (subject, etc.).

DAKOL ELECTRIC, LTD., London, S.W. Registered March 13th, £2 000, £2 000, £1 000 and £1 000 debentures, balance of £12 000; general charge.

DUNOON AND DISTRICT ELECTRICITY SUPPLY CO., LTD., London, W.C. Registered March 10th, debenture for £7 500 and further advances, with premium of 10% on maximum amount at any time due, to Johnson and Phillips, Ltd., Columbia House, Aldwych; general charge.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

COOK'S WIRELESS CO., LTD., St. Helens Street, Ipswich. Pursuant to section 238 of the Companies Act, 1929, a meeting of the creditors in this matter was held on March 24th at the Abercorn Rooms, Liverpool Street Hotel, E.C., when Mr. Dansie, the governing director of the company, presided. Prior to the meeting of creditors the shareholders had nominated Mr. Ensor of Ensor, Son, and Goult, C.A., 30, Museum Street, Ipswich, to be the liquidator of the company. Mr. Ensor submitted a statement of affairs which disclosed liabilities of £4 323, of which £3 123 was due to the trade, and there were directors' loans amounting to £1 200. There were also liabilities on bills discounted amounting to £91, which were not expected to rank. The assets consisted of cash at bank £239; cash in hand, £16; stock-in-trade, estimated cost £1 700, expected to realise £1 360; trade fixtures, fittings, utensils, etc., put down at £100; two motor cars valued at £30; good book debts, £773; doubtful and bad debts, £342, estimated to produce £140; making total assets of £2 658, from which had to be deducted preferential creditors, leaving net assets of £2 619, or a deficiency of £1 704.

The accountant said the company was incorporated on February 15th, 1924, to take over a business of manufacturers of and dealers in wireless and electrical apparatus, which had been carried on by Mr. Fish and Mr. Dansie in partnership. The purchase price of the business was £876, which was satisfied by the allotment of 700 £1 shares at par, and by the payment of £176 in cash. The assets taken over included stock at cost £400; fixtures and fittings £100; motor cars, £100; cash, £97; and goodwill, £178. A further 32 shares had been issued since that time making the total capital issued and allotted £732.

Mr. Ensor said that for the six months to June 30th, 1924, the sales were £1 969, and, after charging the directors' fees, there was a net profit of £55. For the next twelve months the sales increased to £11 974, and there was a net profit of £35. For the next twelve months to June 30th, 1926, there was a profit of £146 on a turnover of £16 955, but in the next year, although the turnover increased to £23 781, there was a loss of £432, while for the twelve months to June, 1928, the turnover was £26 503, and there was a net profit of £100. For the six months to December 31st, 1928, the turnover was £10 821, and there was a profit of £165, while for the six months to June, 1929, the sales dropped to £5 453, and there was a loss of £362. During the whole of that period the directors were entitled to fees amounting to £1 834, but of that amount the sum of £1 200 has been left on loan in the business, and that amount was shown on the statement of affairs to-day. It would appear, therefore, that for the five years the directors had only drawn fees amounting to £624. In answer to questions the chairman said that Mr. Fish retired from the business in September, 1928, and the present directors of the company were himself and his wife. He realised that the position was not as it should be when he consulted Mr. Ensor and his solicitor three or four weeks ago. The company had been trading under difficulties prior to that date, but they had continued trading hoping that the business would improve. Unfortunately, however, the wireless trade at the present time was absolutely flat. Several creditors said that with regard to the latter remark they could not consider that to be their experience in the wireless trade to-day. After further discussion it was resolved that the appointment of Mr. Ensor as liquidator of the company should be confirmed. A committee of inspection consisting of the representatives of the five largest creditors was appointed.

London Gazette, etc.

Companies Winding-up Voluntarily.

ALMONDSBURY AND DISTRICT ELECTRIC SUPPLY CO., LTD. By special resolution March 20th, W. H. Goodenough, of the firm of F. J. Ackland and Co., accountants and auditors, appointed as liquidator.

"M.P.A." WIRELESS, LTD. Statutory meeting of creditors at the Holborn Restaurant (Caledonian Room), Holborn, London, W.C.1, on Friday, April 4th, at 12 noon.

Bankruptcy Information.

BALL, Ernest, Old Hall Street, Middleston, Lancashire, electrica contractor. Receiving order, March 17th. Debtor's Petition. First meeting April 2nd, 3 p.m., Official Receiver's Offices Byrom Street, Manchester. Public examination May 21, 10.45 a.m., Court House, Church Lane, Oldham.

BURDEN, Frederick James, 19, Durngate Street, Dorchester. Receiving order March 20th. Debtor's petition.

GARDNER, Kenneth Lancelot, 7, Bridge Street, Wisbech, Cambridge, dealer in wireless apparatus. Receiving order, March 18th. Debtor's petition. First meeting April 1st, 11.30 a.m. Official Receiver's Office, 41, Sidney Street, Cambridge. Public examination April 17th, 11 a.m., Court House, King's Lynn.

WARNER, Leslie Charles, 4 School Lane, Leominster, Hereford, Wireless dealer. Receiving order, March 17th. Debtor's petition.

Notices of Dividends.

BATES, Victor Harold, High Street, Linton, Cambridge, trading as the Linton Radio Service, wireless engineer. First and final dividend 1s. 6½d. per £, payable March 31st, Official Receiver's Office, 41, Sidney Street, Cambridge.

PEOVER, Harry, electrical apparatus and tool merchant, Market Lane, Newcastle-upon-Tyne. First and final dividend, 1s. 11d. per £, payable March 26th, Official Receiver's Office, 81, St. Mary's Place, Newcastle-upon-Tyne.

Notice of Intended Dividend.

HOBSON, Joseph, electrical engineer, 1A, Thorncliffe Grove, Whitworth Park, Cross Street, Pendleton, Salford. Last day for receiving proofs, April 5th. Trustee, F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver.

Application for Discharge.

MCLEOD, John Stuart, trading as MCLEOD BROTHERS, 189, Blackburn Road, Bolton, and also with a partner as McCloud Brothers, at 55, Chorley New Road, Horwich, radio and electrical engineer. Hearing, April 15th, 10 a.m., Court House, Mawdsley Street, Bolton.

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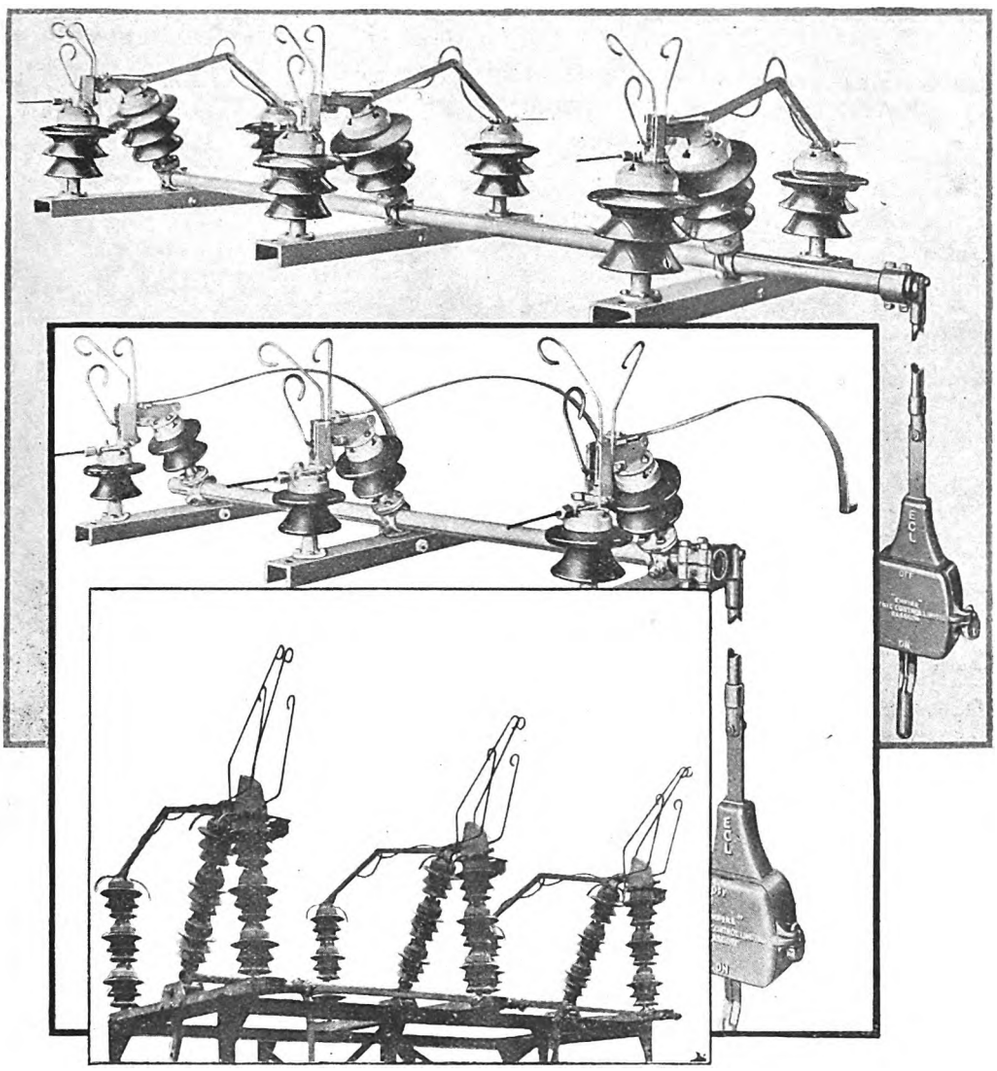

HORIZONTAL DISCONNECTING SWITCHES

THESE disconnecting switches are made in two types, with three and two insulators respectively.

Both are illustrated above, the two-insulator type effects a slight economy by eliminating the third insulator on each phase, the moving insulators being coupled to the line by arched flexible strips secured by gun-metal clamps.

The detail work is of a very high standard, the pivot bearings being of stainless steel in order to obviate possible corrosion; the units are mounted on heavy, rigid, hot-galvanised channel steel; the insulators are carried upon forged steel brackets, and all iron and steel parts are hot galvanised; all other metal parts are cadmium plated.

The small illustration shows a three insulator switch (66,000 volts, 400 amps).

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

302 904 British Thomson-Houston Co., Ltd. Electrical frequency-changers. (23/12/27.)
322 363 W. McGee and Son, Ltd., and G. S. Young. Cooling arrangements of enclosed dynamo-electric machines. (19/12/28.)
303 156 Waygood-Otis, Ltd. Elevator door-control system. (30/12/27.)
302 931 Siemens-Schuckertwerke Akt.-Ges. Arrangement for exciting synchronous machines. (23/12/27.)
322 367 F. B. Woolford. Electric furnaces. (24/12/28.)
322 371 K. Breusing and U. Gottesmann. Rapidly producing uniform metal deposits electrolytically. (28/12/28.)
322 372 Siddall and Hilton, Ltd., and R. Siddall. Seats for tramcars, buses, and the like. (29/12/28.)
304 653 British Thomson-Houston Co., Ltd. Transmission of pictures. (23/1/28.)
322 382 F. Farrant. Electric lamps. (15/1/29.)
318 913 L. Zwilling. Electric gas-lighters. (12/9/28.)
304 724 Associated Electrical Industries, Ltd. Thermally-responsive electric switches. (25/1/28.)
305 463 Birtman Electric Co. Vacuum cleaners. (1/2/28.)
322 386 C. D. Sutton and Cambridge Instrument Co., Ltd. Electrical measuring instruments. (26/1/29.)
311 395 C. Lorenz Akt.-Ges. Apparatus for the transmission or reception of ultra-short waves. (12/5/28.)
306 943 General Railway Signal Co. Train-dispatching systems. (28/2/28.)
306 460 Marconi's Wireless Telegraph Co., Ltd. Radio-communication systems and the like. (20/2/28.)
322 403 Soc. Anon. Calor and L. Trouilhet. Electrically heated smoothing-irons. (22/2/29.)
322 409 J. Salomon. Disc-shaped electro-motors. (19/2/29.)
307 842 British Thomson-Houston Co., Ltd. Restraining-devices for railways and the like vehicles. (14/3/28.)
311 370 C. Zeiss. Illuminating bodies with concave reflector and diffusely radiating incandescent bulb. (10/5/28.)
310 800 Associated Telephone and Telegraph Co., Ltd. Telegraph concentrators. (30/4/28.)
310 420 J. T. Dourgnon. Indirect-lighting system for apartments and for other uses. (25/4/28.)
322 423 K. Geyer and F. Ulbrych. Holder for electric incandescent lamps. (28/5/29.)
322 181 A. K. Croad (Sand Spun Patents Corporation). Magnetic clutches. (27/7/28.)
291 721 International General Electric Co., Inc. Earth-fault electric protective arrangements for alternating-current generators. (4/6/27.)
322 481 J. L. Baird and Television, Ltd. Television apparatus and the like. (6/6/28.)
291 799 Dr. R. Blum, Jun. Electrically-heated apparatus for the treatment of the body. (8/6/28.)
322 482 A. Szente. Electromagnetically-wound clockwork mechanism. (4/7/28.)
302 678 Siemens and Halske Akt.-Ges. System for transmitting alarm signals over telephone lines. (20/12/27.)
322 485 G. Lakhovsky. Apparatus for collecting electrical oscillations. (31/7/28.)
294 945 British Thomson-Houston Co., Ltd. Means for protecting electrical apparatus. (1/8/27.)
322 434 J. A. Crabtree and J. R. Dolphin. Insulating-covers for electrical switches, bell-pushes, ceiling-roses and the like. (25/8/28.)
322 470 Standard Telephones and Cables, Ltd., and E. K. Sandeman. Loud-speakers and the like. (29/8/28.)
322 487 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Composite signalling systems such as combined telegraph and telephone systems. (29/8/28.)
322 471 J. Y. Johnson (I.G. Farbenindustrie Akt.-Ges.). Treatment of gases and vapours with electric arc discharges. (29/8/28.)
322 509 Baron Marks (Hart Manufacturing Co.). Electric time-switches (30/8/28..)
322 443 C. McAllister and A. Munn. Electric switches. (3/9/28.)
322 510 General Electric Co., Ltd., and F. Hopewell. Automatic electrical voltage or current regulators. (3/9/28.)
322 477 H. C. Wingfield. Automatic switch indicator for electrical prepayment meters. (4/9/28.)
322 513 H. E. Angold and Smith Meters, Ltd. Induction-type electricity meters. (4/9/28.)
322 517 W. Hahn and H. Warncke. Device for the control of the measure of transmission in telephone systems, amplifying systems, or the like. (6/9/28.)
307 044 Hirsch, Kupfer-und Messingwerke Akt.-Ges. Ironless induction furnaces. (2/3/28.)
322 520 R. Maddison and Associated Electrical Industries, Ltd. Terminals for electrical heating-elements. (7/9/28.)
307 733 Newcombe-Hawley, Inc. Electrostatic acoustic device for transmitting and receiving purposes. (12/3/28.)

Applications for Patents.

November 18th.

35 188 A. Avis. Poles for overhead cables.
35 251 J. C. Brown. Electromagnetic sound reproducers.
35 240 A. Chorine. Printing telegraphs.
35 292 L. Denbow. Electric switch.
35 171 W. O. Duncan (Aldawade Electrical Appliances Pty., Ltd.). Water, etc., heaters.
35 274 International General Electric Co., Inc. Alternating current generators. (16/11/28, Germany.)
35 258 Marconi's Wireless Telegraph Co., Ltd. Radio-communication systems. (17/11/28, U.S.)
35 260, 35 261 Marconi's Wireless Telegraph Co., Ltd. Radio receiving systems. (16/11/28, U.S.)
35 255 J. Meluish. Telephone sets.
35 129 G. W. Parker. Electric trolley omnibuses.
35 215 Siemens-Planiewerke Akt.-Ges. fur Kohlefabrikate. Connecting current capacity parts. (25/10/29, Germany.)
35 216 Siemens and Halske Akt.-Ges. Control apparatus for optical electrical sound carrier reproducing devices. (19/11/28, Germany.)
35 142 W. A. Stevens. Regulating regeneration in electric vehicles.
35 234 Symphony Gramophone and Radio Co., Ltd., and H. C. Willson. Radio receiving apparatus.

November 19th.

35 337 British Thomson-Houston Co., Ltd. Electromagnetic compasses. (19/11/28, U.S.)
35 338 British Thomson-Houston Co., Ltd. Volume control means for radio receivers, etc. (19/11/28, U.S.)
35 340 British Thomson-Houston Co., Ltd. High frequency signal transmitting systems. (20/11/28, U.S.)
25 392 L. da S. Conto. Electromagnetic clutches. (20/11/28, Brazil.)
35 387 Electrical Research Products, Inc. Continuous loading of conductors. (31/5/29, U.S.)
35 323 Felten and Guilleaume Carlswerk Akt.-Ges. Submarine cables. (23/1/29, Germany.)
35 315 P. L. R. Fraser. Wiring for electric circuits.
35 363 Hirsch Kupfer und Mersingwerke Akt.-Ges. Electric annealing furnace. (15/12/28, Germany.)
35 348 F. W. Le Tall (Westinghouse Electric and Manufacturing Co.) Load conveying systems.
35 374 Lissen, Ltd., and R. P. Richardson. Manufacture of dry cells.
33 346 Marconi's Wireless Telegraph Co., Ltd. Radio receiving systems. (19/11/28, U.S.)
35 388 J. Robinson. High frequency electrical apparatus.
35 389 J. Robinson. Piezo-electric devices.
35 394 Siemens-Schuckertwerke Akt.-Ges. Lubricating arrangements for electric spindles, etc. (23/11/28, Germany.)
35 370 Siemens and Halske Akt. Ges. Transmitting communicating currents with discharge tubes.
35 286 J. B. Tucker. Electric switches.
35 368 S. Zullo. Telephone message apparatus.

November 20th.

35 409 H. E. Ashdown. Dynamo-electric machines.
35 478 Associated Electrical Industries, Ltd., and A. Rudman. Circuit interrupters.
35 461 L. J. F. Austin and Clear Hooters, Ltd. Electric horns.
35 527 Automatic Telephone Manufacturing Co., Ltd., and R. Taylor. Telephone systems.
35 462 J. L. Baird and Television, Ltd. Television, etc., systems.
35 529 J. L. Baird and Television, Ltd. Television apparatus, etc. (31/1/29.)
35 530 J. L. Baird and Television, Ltd. Television apparatus, etc. (4/2/29.)
35 404 Firm of G. Barker and G. P. Barker. Electric water heater.
35 480 P. Girod. Electrodes of electric furnaces. (27/8/29, France.)
35 486 International General Electric Co., Inc. Alternating current generators. (20/11/28, Germany.)
35 503 T. F. Langlands, W. Smith, and C. W. Rettig and Co., Ltd. Electric drive.
35 479 F. W. Le Tall (Westinghouse Electric and Manufacturing Co.) Electric signalling systems for elevators, etc.
35 499 S. Offenbacker. Electrodes for high frequency currents.
35 452 G. Pellizarri and Pellizari and Figli. Cooling device for electric motors.
35 416 H. Rabinovitch. Electric signals for traffic regulation.
35 473 Standard Telephones and Cables, Ltd., and R. W. Bradley. Pressure indicating devices.
35 475 Standard Telephones and Cables, Ltd. Moulded articles, and methods of forming same. (2/1/29, U.S.)
35 476 Standard Telephones and Cables, Ltd. (J. Dorgelo and K. C. van Rijn). Toll telephone systems.
35 474 Standard Telephones and Cables, Ltd. (Western Electric Co.) Carrier current signalling systems.
35 477 Standard Telephones and Cables, Ltd. (J. P. Verlooy.) Toll telephone systems.
35 401 K. Walton. Insulated connections for electric wires, etc.
35 411 G. Wilkinson. Electric heat storage radiators.

COMING EVENTS.

Friday, March 28th (To-day).

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington, London, W. Annual general meeting. 5 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Joint meeting at the invitation of the Manchester Association of Engineers. Paper by Mr. J. Calderwood on "Marine Diesel Installations, with particular reference to Auxiliary Machinery." 7.15 *p.m.*

Royal Institution of Great Britain, 21, Albemarle Street, London. Lecture by Sir E. Rutherford on "The Transmutation of Matter." 9 *p.m.*

Saturday, March 29th.

Association of Mining Electrical Engineers (Western Sub-Branch).—Informal discussion on H.M. Electrical Inspectors' Report for 1928.

Electrical Association for Women (North-East Coast Branch).—Lecture Theatre, Carliol House, Newcastle-on-Tyne. Annual meeting. 11 *a.m.*

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Sir E. Rutherford on "Atomic Nuclei and their Structure." 3 *p.m.*

Finsbury Technical College Old Students' Association.—Trocadero Restaurant, Piccadilly Circus, London. Annual dinner. 6.30 for 7 *p.m.*

Monday, March 31st.

Institution of Electrical Engineers (Western Centre).—University College of the South-West of England, Exeter. Lecture by Miss M. Partridge on "Economics of Rural Electricity Supply for Domestic Purposes." 6 *p.m.*

Institution of Electrical Engineers.—Victoria Embankment, London. Informal meeting. Discussion on "Loud-speakers." (Opened by Captain P. P. Eckersley.) 7 *p.m.*

Institution of Electrical Engineers (South Midland Centre).—University, Edmund Street, Birmingham. Paper by Mr. B. Leggett on "The Medical and Surgical Applications of Electricity." 7 *p.m.*

Tuesday, April 1st.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.

Electrical Association for Women (Bristol and District Branch).—Electricity Offices, Colston Avenue. Lecture on "Rural Electrification," by Mr. E. W. Tole. 3 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, 17, Albert Square, Manchester. Paper by Messrs. H. A. Humphrey, D. M. Buist and J. W. Bansall on "The Imperial Chemical Industries, Limited's, Steam and Electric Power Plant at Billingham." (To be illustrated by a cinematograph film.) 7 *p.m.*

Wednesday, April 2nd.

Electrical Contractors' Association (London Branch).—General meeting.

Electrical Contractors' Association (Southern Section).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting.

Electrical Contractors' Association (Dublin Branch).—Ordinary meeting

Institution of Electrical Engineers (Wireless Section). — Victoria Embankment, London. Paper by Mr. R. H. Barfield. on "Recent Developments in Direction-Finding Apparatus." 6 *p.m.*

Institution of Electrical Engineers (Tees-Side Sub-Centre).—Cleveland Technical Institute, Middlesbrough. Annual general meeting, 7 *p.m.*; paper by Mr. L. C. Grant on "The Breaking Performance of High-Power Switchgear and of a New Form of Quenched-Arc Switch." 7.30 *p.m.*

Thursday, April 3rd.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting.

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting.

Electrical Association for Women.—Visit to Ideal Home Exhibition, Olympia. Special inspection of the Pavilion of Light.

Friday, April 4th.

Institution of Electrical Engineers (Meter and Instrument Section).—Victoria Embankment, London. Paper by Messrs. E. H. Rayner, W. G. Standring, R. Davis and G. W. Bowdler on "Studies in Low-Power-Factor Measurements at High Voltages." 7 *p.m.*

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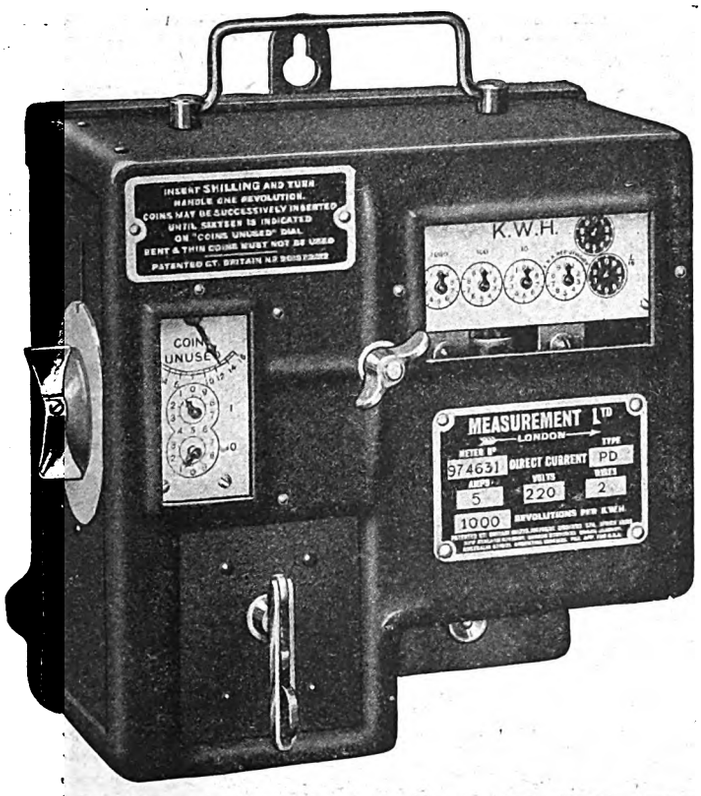

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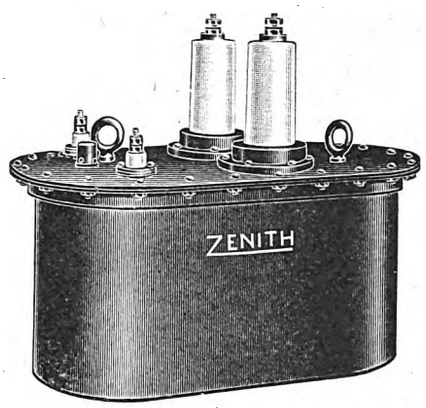

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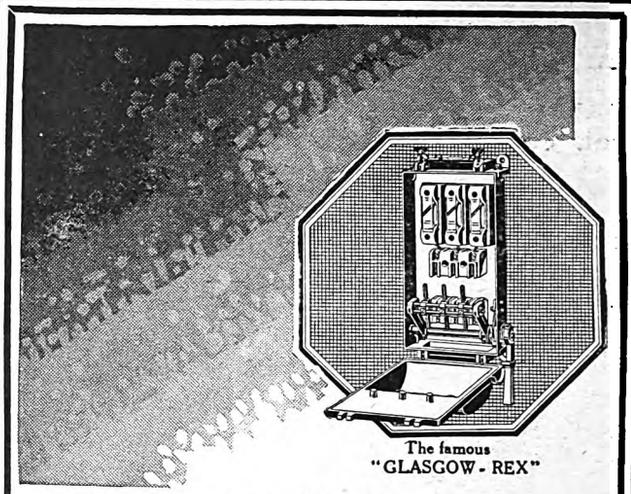

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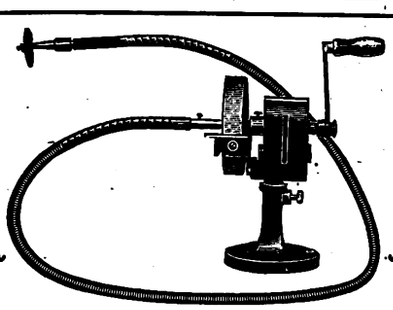

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Transformation of Lots Road.

TWENTY-FIVE years ago when Lots Road, Chelsea, power station was completed to supply current for the electrified Metropolitan District Railway and the Bakerloo, Piccadilly and Hampstead-Highgate tubes, the 6 000 kW Parsons turbo-alternators then installed were the largest sets that had yet been built. Since 1905 not only has there been a large growth of traffic on the original Underground system, but the Central London and City and South London tubes have been added, as well as the London United Tramways, and the original tube mileage has been greatly increased. Car mileage on the railways supplied by Lots Road has grown from 32 500 000 in 1908 to an estimated mileage of 96 250 000 in the current year, so that the figures have nearly tripled in 23 years. From time to time additions were made to the original machinery to meet the steadily growing demand for current, but five years ago it became apparent that something more drastic was required. Recognition of this fact led in 1925 to a decision to replace almost the whole of the original plant by stages.

This decision was made easier by the knowledge that the advance in boiler and turbo-alternator design, since the original plant was installed, had made it possible to increase the output of the station very considerably without enlarging the actual buildings. The new 15 000 kW turbo sets are rather smaller than the 6 000 kW sets of a quarter of a century ago. Since the first 15 000 kW set was installed in 1915 six of these sets have been put in, three of them to replace the original 6 000 kW sets, and a seventh is now in course of installation. In this way the output of the power station has been raised from 70 000 kW in 1925 to 90 000 kW at the present time. When the programme now in hand is completed there will be nine 15 000 kW sets, providing for a total station load of 105 000 kW, with two stand-by sets. There will be room for two more, so that the eventual capacity of the station will be 165 000 kW. The present maximum demand is 92 000 kW with a load factor of 48%, so that Lots Road, as re-equipped, should be in a position to cope with the probable current demand of the Underground system for some time to come. The "heart" of the Underground has in fact been thoroughly rejuvenated.

Modernisation of the station has involved replacement of the switchgear and the provision of an entirely new high tension control board from which the entire electrical system of the power house and feeders will be controlled. The boiler plant is also being reconstructed. The original boilers, of which there were 64, had a capacity of 16 000 lb. of steam per hour at a pressure of 200 lb. and a temperature of 500 deg. F. In place of some of these, eight new C.T.M. Babcock and Wilcox boilers of 39 000 lb. capacity at 290 lb. pressure and 700 deg. F. were brought into use, four in 1922 and four in 1925. In order to facilitate the general reconstruction without interfering with the working of the station, four new C.T.M. boilers of 50 000 lb. per hour capacity were erected in 1927 in a corrugated iron shed at one end of the main power house. Since then 16 of the old boilers have been replaced by eight new ones, of 50 000 lb., to supply the two latest turbines. Eight more are being erected to replace a further 16 of the old type. The thermal efficiency of the whole station is stated to be 16¼%, while that of the new plant is given as 22%—a very satisfactory figure. When it is remembered that the entire reconstruction programme is being carried out without interference with the working of the station, and without enlargement of the original buildings, the achievement becomes the more noteworthy both as an example of ingenuity and resourcefulness and as an object lesson in the progress made in 25 years towards efficiency in the design of electrical machinery and boiler house plant with economy of space and its resultant saving in the cost of the buildings required to house them.

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Current Topics.

Co-operation in Lighting.

AT many recent electrical functions one or more of the speakers has stressed the need for co-operation between different branches of the industry. We are indebted to the General Electric Company in collaboration with the "Daily Mail" for a splendid example of co-operation of a different kind—the "Pavilion of Light" at the Ideal Home Exhibition. As Mr. M. J. Railing, the joint managing director of the G.E.C., pointed out at a Press luncheon a few days ago, architects, decoration experts and electricians combined to produce this beautiful demonstration of the possibilities of modern lighting in the domestic sphere. Mr. RAILING expressed his conviction that although we should by all means keep ourselves informed of what other countries were doing, British electricians, architects and decorators working together could achieve results as good if not better than those of any other nationality. Certainly the "Pavilion of Light" is one of the most popular features at Olympia.

Mr. Morrison in Trouble.

MR. MORRISON is again in trouble with the gas interests on account of his enthusiastic references to electricity at the E.D.A. luncheon a fortnight ago. "The Gas World" rebukes Mr. Morrison for partisanship, but surely since the government of which he is a member is backing the national grid he, or any other Cabinet minister may legitimately urge the electrical industry to greater efforts to secure that increase of consumption without which the grid cannot be financially successful.

More Kite Fatalities.

Is there a limitative element in accidental deaths as well as in suicides? The inquiry is prompted by the electrocution of two more American boys by contact between their kite strings and a 2 500 V overhead transmission line. The coroner in this case recommended that high tension wires should be placed underground—even in America coroners are not always entirely practical in their outlook—but it would seem to be more to the point to endeavour to stop the sale of metallic kite strings. There are cheaper ways of preventing accidents of this kind than burying all transmission lines, but coroners are apt to be a trifle vague—like the majority of the population—where economics are concerned.

Sugar and Electricity.

AT first sight the crisis in the sugar planting industry does not appear to have much contact with electricity. Yet when one goes more deeply into the matter a connection is soon discoverable, so ubiquitous has the use of electricity become. Sugar mills of up-to-date pattern are electrically lighted, and some use electric power for driving their machinery. Even in England, although beet sugar is not comparable in national importance with the cane sugar production of the West Indies, British Guiana, Mauritius, Natal, Queensland and Fiji, some of the more progressive factories are electrified. That at Wellington, in Shropshire, uses 150 electric motors, and has its own power house equipped with two 1 250 kVA turbo-sets. The British sugar beet industry has still some years of the special Government subsidy before it, so that its real testing time has not yet come, and when the subsidy expires the world situation may have improved. The cane-growing countries are in much worse case and their position was placed before the Chancellor of the Exchequer last week by a deputation from the Sugar Federation of the British Empire in a manner which impressed even the far from impressionable Mr. Snowden. If the sugar industry in the West Indies, British Guiana and Mauritius—the most severely affected Empire producers—is allowed to go under as the result of the pressure of accumulated stocks in Cuba and elsewhere, the market for electrical equipment in these colonies will practically disappear, our dependence on foreign grown sugar will be increased and the Imperial Treasury is likely to be faced with demands for grants in aid to balance the budgets of the impoverished colonies.

American Accident Figures.

MR. C. R. BEARDSLEY, chairman of the Accident Prevention Committee of N.E.L.A., publishes in the N.E.L.A. Bulletin for March a statistical study of the trend of accidents in the electrical supply industry in the United States between 1923 and 1928. He reaches the conclusion that accident prevention "has not progressed within reasonable approach to the possibilities," although it is far superior to the results of 15 years ago. There is to-day an excessive spread between the best and worst concerns and between different geographical areas. "Single companies of which executives are known to be personally and continuously interested have obtained consistently fine results year after year far below national averages." Mr. Beardsley adds that known employees' accident costs in the American supply industry certainly reach nearly $7 000 000 a year and probably a good deal more, a sum which, as he justly observes, would "buy a lot of prevention." In 1928 the average fatality rate for all United States supply companies employing from 1 000 to 5 000 persons was 1·41 per 1 000 employees, and the number of days lost through accidents was 121 per 100 employees.

De Luxe Electric Gramophones.

THE electrically amplifying gramophone and the radio-gramophone are now superseded in interest by the "continuous" or automatic electric gramophone—which can be had either as a super-gramophone alone, or combined with radio. These instruments have been prominent at recent exhibitions, where models capable of playing 36 records consecutively, or—when fitted with a different type of "magazine"—both sides of eight records have been shown. The switchboard on one side of the cabinet carries a "brilliancy control"—for emphasising either high or low notes as desired—in addition to switches, volume control and a radio knob giving direct tuning to three stations. A remote control for the gramophone can be plugged into a socket in the cabinet, and needles are changed automatically after each side of a record is played. In another make of the new instrument selective playing of both sides of ten records is provided for. A wooden tablet, connected to the gramophone by a length of flex, carries a switch, volume control and 20 push buttons, so that any of the records can be heard at will; while pressing all the buttons ensures a long entertainment with no further trouble. These new gramophones are very delightful inventions; we hope, however, that flat dwellers who own them will use the volume control with discretion.

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DERBY POWER STATION EXTENSIONS.

Starting up of New 20 000 kW Turbo-alternator—Details of New Boiler House Equipment Installed—The Volcano Burner.

THE 1929 extensions to Derby Corporation power station were started up on Friday, March 28th, by Mr. J. H. Thomas, and new boiler equipment was brought into operation by Mr. T. P. Wilmshurst.

Speaking at a luncheon which followed the opening of the extensions, Mr. Thomas expressed his faith in electrical development, and though he had often received severe criticism at the hands of mine owners and miners themselves, he believed that extended electrical facilities would be for the ultimate good of the country.

Mr. Frank Hodges, of the Central Electricity Board, stated that during the past three years that body had sanctioned contracts to the amount of £13 000 000. With regard to the coal industry, he was of the opinion that pulverised fuel stations were making a contribution to the solution of the problems of the coal trade, as they used low-grade fuel which would otherwise remain in heaps at the pithead. It would, therefore, be preposterous if for any reason at all colliery owners put up the price to an artificial figure, thereby tending to raise the cost of current to the consumer.

The first extension to the original plant at Derby was made in 1896 and included a 1 000 H.P. Ferranti engine and alternator. Further extensions were decided upon with the opening of the Derby electric tramways system in 1904, and four direct current Parsons turbo-generators were installed to provide the supply. The single-phase alternating current system was also augmented with the addition of two more 1 000 H.P. Ferranti engines and alternators. Further steam raising plant, incorporating water tube boilers with mechanical chain grate stokers, was also installed.

Consequent upon the increasing demand for electrical energy, the Electricity Committee in 1907 advised the Council to acquire the adjacent property and erect an entirely new station. This was designed and carried out by Mr. T. P. Wilmshurst and his staff. The new station was officially opened on April 8th, 1908. The plant installed consisted of two 750 kW Parsons direct-current turbo-generators and three water tube boilers. Shortly afterwards a third generator was installed. In 1913 Mr. Wilmshurst presented a report showing the advantages that would be effected by installing larger plant operating at 6 600 V, three phase, 50 periods, for generation and distribution. The report was adopted and a 2 000 kW Parsons turbo-alternator, running at 3 000 r.p.m., was installed.

Two further sets of 2 000 kW capacity were installed, and in 1917, due to the demand in connection with the supply of war material, still further equipment was required and the Government directed to Derby a 4 000 kW Parsons turbo-alternator which was on order for a South African undertaking.

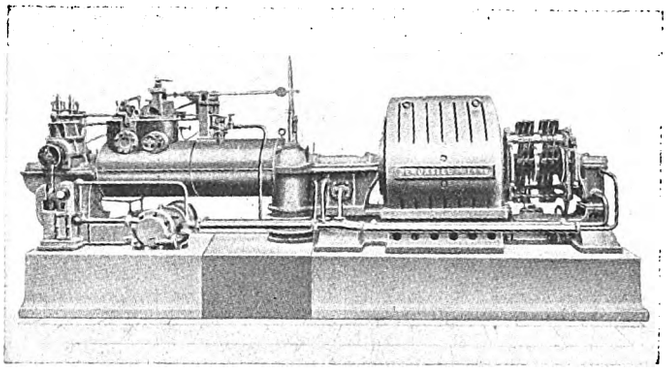

Fig. 1.—300 kW Parsons turbo-set installed at Derby in 1904.

It was decided in February, 1920, to instal a 7 500 kW set with its complement of boiler plant, and the completed station in 1922 consisted of 19 750 kW of Parsons turbo-generating sets and eleven B. and W. land type boilers, each having an evaporative capacity of 25 000 lb. per hour, operating at a pressure of 180 lb. and a final steam temperature of 550 deg. F.

In 1924 the demand necessitated the preparation of plans for further extension, work in connection with which was put in hand early in 1925. In this direction the Committee decided to adopt pulverised fuel firing for the boiler equipment, and became one of the first municipal undertakings to adopt this system of firing; it was further decided to increase the steam pressure and temperature from 180 lb. per square inch at 550 deg. F. to 325 lb. per square inch at 750 deg. F.

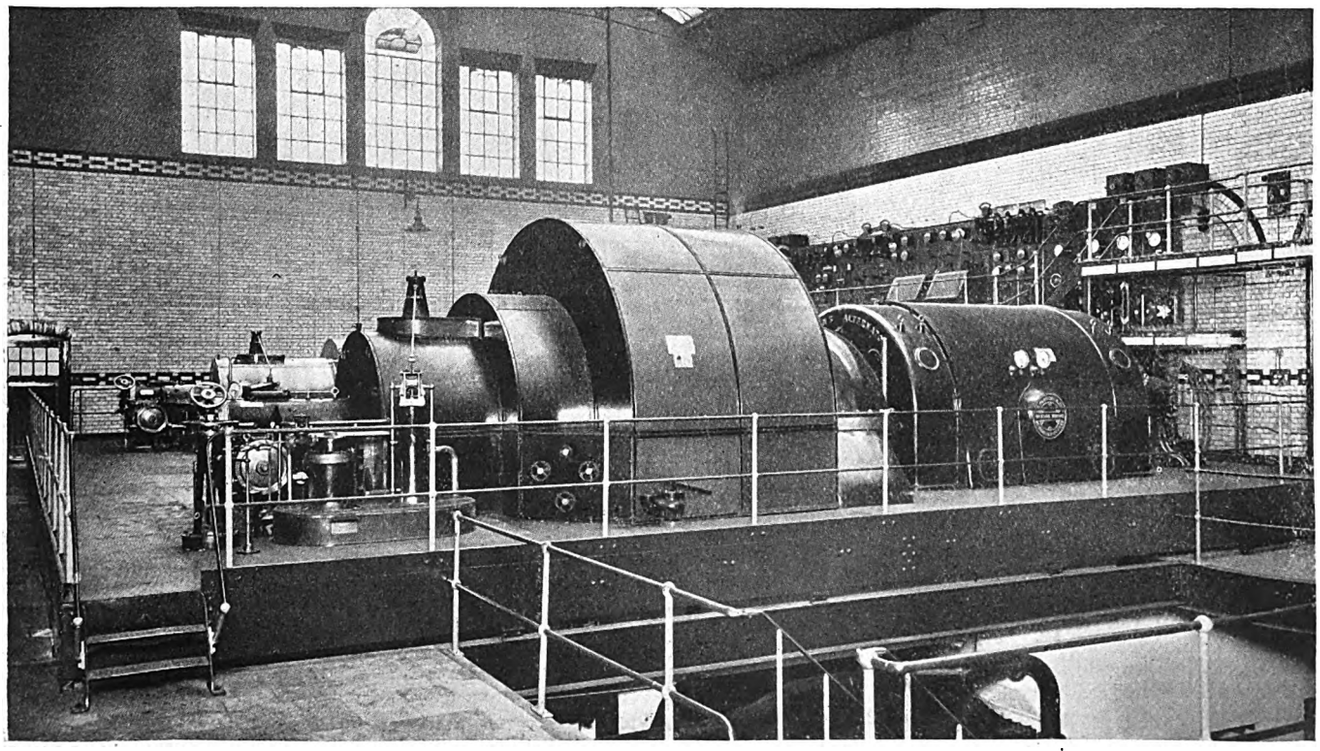

Fig 2.—20 000 kW Parsons turbo-generator installed at Derby in 1929. Compare this with the original 300 kW Parsons turbo-set installed a quarter of a century earlier. The two pictures are not on the same scale.

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For the purpose of housing the steam generating plant a new boiler house was erected on the site of the boiler house of the original generating station. Two B. and W. marine type boilers were installed, each having an evaporative capacity of 60 000/80 000 lb. per hour, with air cooled combustion

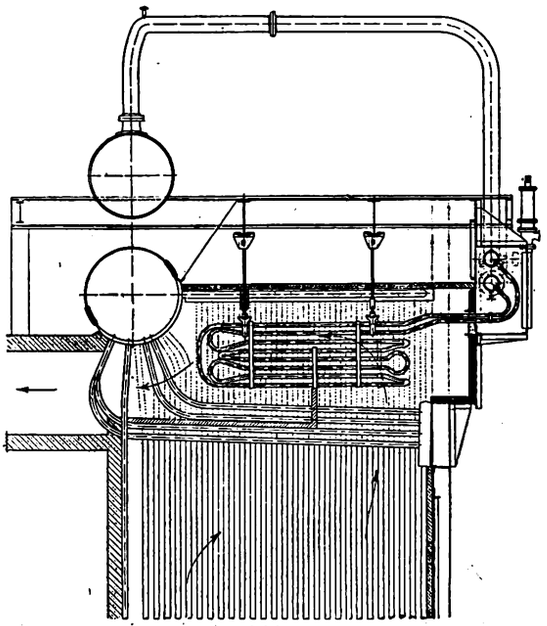

Fig. 3.—Arrangement of "M.L.S." superheater in combustion steam generator.

chambers and equipped for pulverised fuel firing on the Lopulco system. In conjunction with the boiler plant a 10 000 kW Parsons turbo-alternator was installed to operate at the higher steam pressure. To make room for this machine in the turbine room, the two 750 kW direct current machines erected in 1908 were removed. A third boiler was installed in the new pulverised fuel boiler house in 1927-28, similar in capacity to the first two units, but having water-cooled surface in the combustion chamber.

TABLE OF PROGRESS AT DERBY.

UNITS SOLD.

Year	Total Units Sold.	Pounds of Coal consumed per unit generated.	Year.	Total Units Sold.	Pounds of Coal consumed per unit generated.
1904–5	2 082 314	8·5	1917–18	16 986 137	3·92
1905–6	2 617 642	7·9	1918–19	19 342 501	3·75
1906–7	3 048 664	7·37	1919–20	17 238 777	3·62
1907–8	3 320 074	7·46	1920–21	19 435 989	3·07
1908–9	3 957 797	7·40	1921–22	15 878 346	3·02
1909–10	4 660 247	7·05	1922–23	19 135 376	2·77
1910–11	5 687 303	6·66	1923–24	22 671 210	2·4
1911–12	5 933 506	7·44	1924–25	25 126 816	2·22
1912–13	6 142 666	7·45	1925–26	28 905 976	2·19
1913–14	7 059 605	6·08	*1926–27	27 527 119	2·47
1914–15	7 941 609	5·12	1927–28	31 309 187	2·28
1915–16	9 309 201	4·40	1928–29	33 320 044	2·21
1916–17	12 161 151	4·16			

* Coal dispute.

NOTE :—The coal consumed from 1925 onwards is of low grade quality, having an approximate value of 9 000 B.T.U.'s per lb.

The Derby station is a selected station under the Central England Scheme and the work carried out under the latest extensions represents the completion of the first boiler house, fired entirely by pulverised fuel, as laid down in the original design and the replacing of two of the old type turbo-generators with a machine of increased capacity and of modern design.

It is a matter of interest to record that at the close of the year 1929, approximately 100 000 tons of coal had been pulverised and burned in this station since pulverised fuel was originally installed and the immediate benefit therefrom is represented by the fact that the coal cost of each kWh generated is now amongst the lowest obtaining in the country. This has led to a reduction in the tariff of charges to the consumer and an increase in the demand or consumption of electricity as will be seen from the table above showing the growth of the undertaking. Another notable feature of the extensions is that almost 50% of the material has actually been manufactured in Derby and is virtually a home product. This is particularly interesting as in this station it is possible to demonstrate in operation the products from the numerous engineering workshops situated in Derby, most of whom obtain their motive power from the plant which they have constructed. The whole of the work covered in the present extensions has been carried out to the plans and specification prepared by Mr. G. H. Lake, the borough electrical engineer.

On the site which formerly housed six Lancashire boilers yielding at maximum capacity 42 000 lb. of steam there now stands a plant with a capacity of 400 000 lb.

The two steam generators just completed are, it is claimed, different from any plant installed in this country, and have been designed to secure the utmost advantage which is to be gained from the conditions created by the combustion of pulverised fuel. In the early days of pulverised fuel, as no brick furnaces were able to withstand for any length of time the heat produced, the burners were designed with a view to retarding combustion by restricting the air supply, and so removing the intense flame from the vicinity of the refractory walls. There were actually two schools of thought, one maintaining the necessity of having brickwork in the combustion chamber, the other, that, as pulverised fuel is essentially self supporting owing to the more intimate mixture of the air with the finely ground particles of coal, it would be quite practicable to redesign the boiler unit and by surrounding the combustion zone with water tube walls effect the advantages such designs offered. Experience with experimental plants constructed for commercial operation led one to believe the latter theory to be correct and the two units installed at Derby are designed on these lines. This made possible higher furnace ratings and reduced combustion chamber volumes. The field for burner design was also widened and a burner was developed to induce considerable turbulence into the stream of coal and air entering the furnace, and by admitting the whole of the air for combustion through the burner a short and intense flame was produced.

Coal is brought to the site in electric lorries and discharged into a hopper in the boiler house annexe, a grid preventing oversized lumps entering the equipment. An enclosed bucket elevator raises the coal to the top of the boiler house and discharges it to a scraper conveyor feeding the raw coal bunker, which has a capacity of 325 tons, the elevator and conveyor being capable of handling 30 tons per hour. A stand-by elevator is now in course of construction.

The pulverising equipment has been increased by the installation of a third mill required to complete this section of the boiler house plant as originally planned. The new mill is of the Raymond 6-roller type similar to the earlier pulverisers and having the same capacity, namely, 6 tons of coal per hour. Two new pulverised fuel bunkers have been erected

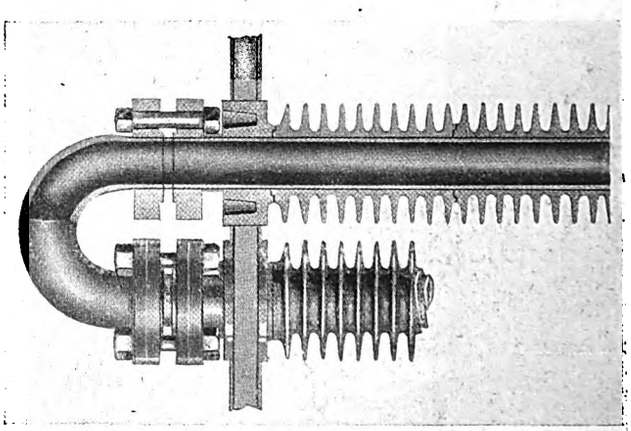

Fig. 4.—Foster Economiser—Construction of element and special joint.

to store fuel for the new boilers. These are of the same capacity and construction as the existing bunkers and are fed from the same screw conveyor. A second screw conveyor is now operating, and the arrangement of supply and discharge chutes is such that the three cyclones and the five pulverised fuel bunkers are completely interconnected through each conveyor. A new design of feeder is installed for the new boilers, having a capacity considerably greater than the older form, only two being required per boiler compared with six of the screw type feeders. The "Duplex" feeder is secured to the bottom of the pulverised fuel bunker and consists of

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two parallel flat plates separated by a casing to form an enclosed box. Both plates are provided with two holes, those in the lower disc being at right angles to the openings in the upper plate. Coal enters the box through the upper openings and is carried round by a revolving scraper until it passes out through the holes in the bottom plate which communicate with the throats of two Venturi tubes connected to the primary

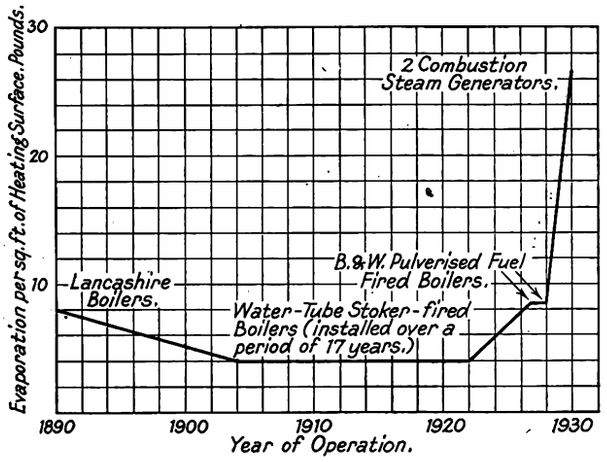

Fig. 5.—Evaporative efficiency of boiler heating surface at Derby Corporation power station.

air fan. The current of air flowing through the Venturi pipes entrains the coal and carries it down to the burner inlet and the Venturi tubes are given a lead downwards to minimise wear by reducing the number of bends in the burner piping. The feeder rotor is mounted on a vertical spindle which extends upwards into the bunker, and carries at its upper end a revolving agitator to prevent the coal arching over the feeder openings and to ensure a steady flow of fuel through the feeder.

Each boiler is equipped with one burner of "Volcano" pattern, built up from the floor of the ash pit and projecting into the combustion chamber through the water screen, the tubes of the latter being set to suit.

The steam generators are fitted with "M.L.S." convection superheaters, each of 1 580 sq. ft. heating surface. They each have 40 single pass multiple loop elements 95 ft. in length, made from solid cold drawn mild steel tubing, $1\frac{7}{8}$ in. outside diameter by 7 W.G. thick.

With regard to the electrical equipment installed it is interesting to note that the first Parsons generating plant put into operation at Derby, in the year 1904, consisted of three

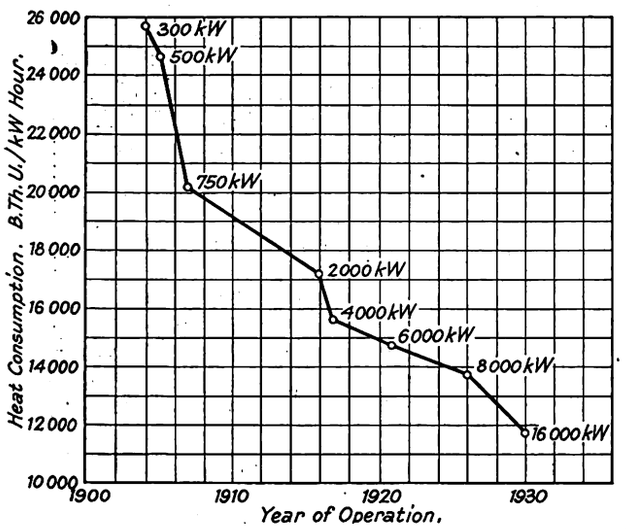

Fig. 6.—Heat consumption of the Full Street station.

d.c. turbo-generators rated for a normal load of 300 kW, but designed to give an overload to 350 kW for one hour without overheating. The speed of the sets was 3 000 r.p.m. The latest addition to the Derby generating plant, namely, the 20 000 kW turbo-alternator, gives a heat consumption per kWh of approximately 55% less than that of the 300 kW machine. The new set is designed to give an economical output of 16 000 kW and a maximum continuous output of 20 000 kW at a speed of 3 000 r.p.m. with a power factor of 0·8. The alternator generates three-phase current at 6 600 V and is of the revolving field and stationary armature type, excitation being provided by a direct-coupled exciter. Voltage regulation is carried out entirely in the exciter shunt field circuit. The turbine is of the single cylinder pure reaction type with Duplex exhaust. It is believed to be the largest single cylinder machine running at the speed of 3 000 r.p.m. ever supplied in this country. It is essentially a high efficiency machine, and by the use of the Duplex exhaust it is able to take full advantage of the vacuum of 29 in. with which it works. The blade heights vary from $1\frac{1}{2}$ in. at the inlet where the rotor is 22 in. diameter to 15 in. on a rotor diameter of 44 in. at the final exhaust. The condenser is of the surface two-flow type, having an interior cooling surface of 19 250 sq. ft., and comprising 6 130 tubes each $\frac{3}{4}$ in. external diameter. The quantity of cooling water circulated is 16 800 gallons per min.

The switchgear throughout is of the back-to-back double busbar arrangement, and it is accommodated in cellular type stone cubicles. Each cubicle contains the apparatus for one circuit equipment, arranged and mounted in separate cells formed by horizontal shelves and vertical barriers. Each cell is enclosed by a hinged steel door padlocked, and, where necessary, interlocked to ensure access with safety. In order

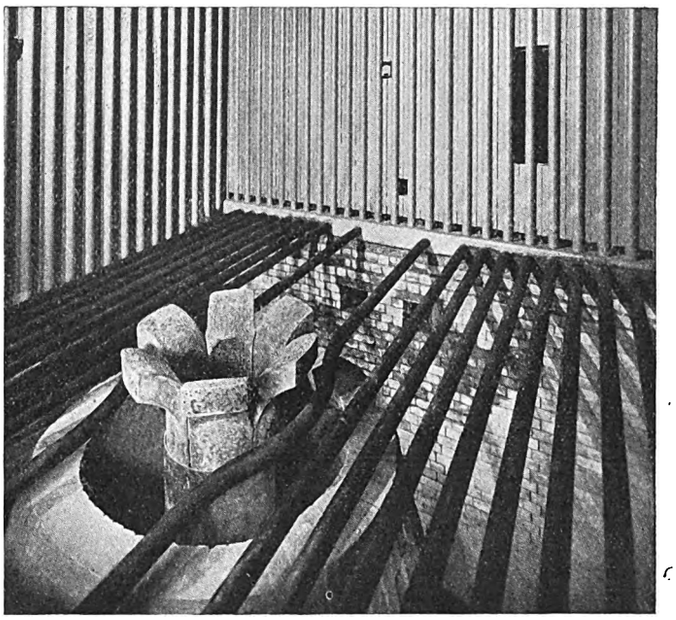

Fig. 7.—Interior of combustion steam generator, showing "Volcano" burner.

to maintain this isolation, the connections passing from one cell to another are taken through porcelain insulators cemented in the stone structure. All the oil circuit-breakers are solenoid operated by means of small barrel type control switches mounted, along with red and green indicating lamps, on the respective black enamelled slate panels of the control board. The control board is of the flat panel type, and is located in the turbine house and mounted on a gallery above the original bank of switchgear cubicles. All the isolators are mechanically operated and interlocked.

The list of contractors responsible for the work in these extensions were:—Derby Corporation Works Department (building and site); International Combustion, Ltd. (pulverised fuel plant); Combustion Steam Generator, Ltd. (steam generators); Superheater Co., Ltd. (superheaters); Eco Power, Ltd. (economisers); Underfeed Stoker Co., Ltd. (air preheaters); Davidson and Co., Ltd. (draught plant and dust collectors); Aiton and Co., Ltd. (pipework); J. Booth and Sons, Ltd. (structural steelwork); C. P. Parry and Co., Ltd. (soot blowers); C. A. Parsons and Co., Ltd. (turbo-generator and auxiliaries); British Thomson-Houston Co., Ltd. (switchgear); Hopkinson and Co., Ltd., Gummers, Ltd. (valves and fittings); Industrial Combustion Engineers, Ltd. (boiler instruments); Hobdell, Way and Co., Ltd. (heat insulation); F. C. Construction Co., Ltd. (turbine foundation reinforcement); G. F. Tomlinson (circulating water screening chamber); F. W. Brackett and Co., Ltd. (circulating water screen).

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MODERN BOILER HOUSE PRACTICE—II.*

Boilers Designed for High Pressures—Dual Generation—Superpressures—Pipes, Joints and Valves—The Future.

By F. JOHNSTONE TAYLOR.

IN the previous article under this heading the writer dealt with what may be regarded as standard boiler practice of the present day in large power stations using steam at or about 300 lb. and fired by coal of the usual grades deemed suitable for mechanical stokers.

As the very large units, irrespective of pressure, which now figure in the super stations are fired to a considerable extent by pulverised fuel, these are dealt with in the next article under that heading, the present one being devoted to the important considerations relating to what have been classified as high pressures, that is those at or around 500 lb., the special considerations relating to pressures of the 1 000 lb. order being outside of the scope of the present notes.

The whole matter of high pressure steam is much too vast to be dealt with in a short article. There have been a large number of excellent articles by well known experts on this subject during the last few years in the leading technical journals, both in this country and America and high pressure steam has been proved in practice to effect economies which are amply justified by the extra cost of such plant. The

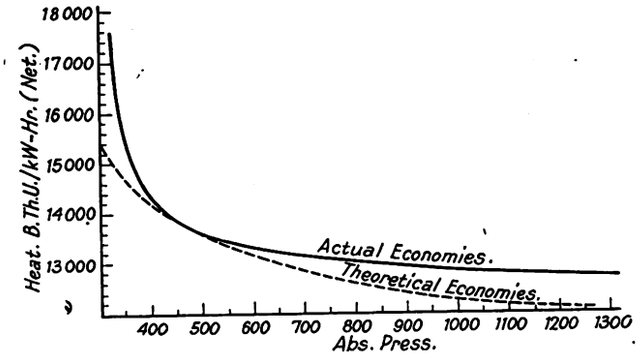

Fig. 1.—Actual and theoretical economy curves for H.P. steam.

high pressure turbine is a relatively simple proposition and is a sound commercial one in sizes which admit of the large range of expansion required for h.p. steam. This introduces what is perhaps the most attractive field for high pressures at the present moment, and that is additions to power stations where h.p. boilers supply steam to h.p. turbines, which in turn exhaust into others of standard type at the pressures usually associated with them, a practice which has been followed in several instances. At the same time it has, of course, been known for many years that h.p. steam is economical from the theoretical standpoint, and now that engineering progress has made it possible by the use of forged steel boiler drums, special material for turbine blading, etc., actual economies substantiate these theories, as the curve in Fig. 1 will show. Here the theoretical economy curve is constructed from the regenerative cycle thermal efficiencies of various stations modified by a fixed plant efficiency ratio of 60·8% in consideration of a boiler efficiency of 87%, a turbo-generator efficiency ratio of 77%, auxiliary usage 4·4%, and operating losses of 5%. Some high pressure actual economy points are below the dotted theoretical curve which shows the actual gains of some of the newer stations to be greater than the theoretical gains due to pressure alone. This improvement over the theoretical curve is caused by the installation of more heat saving equipment, better loading and other favourable local conditions.

Standard types of water tube boiler such as the Babcock, Yarrow, Thompson, Nesdrum, Woodeson, and others which have proved their merits in the past have been adopted without much difficulty to working at pressures around the 600 lb. limit, the Yarrow boiler illustrated in the previous article being actually designed for 600 lb. Principal interest centres in the manufacture of the drums. These are in some instances produced from an octagonal ingot, which, forged to a round billet is then bored to take a mandrel. Upon this mandrel it is expanded during a second forging operation to approximately finished diameter, while a third forging operation increases the length without increasing the diameter, but reducing the thickness of the shell. In the form shown in Fig. 2 the drum is bored to finished size and the ends are closed over a mandrel which leaves the openings for the manhole covers. Otherwise these boilers, as already shown, do not depart materially from the orthodox. Babcock boilers are doing duty at the Langebrugge (Belgium) station at 800 lb., and here again the essential features of the orthodox design remain, though the arrangement of tubes is somewhat different in that there are two banks, one five high, which is lowermost, and the other fifteen high, while between them and at right angles is the superheater element. But the boiler drums which are 42 in. dia., are built up of plates in the usual manner. They are 1⅝ in. thick, reinforced where the tubes enter by plates of the same thickness. The tubes are 3 in. dia. and 13 ft. long, while the superheater tubes which are expanded into cylindrical headers are 1½ in. dia. The 48 in. dia. steam and water drum is of forged seamless steel construction, and it provides a reserve water capacity making it easy to operate the boiler under all sets of conditions, such as in starting up and under variable loads, rendering it unnecessary to provide pumps having 100% reliability such as are requisite with the series type of h.p. boiler.

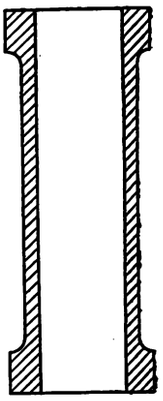

Fig. 2.—H.P. boiler drum.

Fig. 3 shows the principal features of the Babcock boiler as designed for high pressures, but other constructions will become apparent in the next article as pulverised fuel is now intimately associated with h.p. working. The feed from the economiser passes directly into the boiler, which makes it necessary to build the economiser for a somewhat higher pressure than the boiler. It is formed of seamless steel tubes expanded into forged steel boxes. These boxes are spaced

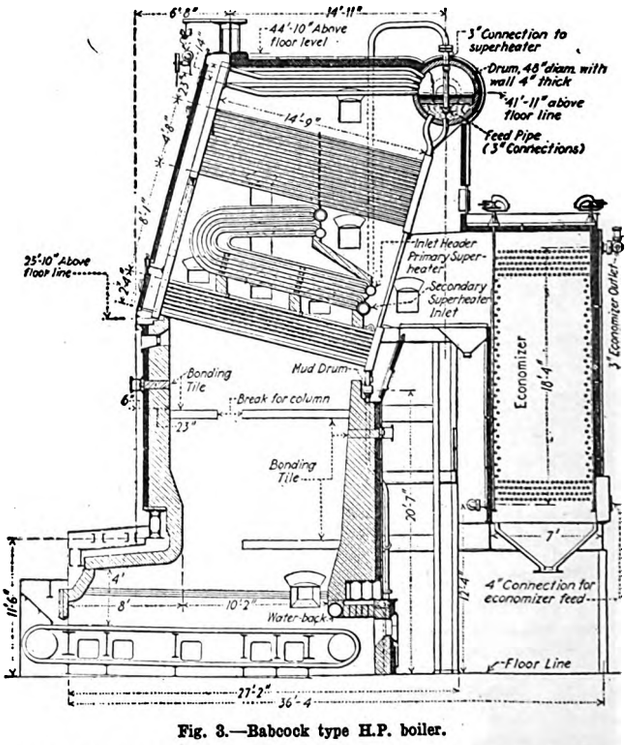

Fig. 3.—Babcock type H.P. boiler.

apart to allow the removal and replacement of the economiser tubes from between the boxes with tubes at an angle which allows the tubes to be removed and replaced with a relatively narrow aisle width. The ends of the horizontal circulating tubes of the boiler are bent so that they enter the drum in circumferential lines which are twice as far apart as the

* The first article of this series was published in our issue of March 7th, and the third will appear in THE ELECTRICIAN to be dated May 2nd.

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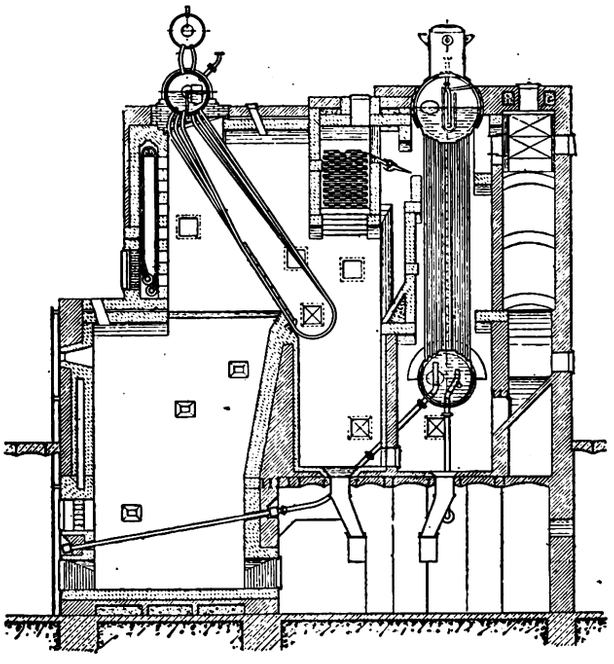

Fig. 4.—Sulzer H.P. boiler (dual generation).

distance between the horizontal circulating tubes where they enter the headers. There are two circulating tubes running from the top of each uptake header to the steam and water drum.

The essential features of a dual generation boiler are seen in Fig. 4. That is to say, there is a h.p. and l.p. side, the two parts being virtually distinct, except for the fact that the l.p. side functions as a feed heater to the h.p. side—on the left—which it will also be seen has a radiant heat superheater built into the furnace wall, while that of the l.p. side located between the two is of the usual type, and the l.p. boiler itself on the right will be seen to follow Sulzer's standard practice which received notice in the previous article. There is something to be said for this special construction, especially when very high pressures are used. The less costly l.p. section is quite adequate to

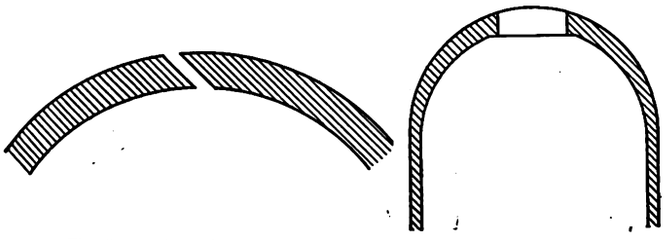

Fig. 5, *a* (left) and *b* (right).—Construction of H.P. boiler drums.

abstract the heat from the partially spent flue gases, and the arrangement thus avoids the installation of costly h.p. heating surface in the region of low gas temperatures. The l.p. section can provide these large surfaces, leaving the other section the duty of intensive heat absorption in the high temperature zone. The l.p. boiler, too, provides distilled water for the h.p. end. The forgings used for the h.p. drums are produced by Krupps in the form of hollow forgings as already indicated, but the method used by the German firm of Thyssen is worthy of mention, as by their method the drums are formed, relatively cheaply, from a plate with a single longitudinal welded joint. After careful heat treatment and rigid inspection, the edges of the plates are planed and then passed through bending rolls giving a scarf lap joint to be welded of the form shown in Fig. 5*a*. The welding is done in a special machine, after which the shell receives a final rolling to shape. The ends are then closed to the form shown in Fig. 5*b*, and the thickening around the centre should be noted. Thereafter under a special method of testing, the drums are actually stressed up to the elastic limit after which a final annealing is claimed to leave them entirely free from any strain or local hardness.

The radiant type of superheater mentioned above may also be considered as a feature of the modern high pressure boiler. Originating about ten years ago in the form of cast iron blocks shrunk on steel tubes, which in turn gave way to cast steel and later to forged steel elements, further improvements have now been made which include a change in both the form and spacing of the elements. For instance, in the Foster Wheeler type which is in extensive use in America, round tubes 2 in. in diameter, widely spaced both from each other and from the furnace wall behind them have taken the place of the flat-faced elements of previous designs and are stated to be eminently satisfactory. The tube construction is lighter and requires much less supporting steel, first because it is light, and secondly because it requires no reinforcement. Round tube elements placed 8 in. from the furnace wall and spaced on wide centres, receive heat on all sides by radiation, in addition to quite an appreciable amount received by convection. The entire tube area, therefore, is available for heat transfer, with the net result that a greater amount of heat can be transmitted per unit length of element installed, or per unit area of wall space occupied. It may be regarded as altogether a good arrangement.

Fig. 6 shows the type of boiler built by the German Siemens-Schuckert Co. to operate on the Benson system. The Benson system, which is perhaps the most logical for producing steam at 1 000 lb. and upwards, functions on the " critical condition " principle in that the steam is generated at the critical condition (3 000 lb. and 705 deg. F.) where the specific volume of saturated steam equals that of water and the latent heat of evaporation is zero. Under these conditions there is no steam and water mixture, so that boiler drums for the separation of steam and return tubes for water circulation are unnecessary. In the arrangement shown there is a water tube boiler of orthodox type on top, while the three banks of tubes below and at right angles to the upper ones constitute the Benson element, and they are small bore tubes having the feed entering the lowermost bank at high temperature. Here, being heated to temperature somewhat above the critical, it passes into highly-superheated steam at 3 200 lb. and enters the upper bank which functions as a superheater. Thence to a throttle valve which reduces the pressure to about 1 500 lb., the steam enters the middle bank where it is re-superheated to about 770 deg. F.

Typical American practice is shown in Fig. 7, which depicts a 1 400 lb. pressure unit by the Combustion Co., at the North-

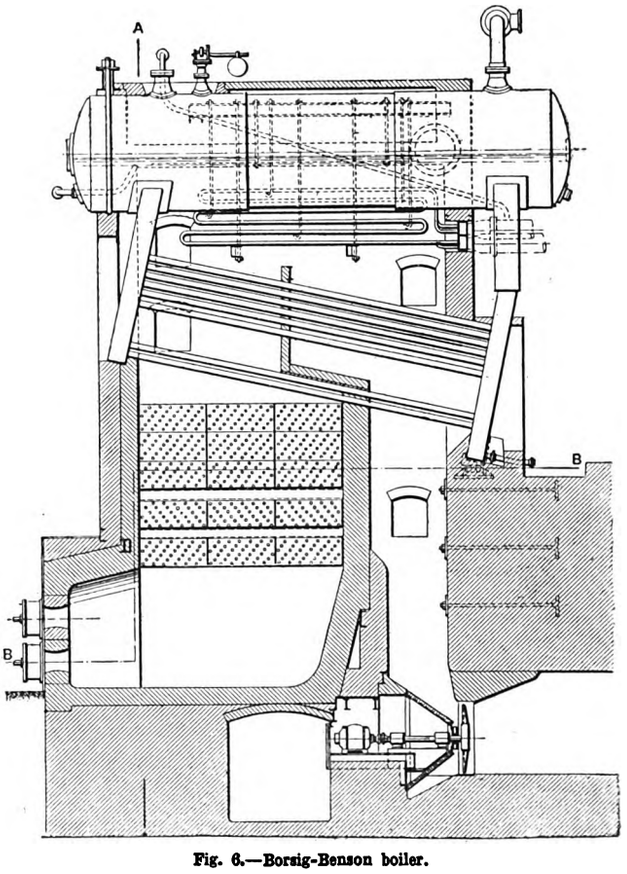

Fig. 6.—Borsig-Benson boiler.

East Station, Kansas City. They are, it will be observed, fired by pulverised fuel.

The use of high pressure has brought with it the necessity for pipes and pipe joints and valves to suit the conditions.

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Expansion bends, for instance. The orthodox types prove unsatisfactory under h.p. conditions on account of the relative weakness of the outer wall. This has brought into general use the corrugated bend formed from solid drawn soft steel tube, which is strong, flexible, and capable of withstanding vibration when necessary.

Butt Welding Pipes.

In respect of joints, there is something to be said for butt welding pipes whenever possible, end-on in position. Such pipes require to be kept in true alignment by means of roller-guides in order to prevent cross stresses coming upon the butt-welded joints which, as an additional precaution, can have collars welded over the butt weld. Flange joints as a rule have welded flanges, as rivetted ones are unsatisfactory with high pressures and the caulking is often ineffective under such conditions. The welding is done by the carbon arc method and it should be continuous right through the flange,

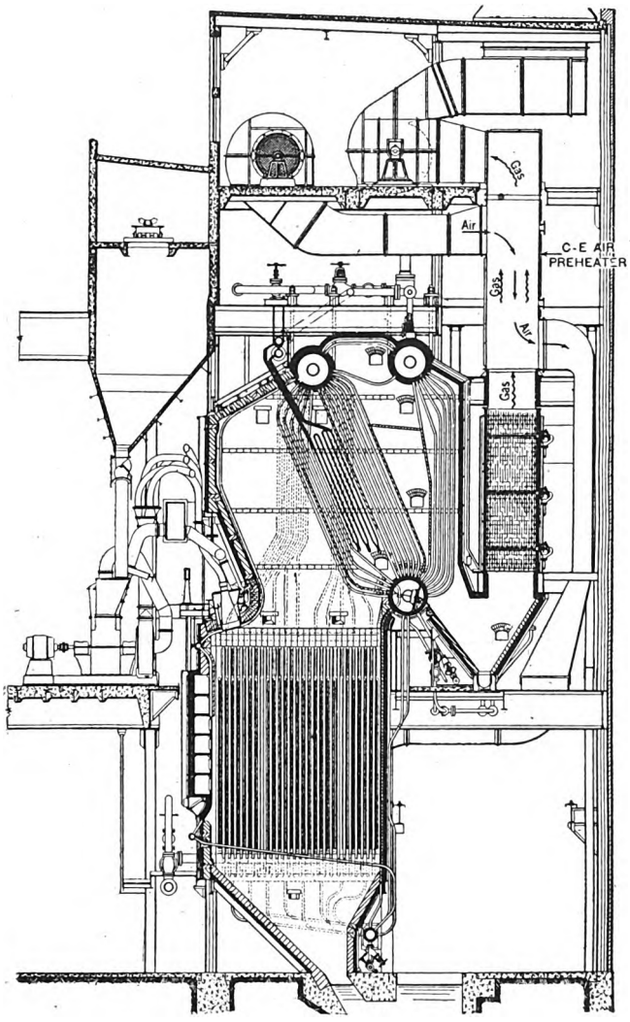

Fig. 7.—American type H.P. boiler.

back to front, with a generous fillet worked up at the back. Heavy flanges are required to preclude any tendency to springing, and the joints are made on a raised face within the bolt holes. As to jointing material, corrugated metal rings with a thin wash of cement have proved satisfactory, while the bolts should be of 20-35-ton steel.

The pipe joints at the previously mentioned Langebrugge station are of the form shown in Fig. 8. The flanges are both faced off square, and between then is inserted a disc of mild steel about ¼ in. thick, machined all over and bored to the pipe diameter, while there is a series of vee-shaped concentric ridges on the faces. It is these ridges on the steel ring which form the actual joint, while the bolt holes are reamed in position for the accommodation of fitted bolts as shown.

For relatively small solid-drawn steel tubes, the joint shown in Fig. 9 is well suited. Here the ends of the pipe are screwed with a vanishing thread and the pipe ends are expanded into the flanges after being screwed into position. The end of the pipe thread at the flange is then sealed by welding, a metal-to-metal joint being made on the flange faces within the bolt circle. At the periphery of the flange there is a clearance, but it is very small—about 2/1 000 in. in fact—but it enables any bending of the flange to be detected.

Valves are perhaps rather outside of the scope of these notes but for high pressure special considerations enter into the design which demand such refinements as forged steel bodies and seats of material which will stand up to the conditions which are very severe, the slightest leakage having a drastic cutting effect, but several good designs are now listed by the leading valve makers.

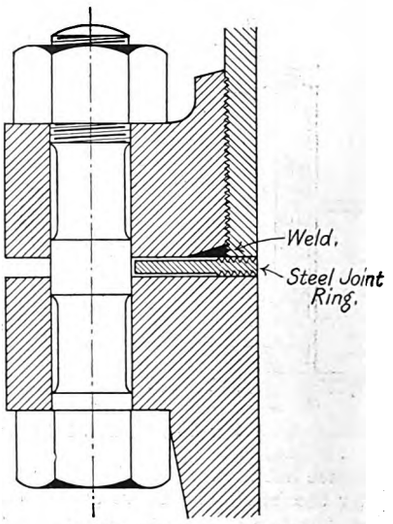

Fig. 8.—H.P. flange pipe joint.

It is altogether impossible to state in a general way what prospects the future holds for the use of steam at pressure much over 600 lb. One has to study the results at those stations now operating under such conditions and then to take local considerations into account. Perhaps the most comprehensive data available at the moment is that due to Mr. Moultrop concerning the American Edgar station. According to "The Engineer" of May 20th, 1927, results at the Langebrugge station with 800 lb. show an average fue economy of about 35% as compared with results from steam at lower pressure and temperature used in the same station. Information concerning the Lakeside station, Milwaukee, appears in "Engineering" of January 6th, 1928, while the results at the previously mentioned Edgar station are commented upon at some length in a leading article in "The Engineer" of April 19th, 1929. According to Mr. Moultrop, as our contemporary points out, the use of steam at 1 200 lb. pressure is entirely practical for power station work, and it does actually give the efficiencies expected. This last point is particularly reassuring, for were the benefits illusory the practicability becomes of academic interest only. The opinions of users of high pressure steam are worth more than all the calculations in the world as to what is or is not to be gained by increasing pressures, and these opinions, so far as we know, all bear out the view that the advantages outweigh the difficulties. From the figures given by Mr. Moultrop it would appear that the 350 lb. section of the Edgar station is running with a thermal efficiency of about 23·8 per cent. This is exceedingly good and quite high enough to tempt many engineers to rest satisfied with the pressure.

When the complete high pressure equipment has been installed, so that all the 350 lb. turbines are driven by the

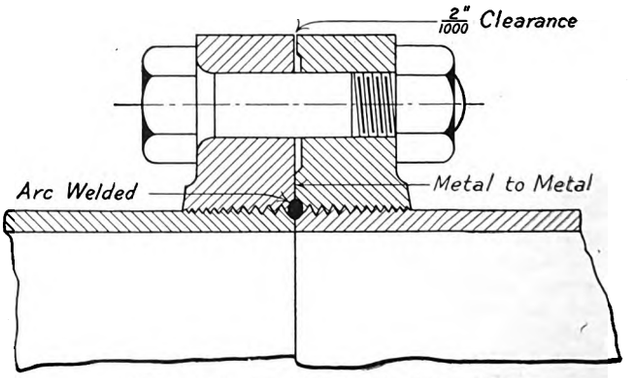

Fig. 9 H.P. pipe joint with screwed flanges.

exhaust of 1 200 lb. sets, a thermal efficiency of practically 27 per cent. is counted upon, the fuel consumption being 0·9 lb. of 14 050 B.Th.U. coal per kilowatt-hour. For an efficiency of this order one can forgive a few development troubles, even had they been of much more consequence than those experienced at Edgar.

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MODERNISATION OF LOTS ROAD.

Replacement of Original Turbo-sets and Boiler Plant—Great Increase in Capacity—£1 000 000 Five Years' Programme Nearing Completion.

LOTS Road power house was completed in 1905 to provide current for the operation of the Metropolitan District Railway and the three tubes that now form the London Electric Railway; when inaugurated it represented the most modern installation of its kind in the world, the 6 000 kW turbo-alternators being the largest that had then been built. The power house has now to supply not only the Metropolitan District and the London Electric Railways, but also the Central London and City and South London Railways, and the London United Tramways. In 1908 the total car mileage on

New control room, Lots Road.

railways supplied by Lots Road power house was 32 500 000; the estimated figure for 1930 is 96 250 000, an increase of about 196%.

As new demands were made through the opening of tube extensions and increases in the speed and frequency of train services, the capacity was augmented by the addition of new machinery, but in 1925 it was recognised that further additional demands could not be met adequately except by the replacement of practically the whole of the original plant.

On the completion of the present programme the plant will comprise nine 15 000 kW turbo-alternators, with a station load of 105 000 kW, two sets being stand-bys. A further installation of two 15 000 kW sets is contemplated. By the autumn the output will be 95 000 kW. Increase in capacity has been accompanied by a commensurate increase in efficiency. The task of reconstruction has been in progress for five years and will be completed next year, at a cost of not less than £1 000 000.

The original equipment comprised eight turbo-alternators of 6 000 kW capacity each. Three extra sets, each of 15 000 kW, were installed between 1915 and 1925. Since then three of the old 6 000 kW sets have been removed and replaced by three 15 000 kW machines. A further 15 000 kW set is now in course of erection, displacing a fourth 6 000 kW set. The two latest large sets are working at a higher steam pressure (275 lb. per sq. in.) and temperature (650 deg. F.). The other four large sets are running under the old steam conditions (185 lb., 500 deg. F.). With the exception of the set erected in 1915, all are capable of conversion to the higher steam pressure, with a minimum of alteration.

New Control Room.

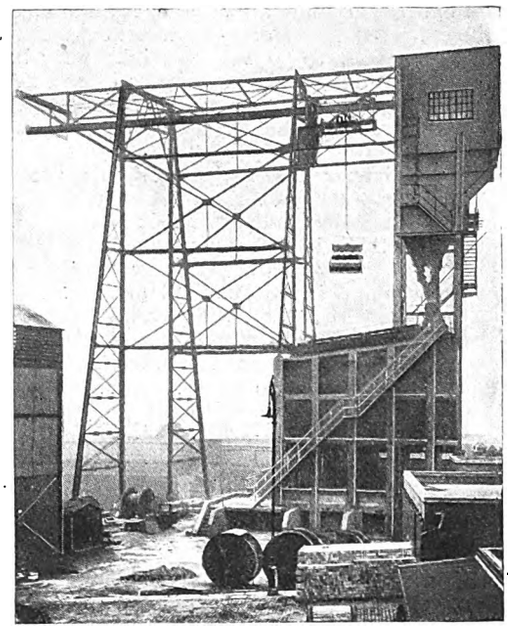
The whole of the h.t. switchgear is being replaced, the new switches having a rupturing capacity of 750 000 kVA. Over half of this work has been completed, including the provision of more ample busbars, together with a ring main bus. Generator reactors are being installed.

An entirely new h.t. control board has been erected in a new control room at the eastern end of the engine room building, and the existing control board on the gallery will be dismantled. The d.c. auxiliary board has also been transferred to the new control room and is in service in that position. The whole of the electrical system of the power house and feeders will shortly be controlled from the new control room. An illuminated diagram will be provided, giving automatic indication as to which feeders supplying substations are alive. A complete new telephone equipment will shortly be installed, giving direct communication to all substations and traffic controllers.

The old auxiliary equipment, operated at 220 V a.c., but this is being changed over to 440 V a.c., and the auxiliaries on the two latest turbo-alternators, are working at the higher voltage. The new 440 V busbars are housed in the basement, and the main switches are all remote controlled. The new "house" transformers are being erected on the engine room floor, while the 440 V "unit" transformers and the generator reactors are housed on a new floor between the basement and the engine room floor.

The original equipment consisted of 64 Babcock and Wilcox land-type boilers, each of a capacity of 16 000 lb. of steam per hour at a pressure of 200 lb. and a temperature of 500 deg. F. Eight new boilers, of the C.T.M. type, made by the same firm, have been installed, four in 1922 and four in 1925. All these have a capacity of 39 000 lb. per hour, at 290 lb. pressure and 700 deg. F. To facilitate the general reconstruction without reducing the output from the station, four new C.T.M. boilers have been erected outside the western end of the main boiler house. These have a capacity of 50 000 lb. per hour each at the higher pressure and temperature, and have been in service since 1927.

So far 16 of the old boilers have been removed and replaced by eight new ones of 50 000 lb. capacity, working under the higher steam conditions, and supplying the two latest large turbines. The remaining boilers are at present working on the low-pressure steam system. Eight further large boilers (of 50 000 lb. capacity) are at present in course of erection, replacing the second batch of 16 old boilers which have been removed. All the new boilers are equipped with balanced draught equipment, the 50 000 lb. boilers having compartment-type stokers. Each boiler has a superposed steel economiser. The thermal efficiency of the installation, as it is to-day, is 16¼%, that of the new plant being 22%.



Ash handling plant, Lots Road.

The steelwork supporting the coal bunkers is at present being overhauled and renewed where necessary. At the same time two partitions are being built in the large bunker between the four original brick stacks. This is intended to facilitate the operation of the station.

The old system of handling ashes by means of skips has been replaced by a water-sluicing system, discharging into a sump built in the yard at the west end of the power house. From this sump ashes are grabbed by a telpher crane, and can be either passed through screens for sizing, or discharged into barges in the Chelsea Creek. The water supply has been improved and new lightning conductors have been installed on the four brick chimney stacks.

A new artesian well has been sunk in the yard at the east end of the power house, and is fitted with an electrically-driven centrifugal pump.

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PRICE OF ELECTRICITY.*

Load Factor—Lighting, Heating, Cooking and Power Loads—Analysis of Charges for an All-Electric House.

THE subdivision of the cost of electricity supply under the two main headings of Standing Charges and Running Costs is generally well understood by those who have the administration of such undertakings. The equity of the principle that every class of load should bear its just proportion of the Standing Charges is also accepted, but the question which must present itself to the councillor or director who has to keep a business eye on the administration is: "Where is the equity in these varying charges?"

Let it be supposed that an authorised undertaking is buying electricity in bulk upon the two-part tariff of 10s. per kW of maximum demand per month, plus 0·4d. per unit. On account of the seasonal differences in loads the monthly kW charge of 10s. will not work out in practice at the equivalent of £6 per annum, but about 20% less than this, say, £4 16s. Let us call the bulk price £5 per annum per kW of maximum demand, plus 0·4d. per unit.

There are 1 200 pence in £5, so that if a kW of load is used for 1 200 hours per annum, it will consume 1 200 units and the cost of those units will be (after adding on the running cost of 0·4d. per unit) 1·4d. per unit. There are 8 760 hours in a year, and taking that number as being 100 %, 1 200 hours use per annum only represents about 13½%. This percentage is technically spoken of as the load factor, and it is the principal factor in determining the cost and value of electricity.

Character of the Lighting Load.

The hours during which full artificial lighting is required in private houses, hotels, etc., in this country are necessarily short; they only amount to about 1 000 hours per annum since Summer Time has been introduced. In the case of shops and offices, however, due to compulsory closing hours, early closing days and no Sunday or holiday use, the hours of lighting are only about 200 per annum. These hours may be extended by advertisement use after closing hours, and in an endeavour to improve the inherently bad load factor of shop lighting, supply authorities often offer shopkeepers an attractive lower rate for such after hour use. All night public lighting runs to about 4 000 hours use per annum, and can greatly improve overall lighting load factors, but very little of such lighting is done in the smaller provincial towns.

The peak demands of all these lighting loads are bound to be simultaneous, and the result is that short and long hour lighting, taken in the aggregate only, establishes a load factor of about 10 per cent. per annum. Private houses, hotels, restaurants, etc., with public lamps, are long hour users with a load factor of about 15% overall, whilst shops and offices have a lighting load factor of only about 5 per cent. Appropriate costs at the above-named bulk tariff are as follows:—

Shops and offices	3·15d. per unit
Private houses, hotels, etc.	1·32d. „ „
Aggregate of all lighting	1·77d. „ „

These loads are not dependent upon hours of darkness, and since they are mainly used during the day-time they are spoken of as "day loads." They are not, however, entirely confined to daylight hours, and the power and heating loads are bound partially to overlap the lighting peak in the darker winter months, between about 4 p.m. and 6 p.m. Hence the advantage of a monthly kilowatt charge for bulk supply.

The aggregate overall load factor of these three classes of load is at present about 30%, and is tending to improve, particularly where the cooking load is being developed. At 30% the bulk cost is 0·86d. per unit.

Analysing these loads further we find that industrial power loads, working 46 hours per week, put up a load factor of about 20%, equal to bulk cost of 1·08d. per unit. Occasional power loads such as a chaff-cutter, circular saw, sausage-making machine, etc., have a much lower load factor than this, and therefore, a higher cost per unit. Hence the principle of quoting flat rates for small power purposes, beginning at a fairly high price for the first few units per quarter, and diminishing as consumption increases.

Since heating is only a general need in this country during the winter months, and then only for our active waking hours, it cannot have a load factor higher than about 30% if in regular daily use. Heating, however, has its complementary summer loads, such as refrigerating and ice-making, both of which are rapidly developing following recent food legislation. Electric irons are also in use all the year round, as well as certain other heat applications, apart from cooking, such as wash-boilers. The combination of heating and refrigerating, therefore, establishes a load factor of about 30% (0·86d. per unit), but this is tending to improve with the development of low temperature heating under thermostatic control, and may be expected to increase to 40% as a combined load factor (0·74d. per unit).

This is in a class of its own since it is an all-the-year-round load with such attractive features as night baking, in a large way for bakers and confectioners. Where an existing bulk supply peak now occurs between 4 and 6 p.m. in the winter, it is certain that the cooking load is scarcely represented in that peak at all. Practical tests have shown that not more than one cooker in nine is in full use at any one time and probably not more than one in thirty is represented in the peak load of a general distribution network.

The individual load factor of a cooker is not more than about 5%, but the overall load factor of all the cooking loads is likely soon to be not less than 50% (bulk cost 0·67d. per unit).

Water heating by thermal storage with thermostatic control can be definitely excluded from any desired local or system peak. It can therefore be utilised by the Supply Authority entirely for the improvement of load factor. On this account it can be rated at its base unit cost only, viz., 0·4d. per unit.

Tabulating the above named figures we have the base bulk costs as follows:—

	d. per unit.
Lighting	1·77
L.T. power supply	1·08
Heating and refrigerating	0·74
Cooking	0·67
Hot water	0·40

All the above items are represented in a certain definite ratio in the requirements of an all-electric house. These may be set out as follows:—

Units per annum.		£	s.	d.
When lighting now uses ..	200 bulk cost at 1·77d.	1	9	6
Power will call for	150 „ „ „ 1·08d.	0	13	6
Heat and refrigerating call for	6 000 „ „ „ 0·74d.	18	10	0
Cooking will call for ..	1 650 „ „ „ 0·67d.	4	12	1
Hot water will call for ..	4 000 „ „ „ 0·40d.	6	13	4
Total ..	12 000 av. „ „ 0·64d. =	31	18	5

At present retail charges (say 6d. for lighting and 2d. for other purposes) the distribution authority is only selling 400 units per annum to this consumer at an average price of 4d. per unit (including 1¼d. bulk cost):

Local charges therefore require 400 at 2¾d.	4	11	8
Add also 20 per cent. to above bulk cost	6	7	8
Charge to consumer, covering all charges	42	17	9

Average price per unit retail, equals 0·85d.

Futility of Uneconomic Tariffs.

From the foregoing it may be noted that all local charges (including profit) are met, whilst the new business represents an accession to local charges, which will be more than adequate to meet additional local costs for this already existing consumer's larger supply. The price at which such a consumer is able to buy under the above case in an economic one, having regard to the cost of less convenient but competitive alternative means. The example emphasises the futility of offering high uneconomic tariffs if this class of business is to be secured.

The example represents the electrical requirements of a four or five bedroomed house. Assuming that it has a rateable value of £27 10s., then an appropriate tariff for its electricity supply would be a fixed quarterly charge of 5 per cent. of the rateable value (£1 7s. 6d.), plus ¾d. per unit. The yield would be approximately £43 per annum for 12 000 units.

This is the class of business which offers the greatest scope for supply, and a most welcome service to the consumer.

R. W. K.

* An explanatory memorandum distributed by the North Wales Power Company, Ltd., to a conference of electricity supply interests in North Wales convened by the Joint Electricity Authority for the North Wales and South Cheshire Electricity District at Llandudno on March 21st.

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PARIS AGRICULTURAL MACHINERY SHOW.*

Electric Ploughs and Light Cultivating Gear—Farm Pumps—Cheap Electric Washing Machines—Success of French Electrical Agricultural Machinery Makers.

By THEODORE RICH.

OWING to a material extent to the co-operative instincts of many French farmers—instincts only too often absent at home to the extent that some big-wigs of the British farming world have been heard to sneer at the very idea—it has been possible to make material progress regarding electric ploughing. Where fields are comparatively large and a convenient point can be found at which a permanent h.t. line can be tapped at 11 to 16 kV, and if necessary connected by a light h.t. field branch, a 500 metre cable, at comparatively low voltage, can be used to connect the travelling transformer station used to the tractors, giving at that radius facilities for the ploughing of quite a material area. If a group of farmers will agree to the order in which the land of each of them will be ploughed to get the best results, then a contractor or co-operative group can bring his tackle on to the spot and have so many acres in sight to cultivate with a minimum of road movement of the gear. Ploughing is sometimes done at night to make up for delays due to bad weather. To-day in many walks of life transport is a material factor.

The earliest electric plough sets were rigged up by taking the boilers and engines off two steam ploughing engines and replacing them with motors. With such gear the pull which can be put on the wire rope hauling the tip-over plough is limited by the friction of the wheels of the hauling tackle on to the ground. At one metre per second one H.P. corresponds to about 165 lb. pull, and taking a co-efficient of friction of ·4 one has to have normally about 420 lb. weight per H.P. to prevent slipping, that is to say over half of the weight of the gear is required to make it stand up to its work. Where steam haulage gear is used the weight of the boiler and engine required to give the power required is usually sufficient to give the necessary adhesion; an electric motor with cable drum is not nearly so heavy as a steam tractor, and the problem has been to develop a hauling gear which will give the necessary pull without slipping sideways, while remaining much lighter in weight than steam tackle.

M. Estrade has developed a plough of 4½ tons weight which can give the same effort as one of the normal steam type weighing 14 tons, the motor for the former being 45 H.P. (with a momentary overload of 60 to 80%). He gets over the slipping difficulty by making the flanges of the wheels on the hauling gear side with a radial plate ring which will dig into the ground; these flanges are shrouded for transport. This gear is made by the Société Electro-Motoculture of Carcassonne (Fig. 4). A lever with a guide pulley at one end and a haulage drum at the pivoted end, something like a lifting crane, works vertically on an arc of a circle, the rope going over the top, the centre being connected by crank gear to a piston working against a "bottle" of nitrogen gas under high pressure. The heavier the pull the greater the pull down on the lever, and the greater the plate flanged wheels eat into the ground and form an anchorage so that a comparatively light set of hauling gear can exert a heavy pull without slipping sideways.

The Estrade gear is worked with two winches on the Fowler system backwards and forwards. There are eight of these sets at regular work in France.

One French company, "Treuils Pan," has made a speciality of heavy portable haulage winches and special land anchors and tackle for resulting draw-pulls up to 60 tons, the winches being driven either by petrol or electric motor or by belt from a portable electric motor, petrol tractor or other form of power.

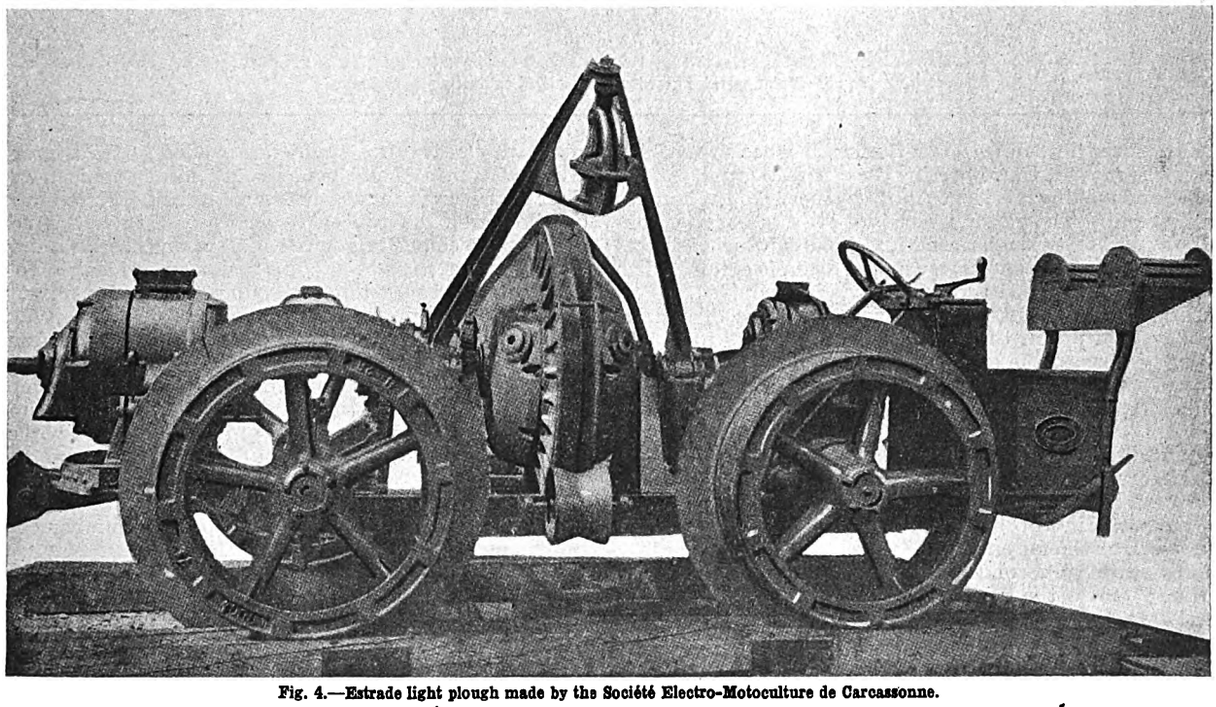

Fig. 4.—Estrade light plough made by the Société Electro-Motoculture de Carcassonne.

The land anchor consists of a number of flat plates with T crosspieces and steel pins driven in. With this gear trees and stumps can be hauled out, mole land drainage gear used and various forms of haulage heavy cultivation carried out.

There has been in France a certain amount of ploughing done on the Howard one-"engine" system with pulleys and anchors in the course of the fields, some of the ploughs used being quite small, as low as 6 H.P.; a difficulty is the amount of labour required in fixing the anchors, guide pulleys and ropes.

A material part of the land in France is cultivated in small holdings, and a great demand has arisen for miniature farming gear of all kinds within the reach of the purse and operating capacity of the small-holder. A small plough and cultivator was brought out a year or so back for a run up to about 50 yards, operated by a hand winch on the plough itself and a light wire rope, a sort of spade forming the anchor, so that various forms of ploughing, harrowing and scarifying could be carried out without animals or motor tractor.

A new development is an electric motor operated gear for hauling light cultivating tools (Fig. 5); it is designed to plough, cultivate ridge, harrow and clean land. An electric motor is mounted on an angle steel frame something like a tinker's barrow with one of the sides open. The motor and

* The first part of this article appeared in our issue of March 28th.

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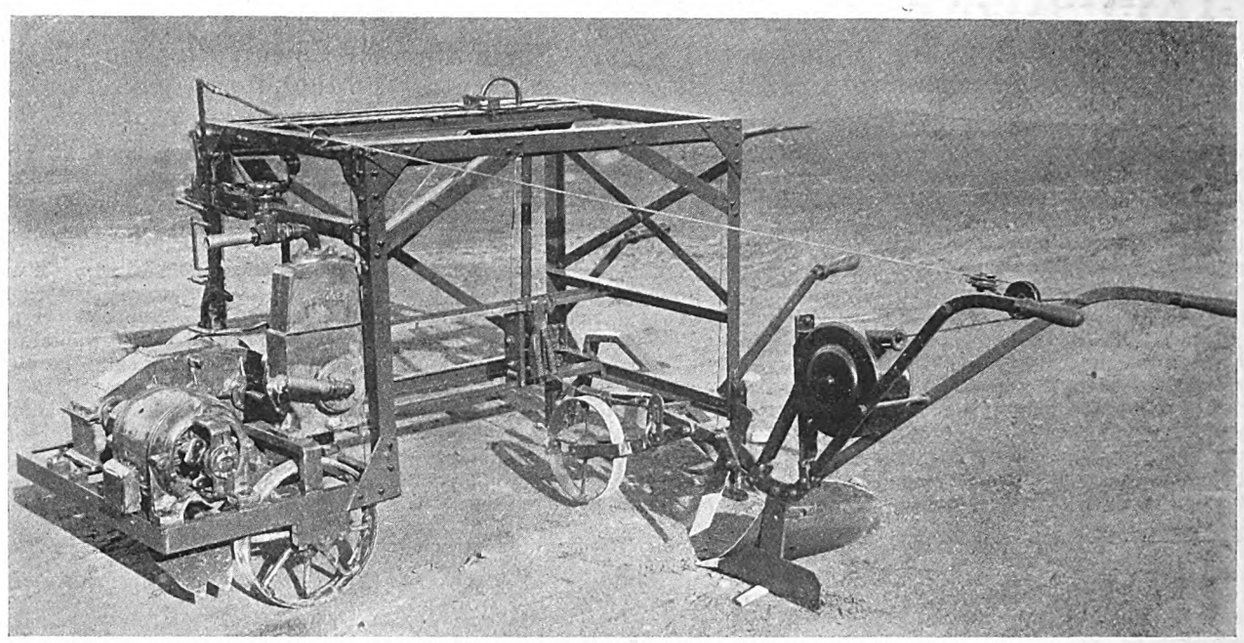

Fig. 5.—Motor operated gear for hauling light cultivating implements.

gearing is placed low down over the small wheels on which the barrow is moved, thus lowering the centre of gravity of the apparatus and making it easier to move by means of the handles at the other end. The motor, which is of ½ H.P. or 2 H.P., is connected to a gearbox through a centrifugal clutch which also acts as an overload slipping device, a winding drum is connected to the gearbox, a two-speed arrangement being included.

A light wire rope runs from the winding drum diagonally to a pulley high up on the frame, and then drops to a final guide pulley close to the ground, so that the rope pulls along the ground so as to clear the leaves or low branches of bushes or plants. The two latter pulleys work on a horizontal slide. The plough or other implement used is hauled up to the barrow and underneath it also by the wire rope, the opening in the side of the frame increasing therefore the length of the run. A cord is attached to the plough through a spring controlled auto-winding up gear. When the plough is about to start its work at the far end of the furrows, the cord is pulled, the motor starts, a second pull stops it, declutching at the same time; and if the gear is over-run a fork over the rope actuated by a disc throws the clutch out and stops the motor.

The hauling pulleys are on a horizontal slide with dog-tooth catches, so that several furrows can be made without moving the barrow. When the implement is as far to the left as it will go, the tail is lifted, the fixed spuds free themselves, two hinged anchor forks are lifted up, and the barrow is moved forward by one length, and the operation recommenced. The gearbox is arranged with projecting spindles to which belt pulleys can be attached, and a manure pump can be mounted on the frame for use around the holding.

Arrangements are made so that if desired a back haul can be obtained: in the ordinary way the plough or other implement, being light, can be hauled back by hand. The whole apparatus has been designed by M. Rigondeau and made by R. Vignaud, of Fontafie, in the department of Charente, France. The machine is a development of the wire rope cultivation system. It was originally designed to aid small holders, injured in the war, to help them to cultivate a piece of land without a horse plough; it is quite new and, if it stands up to its job, will form an interesting contribution to the stock of appliances available to aid the small holder.

Quite remarkable progress is taking place with regard to the use of various forms of electrically driven pumps for use for portable water supply, manure pumping, irrigation and general farm purposes. Special attention is being given to deep well pumps. The scarcity of labour has made the electrically operated pump a boon to the farmer. Messrs. René Volet, an undertaking with a British branch (at 242, Goswell Road, E.C.1), showed a system of drawing from a deep well by by-passing a certain proportion of the pump discharge down the well again to operate a coned injector pointing upwards, and thus bring the equivalent water level within the reach of the pump suction. No moving parts are therefore required down the well. During the last two years very heavy frosts which prevailed in the winter almost all over Europe have made many farm people nervous, as their house or farm supply service tanks, elevated in roofs or on silo-towers, have been frozen up or trouble has been had with burst connecting pipes. A system has been developed analogous to that in use for years on warships, to act as accumulators to level out the pumping duty on turret turning and other high pressure hydraulic work.

A vertical cylindrical tank is placed in a frost-free basement: it is filled against the pressure of the air in the upper part, and when the air pressure drops the electric pump starts filling the cylinder again from below, so a pressure supply can be given to the house, dairy or farm buildings without any elevated tanks and connections likely to be vulnerable to frost. If much of the air gets absorbed by the water it can be made up by means of a motor tyre pump. The progress in rural electrification can well be judged by the number of electric pumps on view at the Paris show.

In view of the fact that large areas in Algeria and Morocco are being cleared for vineyards and grain crops in areas where supplies of electricity are being made available, it is probable that material developments will take place before long regarding irrigation, pumping and wire rope hauled gear.

A feature of recent French agricultural machinery shows and of the annual Paris Fair has been the number of inexpensive electrical washing machines on view. It is now possible in France to buy a wood tub washer with electrical drive to the dolley for about £8, and with electrically-driven wringer for about £11. They are therefore sold by the hundred. If at home simple wood tub washers were fitted with motor drive and sold at about £15, they, too, would be in thousands of British homes. As it is, they cost from £25 to £36, a price that drives away thousands of potential customers and electricity users. So long as about £5 is charged for a motor for a sewing machine, so long will many people hesitate to have electricity into their homes at all. The class of machine that people in America can afford to buy is out of the question for most families in debt-stricken Europe.

France is very short of farm labour, but necessity has been the mother of invention, and quite a number of ingenious appliances were on view at the Paris winter show. Many examples were to be seen of the application of old principles formerly used on large scale plant only, to small appliances operated by electric motor or petrol engine. One cannot say that in general the quality of the appliances is quite up to British standards, but where there are many small holdings on which the number of hours of work with any particular appliances must necessarily be limited, then a farmer cannot usually afford to buy the very best.

Several firms have been founded in France to deal exclusively with electrical apparatus for agricultural use, and the success of some of them shows that electricity can be of real help to the farmer provided that sensible arrangements and regulations are made so that current can be brought to his door.

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MARINE ELECTRICITY.

Future of Turbo-Electric Propulsion—Need for Compact Machinery Spaces and of High Pressure Water Tube Boilers—A New Electric Machinery Space.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types.")

THERE now seems to be very little doubt that steam is occupying a more important position in marine engineering than it has for some time. Moreover, this importance is increased by the fact that steam has now something definite to offer, as a counter to the Diesel engine, in a group of tonnage which steadily is becoming the prerogative of the Diesel engine.

As far as the largest ships of all are concerned, there is very little doubt that at the moment the geared turbine is the choice of shipowners. If the rumours one hears concerning the new Cunarder are correct, and if the "Bremen" and "Europa" are to be taken as an indication of shipowners' ideas on the matter of "mammoth" ship propulsion, then it is abundantly clear that this form of power will be used on the relatively few transatlantic mammoths that will be built during the next few years. The theoretical advantages of other systems of propulsion are many, and the practical advantages of turbo-electric propulsion for such ships are inescapable, but both on the score of first cost and also due to the fact that shipowners perhaps have a somewhat understandable reluctance to make what might appear to them to be a bold step, it would seem that turbine drive with water tube boilers is likely to be paramount for some time to come. But the building of large mammoth passenger liners is, to a great extent, a matter of national prestige, and few people would contend that as far as constructional work on them is concerned, they are really attractive commercial propositions. While it is unquestionable that the electrical industry would welcome the chance of powering a mammoth ship from purely prestige reasons, it is reasonable to suppose that the most attractive commercial future is held out in the group of passenger liners of 17 000 to 20 000 H.P. which will always be built in increasing quantities. Also a large number of cargo vessels of single screw type of between 2 000 and 5 000 H.P. must undoubtedly need auxiliary turbo-electric drive in order to bring them into line on a competitive basis with the extremely economical motor vessels now building for this purpose.

Here, then, is a glimpse of the future of turbo-electricity as far as marine work is concerned, but from the mammoth all-steam ships, whose powering we have discussed above, can be learned much because any new ship of this type must have high pressure, high superheat water tube boilers. To say that the total area of tank top space occupied by boilers for a ship of 80 000 to 100 000 H.P., compared with the similar ships of 20 years ago, is nearly halved by the use of high pressure water tube boiler plant, may be a rough guess, but will be found to be very approximately correct. High pressure and high superheat is being applied to many recent turbo-electric ships, and an examination of the plans of the new turbo-electric liner now being built in this country shows that the total number of boilers for a ship of about 20 000 H.P. on two shafts is only four, the space occupied by them being very little greater than that occupied by the turbo-generators themselves.

Demand for Compactness.

The cry for compactness is very real where steam plant is concerned, and no one could criticise the most modern of turbo-electric ships on the score of excessive space occupied by machinery. It is, perhaps, too significant that at a time like this, when compactness is being developed to such an extent, there should be, in the newest turbo electric-liners building in this country, a feature which is at once a departure from, and a compromise on, recent arrangement practice. The question of arrangement of turbo-electric ships is in many ways hackneyed, and one had always thought that it had become more or less stereotyped with the motors arranged immediately abaft the turbo-alternator sets, there being then two shaft tunnels of the ordinary type with a long length of shafting leading to the screws themselves. The earliest of all electric ships had of course their motors placed aft in a special compartment, the inconvenience of reaching which caused, in later ships, the motors to be placed in the main power room.

This new ship has her two main double armature propelling motors arranged not quite aft, but well aft. There is, between the power room and the propelling motor room, a small working alleyway which, while primarily designed to carry the necessary cables, is suitable also for ready access from one compartment to another. It is probable, although there is only conjecture to prove this, that such an arrangement of motors in the end makes for a better trimmed ship than would be the case were the motors completely aft. On the other hand, there is a gain in space as far as the ship's cargo-carrying capacity is concerned by virtue of the fact that two large shaft tunnels are eliminated and only one small working alley is substituted in their place. We thus see that these ships are in every sense of the word electric ships, and that in them there is displayed an entirely new technique which all goes to prove that the electric ship is slowly evolving itself as a separate entity, and while, of course, it still has very many problems in common with power driven ships of other types, it does nevertheless at the same time bring in its train a great many questions of its own.

High Pressure Achievements.

Reverting again to the question of compactness of machinery space as a result of increase of boiler pressures, one feels that this is a point which cannot be too strongly emphasised, and it is most certainly to the advantage of electrical companies to advise, wherever possible, shipowners to go in for these high pressure units. There is perhaps a natural reluctance on the part of shipowners to go out wholeheartedly for high pressures, and also a certain nervousness. We may note, for example, the case of two recent turbo-electric ships, in one of which two small water tube boilers of high pressure are used, the pressure being 370 lb. per sq. in. with superheat and air preheaters. On the other hand, a newer ship launched recently has Scotch boilers giving steam to the turbo-generator set at 250 lb. per sq. in. only. There are five Scotch boilers on the ship with the lower pressure, compared with two water tube boilers on the ship with the higher pressure. Although the ship with the Scotch boilers is larger than the ship with the water tube boilers, in proportion the machinery space of the former is larger than that of the latter.

Perhaps the best example of what is possible with high-pressure boilers is to be shown by quoting the case of the Hamburg-Amerika liners of "Albert Ballin" class which have recently been re-engined and re-boilered. Instead of four double-ended and four single-ended Scotch boilers operating at a moderate pressure, four large water tube boilers designed for 400 lb. per sq. in. pressure have been fitted; each boiler is provided with a large superheater, a feed water heater and air heater, the air for combustion being pre-heated to 160 deg. C. and the feed water heater raising the temperature of feed from 115 deg. C. to 116 deg. C. The space required for the new boilers was less than that required by the old units owing to the adoption of higher pressures and the watertight bulkhead between the engine and boiler rooms was able to be placed three frames forward. This shows what a saving in space is possible by the two methods. Incidentally, the space so gained was used to accommodate larger turbines, but this is a matter which does not concern us here.

Since the last article in this series was written, news has come of the definite placing of a contract by Furness Withy and Co. with the General Electric Company for a large turbo-electric liner which presumably in size and in accommodation will be the repeat of a Diesel-engined liner built only a few years ago. America continues to complete electric liners for various services and in this country there seems to be a definite feeling that some Diesel-electric orders for small craft may be placed within the near future. A particularly interesting order, which, it is rumoured is now being considered is that for a Diesel-electric passenger vessel of about 8 000 H.P. to run from Australian ports to the Pacific Islands. This is one of the few cases where Diesel-electric propulsion has apparently been considered for a passenger vessel, and should the order be placed it will show that although turbo-electricity has made some strides, there is no finality and that the Diesel-electric ship may even yet prove to be a serious potential rival to the turbo-electric ship. Whatever be the case, there is no doubt that the next few months are going to witness some very real and interesting developments and that the electrical companies themselves, if they wish it, can look forward to participating in the marine sphere to no small extent.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Nickel Iron Alloys.

[To the Editor.]

Sir,—We have read with interest the article in your issue of March 14th, on the new nickel iron alloy, Permalloy C, for which, as a high permeability magnetic material, properties are claimed which have never before been obtainable. In this connection we would like to bring to your attention a material of which your correspondent is apparently unaware, that is Mumetal (the magnetic properties of which are equal to those tabulated in his article), manufactured by the Telegraph Construction and Maintenance Co., Ltd.

This metal has a wide circulation in this country in the design of electrical instruments and its application is general in the cases outlined by your correspondent as possible spheres of usefulness for Permalloy, viz., as instrument transformers, audio frequency transformers, electrical measuring instruments and magnetic shields. The advantages of Mumetal were strongly brought out at the meeting of the Instrument Section of the Institution of Electrical Engineers on February 7th, which is cited by your correspondent.

As regards magnetic stability, the advantage of Mumetal over straight nickel iron alloys is that it is not so susceptible to damage by strains. We do not claim that the material can be bent or mishandled with impunity after annealing, but we do claim that under ordinary handling conditions involved in instrument assembly, no impairment of magnetic properties results.

We note that it is also claimed by your correspondent that simpler heat treatment is required for Permalloy C than for the earlier alloys of the series. We have for some years employed a simple annealing process as the best heat treatment for Mumetal and many of our customers have carried this out on their own part for some time.

In conclusion we would mention that most British electrical firms of repute employ Mumetal as standard for precision instruments which are, and have been for some time, available in the market.—We are, etc.

For the Gutta Percha Co.,
H. J. Garnett, Manager.

March 24th.

BOOK REVIEWS.

Elettrotecnica. By Profs. Dott, L. Donati and G. Satori (Milan: Ulrico Hoepli.) Vol. 1, Pp. 406; Vol. 2, pp. 596. 120 lire (2 Vols.)

In the description of the contents of these two volumes the authors are very modest. They are described as a brief means of understanding the operation of electrical machines, transformers and motor convertors, with hints in connection with the transmission of electrical energy. They really form a complete treatise on the subjects mentioned.

Vol. 1.—The preface quotes a statement of the late Lord Kelvin:—"Nothing is more fatal to the acquirement of electrical knowledge than lack of confidence in the handling of mathematical formulæ." This statement is certainly believed by the authors since both volumes bristle with mathematical formulæ; they are, however, not too intricate and can be readily followed by students of technical schools and colleges. The first volume contains a preliminary section; this is to prepare students for the subject matter proper which begins on page 31. In this section unit quantities receive some attention. Such subjects as Force, Work, Velocity, Accelleration, etc., are dealt with; elementary vector diagrams and a discussion of various forms of energy are included in this section. The first chapter is confined to explanations of statical electricity. The fundamentals are dealt with in addition to units; considerations of the capacities of condensers in series and in parallel form a large portion of this chapter. The second chapter deals very fully with constant current values; heating units and the heating of water and instruments for measuring same are discussed. The third chapter is confined to electrolysis, the chemical action accumulators is considered to be under this heading. Chapter 4 consists of 60 pages, the whole of which are devoted to electromagnetism. This chapter may be considered as a complete text book on this subject; it is well written and the illustrations are very clear. The fifth chapter deals with induced currents, the formulæ in this chapter should be carefully studied. The sixth and seventh chapters deal with the capacities of conductors and units. Potential gradients and the distribution of voltage in various kinds of dielectrics are adequately discussed. The eighth chapter is very important from the fact that it deals with alternating current; this is done in a masterly manner. The chapter contains almost 100 pages; vectors, wave form, etc., make the arguments very clear. The ninth and the last chapters are confined to considerations of inductance; harmonic quantities are discussed to some extent.

Vol. 2.—The second volume begins with chapter 11; this is really a treatise on static transformers. The calculations are valuable. The matter dealing with electrical machinery commences with chapter 12. The characteristics of both a.c. and d.c. machines are discussed and illustrated. Chapter 13 is confined to the electro-technics of direct current machines; all types of machines are discussed, many curves are given and series and parallel connections are illustrated. Chapter 14 may be said to be a discussion on armature winding. The characteristics and connections of various types of windings, for different pole systems, are given; the magnetic circuit is adequately dealt with, as is also the general expression for the calculation of e.m.f. Chapter 15 appears to be a little out of place since it deals with the essentials of polyphase currents; it should really follow Chapter 16, which is devoted to a.c. dynamos. Both chapters are well-written and should prove useful to students. In Chapter 17 we have the essentials of static and rotating polyphase transformers. Various types of windings and connections are discussed and the outlines of design are given. Direct current motors form the subject matter of Chapter 18, while in Chapters 19 and 20 the essentials and characteristics of a.c. motors and synchronous motors are fully dealt with. The calculations in these sections should prove useful to designers. Chapter 21 is confined to speed regulation and Chapters 22 and 23 deal with various types of rotary convertors. The last chapter deals almost exhaustively with the transmission of electrical energy, this from both an a.c. and d.c. point of view. At the end of each chapter are exercises dealing with the subject matter in the chapter; this is certainly an essential of acquiring knowledge. The chapters and contents are at the beginning of the first volume and the index is at the end of the second volume. The index is extensive and very comprehensive. The volumes are to be commended to all associated with the subjects mentioned. Translated into English, this work would have a ready sale in this country.

Cyril Sylvester.

Wechselstrom-Leistungsmessungen. By Werner Skirl. (Berlin: Julius Springer.) Pp. vii+278. Bound, 14 marks.

This book is now in its third and enlarged edition. It is unique in that practically the whole field of indicating (not integrating) instruments for the measurement of a.c. power is covered by illustrations from the products of one firm, namely, Siemens and Halske. The restriction of the treatment in this way has the advantage that the whole scope of measurements is covered by a single range of instruments designed as regards rating and auxiliary equipment especially for the purpose. The underlying principles, of course, are common to all makes. The construction of various types of movement, first described, is followed by descriptive matter dealing with current, voltage, power-factor and frequency measurements as auxiliaries to power measurement. The several types of wattmeter are detailed, with particular reference to their adaptation to various ranges. Simple theoretical treatment is given in a concise form where necessary. The section on current transformers has been enlarged, to take note of the later developments which have obtained since the second edition. The author lays particular stress on methods of measurement, and to this end he employs exceptionally clear connection diagrams and drawings. The latter displace half-tone blocks and are greatly superior to them. Among various subjects dealt with, the author gives some details of no-load power losses in cables, calibration and the calculation of errors. The book should be useful in electrical laboratories and test beds, especially as there seems to be nothing quite like it in English. Though the book should be particularly useful where modern Siemens instruments are used, so much of the material is applicable to instruments of other manufacture that engineers and students will find the information invaluable both for study and reference.

S. Parker Smith.

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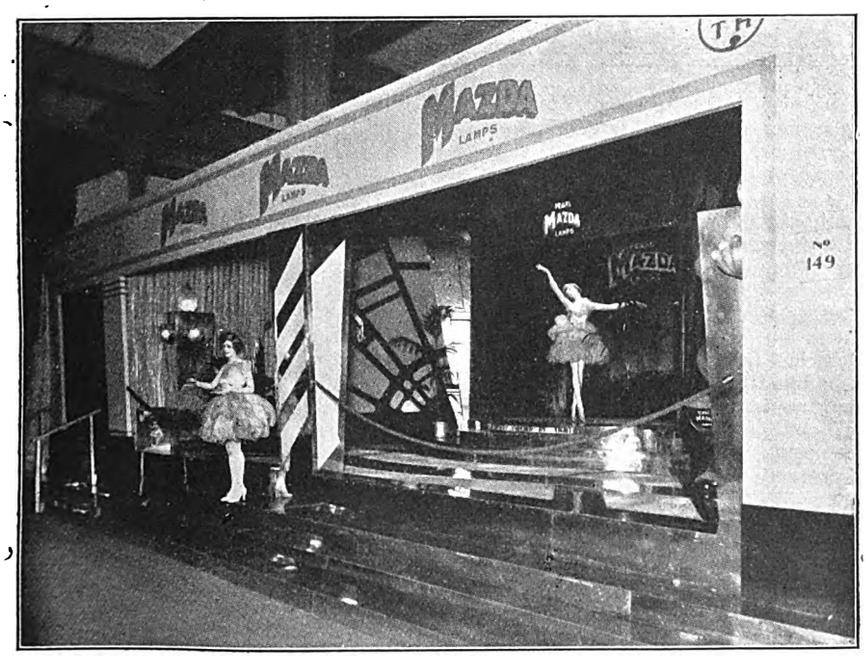
THE IDEAL HOME EXHIBITION.

Further Descriptions of Some of the Electrical Exhibits—The "Hall of Ideals"—New Domestic and Cooking Appliances.

(*Concluded from page 403.*)

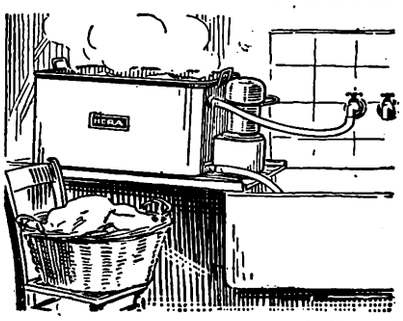
VISITORS to the exhibition will be impressed by the scenic effects in the main hall. These take the form of a large back-cloth suspended round the hall, in front of which are two foregrounds consisting of sea, mountains and trees, the whole representing a scene on the Lido. This scenery is unique, inasmuch as it is the largest that has been erected in this country. The total length of the backcloth is 800 ft. with a maximum height of 35 ft. The whole scene is floodlighted with special projectors, the total power utilised being about 100 000 W. Other features of the exhibition which are arousing public interest are the international nurseries and the ideal attic rooms. The nurseries are a series of scenes depicting nurseries in various countries throughout the world —Holland, Hungary, Lapland, Japan, Turkey—in addition to examples of modern and ultra-modern nurseries. The ideal attic rooms show how a tawdry squalid attic may be converted into living rooms. The special lighting arrangements for the Lido scene, international nurseries and the ideal attic rooms were supervised by the EDISON SWAN ELECTRIC CO., LTD. This same company also occupies three stands, namely, the Hall of Ideals in the Empire Hall, a refrigerator stand in the main hall and a radio stand in the main hall gallery. With regard to the Hall of Ideals, this is made up of seven special exhibits comprising cookers, washers, refrigerators, electrical aids to beauty, a modern lounge, vacuum cleaners and a model drawing room. Passing inside the hall one is received by a commissionaire who hands out a pamphlet describing a series of domestic ideals. Looking about us we see a number of little rooms sheltered behind large plate glass windows. Each room represents an ideal, and we turn to the first. Seated on a chair is a girl dressed in a frock of green, gold and yellow. As we approach she rises from her chair and tells us in dumb show of the first ideal, an electric washer and ironer. As she demonstrates how this machine will do the week's washing in an hour while we sit and watch it she explains by means of ingeniously arranged showcards, the advantages and the simplicity of operation.

As we continue our tour of the hall, we see under similar conditions electric polishers, cleaners, electric radio sets, artistic lighting fittings, electric fires and an electric beauty parlour, where artificial sunlight, ultra-violet rays, vibro-massage apparatus and other aids to beauty are shown by a girl sitting at an ultra modern dressing table.



A general view of the stand of the British-Thomson Co., Ltd., at the Ideal Home Exhibition.

From the electrical point of view, the "Village of Ideal Homes" is disappointing, and in only one instance did we notice an electric cooker (by the CREDENDA CONDUITS CO., LTD.). Water softeners, refrigerators, floor polishers and cleaners, mostly by ELECTROLUX, LTD., are more numerous, while in the cavity brick house SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD. show good examples of modern lighting. This section of the exhibition provides an excellent opportunity for demonstrating the possibilities of the all-electric house, and it is therefore regrettable that nothing appears to have been done with a view to making ideal houses, at least all-electric homes. With the large number of all-electric kitchens to be seen elsewhere in the exhibition, it certainly seems odd that such kitchens are absent from what pretend to be houses of comfort and convenience.



The new "Hera" washer of L. G. Hawkins and Co., Ltd.

With regard to the other exhibits it would be useless in the space available to attempt a description of each, and since most of the appliances have already been described in THE ELECTRICIAN, little purpose would be served by such a course. Mention of outstanding items, however, is another matter, and on the stand of L. G. HAWKINS is shown for the first time a "family-sized" electric washer of the name of "Hera." This machine has a tub measuring 21¾ in. by 14 in. by 16½ in. and is finished in white enamel relieved in blue. The construction is such that the washer may be placed over a heater and the water inlet and outlet connected to the tap and sink.

The "Junior" cooker, though not new, is now offered by the JACKSON ELECTRIC STOVE CO., LTD., in two ranges, namely, for 2-3 and 4-5 persons, and inspection of these two cookers is recommended. A range of new cookers by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., has also been added to the Hotpoint-Falco series. These embody all the latest desirable features in connection with the design of cookers, and include mottle-grey enamelled hob, removable oven interiors and doors to grill chambers. This new series comprises cookers suitable for two to three people up to 25 to 30 people.

Another interesting appliance to be seen at the show is an electrically heated washer made by the WONDER WASHER CO. This is a new washer shown for the first time, as is also the "Tellus" vacuum cleaner illustrated in our last issue. "Canvary" electric water heaters are exhibited by BERRY'S ELECTRIC, LTD., for the first time, and a feature of the heaters which should appeal to the housewife is that the temperature of the water can be varied as it flows.

The BRITISH THOMSON-HOUSTON CO., LTD., is making a special Mazda lamp display, details of which were given in our issue of March 21st. B.T.H. refrigerators are also shown, these forming one of the exhibits of the EDISON SWAN ELECTRIC CO., LTD.

STOKES TABLE COOKER CO. (121, Woodhouse Lane, Leeds), are featuring a novelty cooker, suitable for table use. The range offered is obtainable with elements suitable from 50 V to 250 V, while the consumption is 450 W.

Among the outstanding radio exhibits may be mentioned the radio gramophone sets of the IGRANIC ELECTRIC CO., LTD., and CELESTION, LTD. All-mains receivers are featured by FERRANTI, LTD., while components form the chief exhibits of BENJAMIN ELECTRIC, LTD.

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NEWS IN BRIEF.

A Substitute for Insulating Oils—Electrically Propelled Liner—Swedish Railway Electrification—A New Miners' Lamp—Appointments Vacant.

THE illumination of the church clock at Conisborough is to be effected by means of electricity taken from the overhead trackless car wires. A lamp has been so placed as to throw a light on to the clock.

The Sussex Branch of the Electrical Contractors' Association is holding a dinner and dance at the Royal Pavilion, Brighton, on May 10th, at 6.15 p.m. Tickets can be obtained from Mr. G. E. Hervey, 20, Glynde Avenue, Hampden Park, Eastbourne.

It is reported that Furness, Withy and Co., Ltd., have placed a contract with Vickers-Armstrongs, Ltd., for a new liner of about 23 000 tons, which is to be propelled electrically by means of General Electric (Fraser and Chalmers') turbo-alternators.

An electrical engineer is required for H.E.H. the Nizam's State Railway.

A mains engineer is wanted by the Mid Cheshire Electricity Supply Co., Ltd.

Brighton Corporation invites applications for the position of engineer and manager of its electricity undertaking.

Personal telephone calls to the Irish Free State are now obtainable from any place in Great Britain and Northern Ireland.

The number of hired cookers connected to Manchester Corporation's mains during January was 52, making a total of 5 945 on circuit.

Stoke Newington (London) B.C. has been recommended to accept a tender for the erection of the southern sub-station, at a cost of £2 300.

Bournemouth Corporation has placed a contract, amounting to £943, for the supply of 24 police telephone boxes, to be erected in various parts of the town.

The Budapest telephone authorities have established a special "medical exchange" which will put patients into touch with their doctors at any time of the day or night. It is said that doctors will keep the exchange informed of their movements.

The Federation of British Industries has drawn up standard fundamental clauses which appear to be suitable for inclusion in contracts for all classes of work. These include an arbitration clause, and clauses relating to damages for delay, extension of time in certain specified circumstances, insurance and the general liability of contractors.

King's Patent Agency, Ltd., 146A, Queen Victoria Street, London, E.C.4, has issued an enlarged edition of its handbook on "Patents for Inventions." Amongst new features is one relating to employees' inventions, and the book contains a mass of information on the patenting of inventions, the registration of trade marks and designs and the protection of copyrights. Copies will be sent free to applicants.

The first annual general meeting of the Bristol and District Branch of the Electrical Association for Women was held at Messrs. Fortt's Restaurant, Bristol, on March 24th. The meeting was followed by a supper, at the invitation of the Edison Swan Electric Co., Ltd., after which a lantern lecture on "Electricity in Architectural, Furnishing and Lighting Design" was given by Mr. H. Lingard.

Mr. F. Lee, M.P., who is on the Mines Department Safety Research Board, explained to the Derbyshire Miners' Association last Saturday what is being done in regard to safety research work. He said the Board had under consideration an electric safety lamp which showed a red disc in the presence of gas, and when connected up to a coal-cutting machine would cut off the current in the presence of gas. It was a British invention and was to be tested in collieries in South Yorkshire.

The Westinghouse Electric and Manufacturing Co. recently gave a demonstration of a new application of the "electric eye." It sets a bell in operation and "trains a revolver" upon a prisoner who climbs a prison wall.

The Swedish Government is considering a proposal for converting 595 miles of the State railways to electric traction, at a cost of about Kr. 71 840 000. It is calculated that direct and indirect savings of over 1¼ million kronor will be effected by the change.

Edinburgh Education Authority opens a certain number of evening continuation schools for an eleven weeks' session in the spring and early summer. The session began on Monday. The classes include one for women on the use of electrical apparatus in the home.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *of April 3rd, 1880, the telephone was successfully used over a distance of about a mile at the Easter Monday Volunteer Review.*

A patent for transmitting scenes to a distance by electricity was applied for by patent agents of Pittsburgh, Pa.

The electrical heating of boilers by means of a spiral winding of platinum wire was proposed by Mr. Charles Davis, of Paris.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of April 7th, 1905, contained a reference to the work then in progress on the bridging of the Zambesi at the Victoria Falls. At the end of this month, a quarter of a century later, tenders are returnable for construction of the second bridge across that river, at Sena, Portuguese East Africa, of which the cost will be well over £1 000 000.*

The Swedish State Railways were about to submit to the Riksdag a proposal to purchase for 4 000 000 kr. the waterfalls near the principal railways and to utilise the water power to generate electricity for working the trains.

A tender for the erection of new electricity showrooms has been accepted by Eccles Electricity Committee.

Hastings Corporation has accepted a tender for the supply of 12 half timber framed police boxes, to cost £782.

The Post Office has begun the laying of 68 miles of underground telephone cable, containing over 100 pairs of wires, from Dundee to Aberdeen.

On March 27th over 60 members of the E.A.W. visited the Ediswan Works at Ponders End, where the party made a tour of the various departments.

The 53rd convention the of National Electric Light Association (U.S.A.) will be held from June 16th to 20th, in the Exposition Auditorium, San Francisco, Cal.

Electric cookers can now be hired from Blackpool Corporation at 7s. 6d. per quarter instead of 10s. as hitherto, and the charges per quarter for washers and boilers are 4s. 6d. and 6s. (instead of 6s. and 7s. 6d.), respectively, for 10 and 14 gallon sizes.

It is stated that a new German invention is a switch which breaks, without sparking, on a 600 000 kW circuit. This is said to be effected by replacing the usual oil by a fluid which is at present a secret.

An ingenious model, designed by Partridge's Models, Ltd., has been made in London for the Mersey Docks exhibit in the British section of the Antwerp Exhibition. It is a scale model of part of the river and docks. Eighteen-inch models of famous liners, drawn by electric magnets under the water, pass up and down the river and come to rest in the docks. Lock gates open and close automatically, and the rise and fall of the tide is reproduced. The model is entirely electrical.

The third annual general meeting and luncheon of the Cheltenham Branch of the Electrical Association for Women took place on Wednesday of last week. Amongst the guests were the Mayor of Cheltenham, Miss C. Haslett (director of the Association), Mr. E. E. Sharp (Venner Time Switches, Ltd.), and Mr. W. J. Bache (borough electrical engineer of Cheltenham). Ald. J. Moore (Cheltenham) said many modern improvements in domestic apparatus were entirely due to the efforts of the E.A.W. Mr. Sharp delivered a lecture on "Domestic Electrification Overseas."

Mr. H. Lingard addressed a meeting of the Birmingham and Midlands Branch of the Electrical Association for Women last week on "Electric Light and Eyesight Preservation." He said although the average home, factory and school was grossly under-lighted, by far the greatest defect was the general prevalence of glare. If clear electric lamps were used they should be concealed from view in well designed reflectors and fittings. The light of pearl or opal lamps was noticeably softer in effect upon the eye, and it was to be hoped these would soon entirely replace the naked filament lamps.

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BUSINESS ITEMS.

THE manufacturers of, or agents for, "Calrod" heating elements are requested to communicate with the Editor.

A. C. COSSOR, LTD., announce the opening of a Liverpool branch at 42, Paradise Street, under the management of Mr. S. G. Beer.

The address of the London office of the UNITED STEEL COMPANIES, LTD., has been changed to 16, Great George Street, S.W.1.

The bronze coloured brass lighting units installed in the Glasgow University Chapel were designed and supplied by the Glasgow branch of the GENERAL ELECTRIC CO., LTD., in conjunction with the architects, Messrs. John Burnett, Son and Dick.

POWER CONTRACTS (BATWIN), LTD., 164, Southwark Bridge Road, London, S.E.1, inform us that they have acquired from Power Contracts, Ltd., the Batwin motor department, and that service and delivery of Batwin machines is now given from the above.

Amongst recent orders of an extensive character received by the UNDERFEED STOKER CO., LTD., are the complete ash sluicing plants for the London Power Co., Battersea power station; Ipswich Corporation; Shropshire, Worcestershire and Staffordshire Electric Power Co., Ltd., Severn power station, Stourport, Worcestershire. Edward Lloyd and Co., Ltd., Kemsley Paper Mills, Sittingbourne.

An interesting method of controlling present-day machinery may be seen at the Laundry Exhibition, which was opened by Miss Margaret Bondfield on March 24th, at the Agricultural Hall, London. A "Mammoth" washing machine is exhibited, controlled by speech. This machine, made by the BRITISH-AMERICAN LAUNDRY MACHINERY CO., LTD., consists of a polished steel drum 12 ft. in length and about 8 ft. in diameter, and is capable of washing about 1 000 lb. of clothes in an hour. When the word "start" is spoken into a microphone the machine commences to operate, while at the command "stop," the machine comes to a standstill. Needless to say, this type of control was only installed as an experiment, and the transverse current microphone and control gear for this operation were made and supplied by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London.

The progress which is being made in the adoption of the Foster Economiser is indicated by the contracts placed during the first three months of this year. Installations ordered for Great Britain include the Yorkshire Electric Power Co., Thornhill (4); London Power Company, Deptford, West (2); Sheffield Corporation Electricity Supply (3); Shoreditch Borough Electricity Supply (1); Torquay Electricity Works (2). In addition to the foregoing, orders have been received for installations abroad as follows:—Monte Video, South America (8); Ymuiden, Holland (2); Utrecht, Holland (6); Twentsche Centrale, Holland (2); Mines de Drocourt, France (2); Raffineries F. Beghin, France (2); Rotterdam, Holland (2). An outstanding feature of the economiser is the construction of the elements, which employs cast-iron gills or rings machined and shrunk on to solid-drawn steel tubes. The apparatus is manufactured at the Wakefield works of E. GREEN AND SON, LTD., for Eco POWER, LTD., London.

A GENERAL view of the stand of Falk, Stadelmann and Co. at the Ideal Home Exhibition.

PERSONAL.

MR. Hy. Mozley, who retired last week-end as manager of Burnley Transport Department, has spent 62 years with transport undertakings.

THE Championship Cup of the Swinton and Pendlebury Ladies' Hockey League, with medals and badges, has been won this season by the Chloride Recreation Ladies "A" Team, composed of employees of the Chloride Electrical Storage Co., Ltd. Throughout the season these girls have played 21 matches without defeat, the only point lost being a drawn game in the first match of the season. The goal scoring ability of the side is shown by the record of 117 goals, while the defence has only conceded 8 goals. Miss Hilda Athorn, the centre forward, heads the list of League goal scorers with the total of 71 goals.

Estate of the gross value of £64 868, with net personalty £63 210, was left by the late Mr. Henry Alabaster, late chairman of the "Electrical Review," Ltd., who died on January 13th, aged 83 years.

We learn that Mr. H. Walkington, late works manager of S. G. Brown, Ltd., having retired, Mr. S. G. Brown, F.R.S., is taking full charge of the works. He will be assisted by Mr. H. A. Webb (radio department) and Mr. H. H. Hebden (gyro and electro-megaphone department), who have been associated with the firm for many years.

Estate of the gross value of £99 785, with net personalty £99 261, was left by the late Mr. Alan Archibald Campbell Swinton, chairman of Crompton and Co., a director of Parsons Marine Steam Turbine Co., Wallsend, and of many electrical supply companies, who died on February 19th, aged 66 years. He left scientific books to the I.E.E.

Sir Alexander Roger, finding himself in disagreement with the policy adopted by the Board of the Constantinople Telephone Company, has resigned his directorship, and on Saturday, March 29th, Mr. Frank Gill was elected to fill the vacancy. It was reported last week that the International Telephone and Telegraph Corporation had purchased a controlling interest in the stock of the Constantinople Telephone Company.

Presentations were made this week by the directors of Benn Brothers, Ltd., and by the staff of "The Hardware Trade Journal" to Mr. Edgar E. Starke and Mrs. Starke, who celebrated yesterday, Thursday, the 25th anniversary of their wedding. At a meeting of the board, the directors passed a resolution expressing their congratulations and their esteem and abiding friendship for Mr. Starke. This resolution is to be engrossed and signed by Sir Ernest Benn (chairman), the directors and senior members of the staff.

Obituary.

MR. TOM ARTHUR FLATHER, aged 62 years. He was managing director of Flather and Co., Ltd., of Beeston, and founded the firm in 1893.

MR. PERCY GEORGE CHEVERTON, on March 26th, aged 62 years. He was for about 45 years with Crompton and Co., Ltd. (now Crompton Parkinson, Ltd.), in the firm's purchasing department, and resigned about a month ago.

SIR WILLIAM SYMINGTON MCCORMICK, F.R.S., on March 23rd, chairman of the Advisory Council to the Department of Scientific and Industrial Research. Cremation having taken place in France a memorial service was held at St. Margaret's, Westminster, on Monday.

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IN PARLIAMENT.

Discussion in House of Commons on Government's Empire Wireless Policy.

IN the course of the discussion on the motion for second reading of the Consolidated Fund Bill in the House of Commons on March 26th, Sir E. Hilton Young called attention to the decision of the Government and the determination of the Post Office to develop the overseas wireless telephonic system of communications without the co-operation of the Communications Co. He said the company was formed to co-ordinate and rationalise the cable and wireless system of overseas communication, and it possessed the outfit and had established wireless beam stations, which were the means of carrying the overseas wireless telegraphic communications of the Empire. It was beyond controversy that at the time of the institution of the company it was contemplated that it would carry on, on behalf of the Post Office, the overseas telephonic as well as the telegraphic communication. The Post Office, however, would not even negotiate with the company and would not give it an opportunity to make good its claims.

The Communications Company could give a service at once with the oversea Dominions. The Post Office could give nothing immediate. It was all speculative. Some statements suggested that he had not got to the bottom of the matter. One statement was that there would be an economy of £17 000 a year in the working costs, but it appeared from other statements that instead of being £17 000 a year less than that of the Communications Co. it would be £3 000 more. The strong recommendation of the Committee of Experts to the Postmaster-General was that he should co-operate with the Communications Co. If the Post Office did not co-operate with the Communications Co. they would have to rely on somebody else, and that somebody else would be, not a British interest, but the large American Cable Co. Mr. Lees-Smith (Postmaster-General) said when the late Government leased the beam wireless stations to the Communications Co., they reserved the future of wireless telephony. Economy might, no doubt, be obtained in using the beam stations for wireless telephony, but there were advantages in the concentration of all the services at Rugby. The Communications Co. relied on the efficiency of aerials with very high masts, while the Rugby engineers, using lower masts, at much less cost, believed that although there was a certain loss of power it could be compensated for by developing a very powerful transmitter. The higher masts cost roughly, £34 000, and the lower masts £3 500. It was estimated that the cost of using the Rugby system would be between £20 000 and £30 000 less than that of renting the beam stations. With regard to contracts for machinery at Rugby and Baldock, the Standard Co., although it had American capital, had works in this country where it employed 7 000 British workmen. The debate was interrupted by private business.

Finsbury Park Tube Railway.

A Select Committee of the House of Commons has had under consideration, during the past week, the London Electric Railway Co.'s Bill to authorise a tube railway extension, 7¼ miles in length, from Finsbury Park to Cockfosters.

Mr. Frank Pick, managing director of the company, said 27 250 000 passengers yearly arrived at Finsbury Park by the tube and Metropolitan District Railways, and only a small proportion of these transferred to the L. and N.E. Railway. It was proposed to build a new depot at Cockfosters, which would facilitate a speeding up on the whole line. Generally speaking, they expected the Treasury to pay interest on part of the capital for 15 years. The cost of the works, including the purchase of land, a westward extension, improvement of existing stations, etc., would be about £13 000 000.

Sir Ralph Wedgwood, general manager of the L. and N.E. Railway Co., said extension of the tube railway beyond the Manor House must result in serious diversion of traffic from the L. and N.E. Railway. He believed the proposed line would result in a drop of £110 000 in his company's receipts. The L. and N.E.R. Co. had now a scheme for electrifying their main line as far as Welwyn and the old Great Northern branch suburban lines.

The Committee approved of the Finsbury Park to Cockfosters extension, and expressed the opinion that the L. and N.E.R. should not feel discouraged from going on with their electrification.

ILLUMINATION COMMITTEE.

Annual Report of the National Illumination Committee of Great Britain.

THE principal activities of the Committee during the past year have been in connection with the carrying-out of the programme of work decided upon by the International Commission on Illumination at its Bellagio and Saranac meetings, and with making arrangements for the 1931 meeting of the Commission. As recorded in last year's annual report the National Committee has appointed a number of sub-committees to deal with the subjects of which the Commission is making a special study, for five of which the British Committee has accepted the secretariat responsibility. Responsibility for the other subjects is divided among the other countries which are members of the Commission. In connection with most of these subjects the British sub-committees are in fairly close touch with their corresponding sub-committees abroad. In a few cases the contact is not so good, but conditions are improving.

The British sub-committees are at work, and it is hoped that fuller co-operation will now be secured and that the imminence of the 1931 meeting will result in more intensive efforts in all countries.

Preparations and details for the 1931 meeting of the International Commission on Illumination, which is being held in Great Britain at the invitation of the British Committee, were begun early in the year. It was decided that the meeting of the Commission should be associated with an International Illumination Congress, which would visit a number of places of interest to illuminating engineers where papers would be presented and discussions held. The Illuminating Engineering Society has agreed to co-operate with the National Committee in the organisation of the Congress, and an executive committee consisting of members of the two organisations has been set up to deal with all matters relative to the Congress as well as the non-technical portion of the meeting of the Commission at Cambridge. The technical aspects of this meeting will, of course, be directly under the control of the Central Bureau and the Executive Committee of the Illumination Commission.

THE JOHN BENN HOSTEL.

East End Boys' Ready Response to Educational Opportunities.

THE John Benn Hostel, Stepney, London, E., has another successful year of work behind it, and the report of the Warden for 1929 makes good reading. The document brings to the reader a sharp realisation of the immense value of the work done in this little community of boys. Here is salvaged part of the immense amount of valuable, but too often wasted, material among the youths of the East End. With 75 boys the Hostel now has its full complement. Employment among the lads is satisfactory, and with hardly an exception they are placed in positions that offer the prospect of future development. Their jobs are not merely blind alleys with the inevitable outcome in unemployment after a year or two. Many boys are apprenticed to various crafts and trades, but still more interesting is the exceptional talent to which the Hostel life offers scope. At the present time two of the boys are studying for matriculation. One hopes to take Orders and the other to distinguish himself as a chemist. Another boy is learning advertising photography, while studies for the Chartered Institute of Secretaries and for proficiency in commercial art are occupying two clever youngsters. Meanwhile, the work of social recreation, carried out in the Milner Hall, goes on daily and successfully and commands the steady support of large numbers of Stepney people. The East End Hostels Association (of which Sir Ernest Benn is the President) is emphatically an organisation deserving the support, on the highest patriotic as well as compassionate grounds, of the charitably-minded.

The annual meeting was held last week.

"THE CURSE OF GOVERNMENT."

In connection with the Individualist Bookshop series of Monday lectures on Present Day Problems, Sir Ernest Benn will speak on "The Curse of Government" at Caxton Hall, S.W.1, on Monday next at 5.45 p.m. The full programme of these lectures is obtainable from the Secretary, Individualist Bookshops, 53, Victoria Street, London, S.W.1.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

NANTWICH RURAL DISTRICT COUNCIL.—Electric wiring of houses. Particulars from the Surveyor.

GREAT WESTERN RAILWAY CO., April 4th-24th.—Supply of electrical cables and wires (list 20) and telegraph ironwork (list 21). Specifications with forms of tender from the Office of the Stores Superintendent, Swindon (form of tender for list 20 on and after April 14th). Tenders for list 21 by April 4th and for list 20 by April 24th.

PRESTWICK CORPORATION, April 4th.—One year's supply of electric lamps, fittings, etc. Schedules, etc., from the Burgh Engineer, Town Hall, Prestwick.

SHEFFIELD CORPORATION, April 4th.—Supply of one wheel press, with electric motor, for the tramways and motors department. Forms of tender from Mr. A. R. Fearnley, general manager, Division Street, Sheffield.

CENTRAL ELECTRICITY BOARD, April 7th.—Supply and erection of 66 kV and lower voltage transformers, in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.-G.T.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

GLASGOW EDUCATION AUTHORITY, April 7th.—Supply of electric lamps, etc. Specification from the Education Offices (Supplies Department), 129, Bath Street, Glasgow; deposit 10s.

STANDING JOINT COMMITTEE OF GLAMORGAN QUARTER SESSIONS AND COUNTY COUNCIL, April 7th.—Electric light installation at Barry Dock Police Station, Court, etc. Specifications from Barry Dock Police Station or Glamorgan County Hall, Cardiff.

PERTH CORPORATION, April 9th.—Electric lighting installation work in 104 houses at Darnhall Drive and 46 houses at Florence Place, Perth. Schedules, etc., from Mr. Thomas McLaren, burgh surveyor, City Chambers, 16, Fay Street, Perth; deposit £1.

STOKE-ON-TRENT CORPORATION, April 9th.—Supply and erection of e.h.t. and l.t. overhead transmission lines. Specification, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

DUNDEE CORPORATION, April 10th.—Supply of e.h.t and l.t. paper insulated, lead-covered and double steel tape armoured cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

DUNDEE CORPORATION, April 10th.—Supply of (1) d.c. and a.c. house service meters; and (2) 35 000 pairs of 8 mm. and 9 mm. × 15 in. long arc lamp carbons, for Angold magazine flame arc lamps. Specification, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

GALASHIELS CORPORATION, April 10th.—Electrical work of five blocks of three-apartment houses (20 houses in all) at Wood Street, Galashiels. Specifications, etc., from Messrs. J. and J. Hall, architects, Galashiels.

MORECAMBE AND HEYSHAM EDUCATION COMMITTEE, April 11th.—Electric light installation at West End Council School, Westminster Road. Particulars from the Borough Engineer deposit £1 1s.

ATHERTON URBAN DISTRICT COUNCIL, April 14th.—Supply of five miles of 0·06 h.t., concentric, paper insulated, lead sheathed, served, steel tape armoured and compounded cable manufactured in accordance with latest B.E.S.A. specification.

Overhead Line Work.

BEDFORD CORPORATION, April 14th–May 5th.—Supply and erection of 11 000 V overhead lines, and auxiliary apparatus, other than transformers, for supplying an area of 100 sq. miles, under the Corporation's rural demonstration scheme. Only British labour and material may be employed. Specification, etc., from the Borough Electrical Engineer, until April 14th; deposit £3 3s. Tenders by May 5th.

COVENTRY CORPORATION, April 14th.—Electrically-driven pumping machinery, for Whitley pumping station. Specification (£10) from Sir Alexander Binnie, Son and Deacon, Artillery House, Artillery Row, London, S.W.1.

EDINBURGH EDUCATION AUTHORITY, April 14th.—Electrical installation in proposed new primary school at Wardie. Specifications, etc., from Mr. J. M. Johnston, 47, Charlotte Street, Leith.

LONDON COUNTY COUNCIL, April 14th.—Manufacture and supply of h.t. and l.t. cables; and reconstruction of existing l.t. cables. Specification, etc., from the General Manager of Tramways, 23, Belvedere Road, London, S.E.1; deposit £2.

MANCHESTER CORPORATION, April 14th.—Twelve months' supply of electricity meters (specification No. 264); potential and current transformers (No. 265); cables (No. 266); time switches (No. 268); auto-transformers and auto-balancers (No. 270); a.c. industrial electric motors (No. 271); and electric kettles (No. 274). Specifications from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s. for each.

Supply of Stores.

MANCHESTER CORPORATION, April 14th.—Twelve months' supply of stores, etc., to the electricity department, including dry batteries for flashlight lamps, cable troughing, conduit for wiring, dynamo and copper tape brushes, fuse boxes, lamp columns, service boxes, wire, etc. Forms of tender, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

BIRKENHEAD CORPORATION, April 15th.—Twelve month's supply of c.i. house service boxes, mains joint boxes, insulating and rubber tapes, and electrical sundries. Specifications from the Borough Electrical Engineer.

BATTLE URBAN DISTRICT COUNCIL, April 16th.—Electrically driven borehole pump, at Powdermill Lane pumping station, and two sets of electrically-driven boosting pumps at Starr's Green booster station. Plant to be of British manufacture and complete with electrical equipment and cable connections. Specification, etc., from Messrs. J. Taylor and Sons, Caxton House, Westminster, S.W.1; deposit £5.

CENTRAL ELECTRICITY BOARD, April 16th.—Construction of site works and foundation works for the transforming stations at Ribble (Preston) and Lancaster. Specification (N.W.E.—P.F.1) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

FIFE EDUCATION AUTHORITY, April 16th.—Electrical work in new elementary school, Sinclairtown, Kirkcaldy. Schedules, etc., from Mr. George Sandilands, Education Offices, Wemyssfield, Kirkcaldy; deposit £1 1s.

DUNDEE CORPORATION, April 23rd.—One year's supply of stores and materials to the tramways department. Specifications, etc., from the General Manager, Transport Office, Dundee.

NEWTOWNARDS (CO. DOWN) GUARDIANS, April 26th.—Electrical plant and wiring, etc., in connection with conversion of workhouse into a district hospital. Specification from Mr. John Warden, clerk to the Guardians; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, April 28th.—Supply and erection of 33 kV, 11 kV and 6·6 kV switchgear, for connecting Board's supply to electricity supply undertakings, under N.W. England and North Wales scheme. Specification (No. N.W.E.-G.S. 4) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 5th.—Supply and erection of 33 kV transmission line crossing of the river Witham, Boston, under Mid-East England scheme. Specification (No. M.E.E.-S.L. 3) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

DUNDEE CORPORATION, May 10th.—Supply and erection of two electrically-driven, vertical spindle main circulating water pumps, in pump room, in connection with Carolport generating station. Specification, etc., from Mr. D. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12th.—Supply and erection of 66 kV and lower voltage switchgear. Specification (No. M.E.E.-G.S. 1) from Mr. R. H. Fox, secretary and

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solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2 ; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12th.—Supply and erection of 66 kV and lower voltage transmission lines, under the Mid-East England scheme. Specification (No. M.E.E.-S.L. 2) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2 ; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice essential.*

PALERMO (SICILY).—Supply of five electric coal elevators, of 80 tons capacity, and 20 (or more) electric cranes, from two to five tons capacity, for new pier at Palermo. (Reference A.X. 9 302.)

SYNDICAT INTERCOMMUNAL D'ELECTRICITÉ DES DEUX SEVRES, TOURS.—Erection of transmission lines, under project, for supplying electricity to 195 villages.

ST. GILLES (BRUSSELS) MUNICIPALITY, April 5th.—Supply of 1 000 5 A and 400 3 A meters and 204 of various capacities, all for 220 V d.c. circuits. Further information (Fr. 5) from Service de l'Electricité, 40, Rue de Bethléem, St. Gilles.

WEST MEATH COUNTY BOARD OF HEALTH, April 7th.—Electric wiring and supply of lamps, etc., at District Hospital and Dispensary, Athlone. Form of tender from Board of Health Offices, Mullingar.

INDIAN STORES DEPARTMENT, April 8th.—Supply of oil engine driven d.c. generating sets, for Manzai power station (Military Engineering Service). (Specification B.X. 6 270.)

PORT ELIZABETH MUNICIPALITY, April 10th.—Supply of electric cable and overhead line material (specification No. 40). (Reference B.X. 6 282.)

ANTWERP MUNICIPALITY, April 11th.—Supply and erection of two mercury rectifiers at transformer station, Quai 232. Further information (Fr. 6) from Hotel de Ville.

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o International Construction Co., Ltd., 56, Kingsway, London W.C.2.

INDIAN STORES DEPARTMENT, April 14th.—Supply, erection, etc., of three oil engine-driven d.c. generating sets. (Reference B.X. 6 231.)

VICTORIAN ELECTRICITY COMMISSION, April 14th.—Supply of 22 000 V switchgear and accessories, for sub-station "C" at Brunswick (specification No. 30/17). (Reference B.X. 6 182.)

NEW ZEALAND POSTS AND TELEGRAPHS, April 15th.—Supply of 4-conductor cords (P. and T. 151/2 218). (Reference B.X. 6 303.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Supply of lead-covered switchboard cable (schedule C.574). (Reference B.X. 6 202.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 22nd.—Supply of braided switchboard cable. (Reference B.X. 6 201.)

Underground Cables.

ORADEA MARE (TRANSYLVANIA) MUNICIPALITY, April 24th.—Supply of lead-covered, double steel tape-armoured, underground cables. (Reference B.X. 6 298.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, April 28th.—Supply and erection of electrically driven high lift and low lift pumping plants, etc., for South-West Tablelands Water Supply (tender No. 51, 1929/1930). (Reference A.X. 9 219.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

VICTORIAN ELECTRICITY COMMISSION, May 5th.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000 V circuit (specification No. 30/19). (Reference B.X. 6 226.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

CAPE TOWN MUNICIPALITY, May 7th.—Supply of l.t. iron-clad switchgear. (Specification No. 492/1930.) Reference B.X. 6 293.)

COPENHAGEN MUNICIPALITY, May 10th.—Supply of switchgear and rectifier plant for Eskildsgade sub-station (Reference B.X. 6 271.)

COPENHAGEN MUNICIPALITY, May 12th.—Supply and erection of two turbo-generators. (Reference B.X. 6 297.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13th.—Supply of terminal strips (P. and T. 151/2 200). (Reference B.X. 6 209.)

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22nd.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc. (Reference A.X. 9 212.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of cable clamps, for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

Tenders Accepted.

CROYDON CORPORATION.—A. Reyrolle and Co., Ltd., supply of switchgear, £1 380 12s. (Recommended).

ADMIRALTY.—Siemens Electric Lamps and Supplies, Ltd., supply of Siemens special battery signalling lamps.

TORQUAY CORPORATION.—Vanstone and Sons, encasing electric wiring at Torre Abbey Sands café in steel tubing, £85.

GLASGOW CORPORATION.—Darroch and Espir, further electrical installation at Shieldhall Hospital, £264 19s. 1d. (Recommended.)

SYDNEY (N.S.W.) CIVIC COMMISSIONERS.—A. Reyrolle and Co., Ltd., supply of 11 000 V metal clad switchgear, for sub-stations, £65 677.

SHEFFIELD EDUCATION COMMITTEE.—Corporation Electric Supply Department, installation of electric wiring and fittings at Earldom Road Council school, £516.

BRENTFORD GUARDIANS.—Electrical Installations, Ltd., provision of central switchboard and laying of electric mains at West Middlesex Hospital, Isleworth, £2 504.

GENERAL POST OFFICE.—Telephone exchange equipment, Post Office Stores Department (Studd Street, London, N.), Standard Telephones and Cables, Ltd. Telephonic repeater equipment, Birmingham, General Electric Co., Ltd. ; Leeds, Standard Telephones and Cables, Ltd.

LONDON AND NORTH EASTERN RAILWAY.—Edison Swan Electric Co., Ltd., 12 months' supply of electric lamps (contract No. 194) ; Metro-Vick Supplies, 12 months' supply of electric lamps ; Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of Siemens gasfilled, vacuum and carbon filament lamps.

LOWESTOFT CORPORATION.—Ferguson, Pailin Ltd., supply and erection at Oulton Broad of e.h.t. sub-station switchgear, l.t. distribution switchgear and switch kiosks, £1 308 (recommended). Also tendered : Switchgear and Cowans, Ltd. £2 034 ; Metropolitan-Vickers Electrical Co., Ltd., £1 838 ; A. Reyrolle and Co., Ltd., £1 804 ; General Electric Co., Ltd., £1 797 ; Crompton Parkinson, Ltd., £1 578 ; English Electric Co., Ltd., £1 509 ; J. G. Statter, Ltd., £1 420 ; British Thomson-Houston Co., Ltd., £1 366. Foster Engineering Co., Ltd., supply and erection of two transformer kiosks at Kessingland, £544 (recommended). Also tendered : A. Reyrolle and Co., Ltd., £1 538 ; British Thomson-Houston Co., £850 ; English Electric Co., Ltd., £819 ; General Electric Co., Ltd., £814 ; British Thomson-Houston Co., Ltd., £777 ; Johnson and Phillips, Ltd., £775 ; Yorkshire Switchgear Co., Ltd., £751 ; Switchgear and Cowans, Ltd., £708 ; Yorkshire Transformer Co., Ltd., £679 ; Crompton Parkinson, Ltd., £654 ; W. Lucy, Ltd., £603 ; Metropolitan-Vickers Electrical Co., Ltd., £552 ; Ferguson, Pailin Ltd., £552.

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WORK IN PROSPECT.

COSHAM.—Extensions, Portsdown School, to cost £13 757. Particulars from the contractors, Green and Foley, Eastleigh.

EYEMOUTH.—School to cost £36 000. Particulars from the architects, John Scotland and Sons, Airdrie.

GLASTONBURY.—Houses (26), for the Town Council. Particulars from the Borough Surveyor.

KINGSTON-ON-THAMES.—Houses (140), for the Town Council. Particulars from the Borough Surveyor.

LEYLAND.—Houses (22), for the Urban Council. Particulars from the Surveyor.

MAIDENHEAD.—Houses (16), for the Town Council. Particulars from the Borough Surveyor.

MALTBY.—Houses (40), for the Urban Council. Particulars from the Surveyor.

MANSFIELD WOODHOUSE.—Additional 54 houses, for the Urban Council. Particulars from the Surveyor.

MOTHERWELL.—Houses (60), for the Town Council. Particulars from the Burgh Surveyor.

NELSON.—Four schools to cost £94 248, for the Borough Education Committee. Particulars from the Director of Education.

NEWCASTLE (STAFFS).—Church hall to seat 500. Particulars from the rector, Rev. L. J. Baggott.

OLD FLETTON.—Houses (72), for the Urban Council. Particulars from the Surveyor.

ROTHERHAM.—Houses (440), for the Town Council. Particulars from the contractors, H. E. Pitt, Ltd., Sunderland.

SAFFRON WALDEN.—Houses (24), for the Town Council. Particulars, from the Borough Surveyor.

SOUTHPORT.—Skin diseases hospital and clinic, for the Town Council. Particulars from the Borough Engineer.

SPALDING.—Houses (27), for the Urban Council. Particulars from the architect, Mr. A. E. Palmer, IA, Pinchbeck Road.

STAFFORD.—County offices for Staffs County Council. Particulars from the Clerk.

STOCKPORT.—Houses (180), and 40 flats, for the Town Council. Particulars from the Borough Surveyor.—Senior school (720 places), for the Borough Education Committee. Particulars from the Secretary, Mr. A. Lawton.

STOCKTON-ON-TEES.—Extensions, Portrack Schools, to cost £7 749. Particulars, Mr. J. C. Watson.

STOWMARKET.—Housing scheme. Particulars, the Surveyor.

STROUD.—Houses (31), for the Urban Council. Particulars from the contractors, Wheatley and Sons.

TAUNTON.—Schools and extensions to cost £19 435, for the Borough Education Committee. Particulars from the Director of Education.

TEDDINGTON.—Church to cost £18 000, for St. Mark's Parish. Particulars from the Incumbent.

THORNE.—100 new houses, for R.D.C. Particulars, H. Plewes, surveyor, Thorne, near Doncaster.

TWICKENHAM.—Houses (72), for the Town Council. Particulars from the Borough Surveyor.

WAKEFIELD.—Wiring 1 000 houses, to cost £10 000. Particulars, L. Ives, borough surveyor, Town Hall, Wakefield.

WARRINGTON.—Bakery for the Co-operative Society. Particulars, the Architect, Balloon Street, Manchester.

WARWICK.—County offices to cost £13 500, for Warwickshire County Council. Particulars from the County Architect.

WELLS (SOMERSET).—Extensions, District Hospital. Particulars, the Secretary.

BOARD OF TRADE ANNOUNCEMENT.

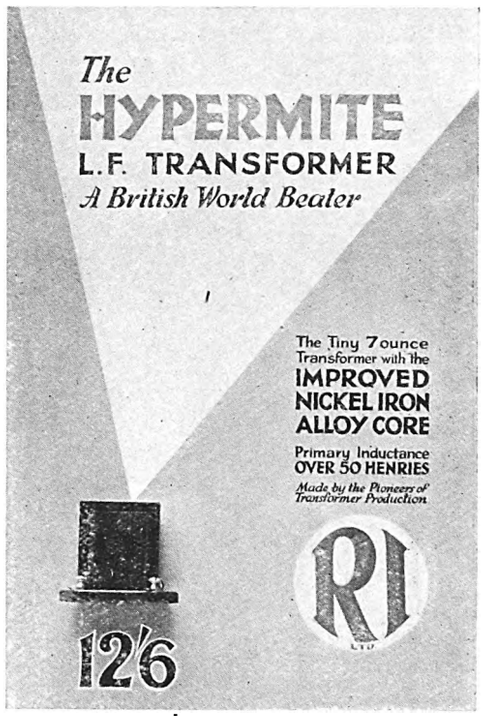
The Lord Chancellor and the President of the Board of Trade have appointed a Committee to consider present trade practices which result in withholding from particular retail traders supplies of goods in which they wish to deal or which prevent the resale of such supplies except upon conditions imposed by the suppliers, and to report whether in their opinion all or any of such practices are detrimental to the public interest, and, if so, what alterations in the existing law are necessary to prevent the continuance of such practices. The membership of the committee is as follows:—Messrs. W. A. Greene (chairman), Alexander Johnston, D. H. Macgregor, W. E. Mortimer, J. E. Singleton, A. G. Walkden. The Secretary to the Committee, to whom all correspondence should be addressed, is Mr. C. K. Hobson, Board of Trade, Great George Street, London, S.W.1.

TRADE PUBLICATIONS.

AMONG the latest publications of the BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester, is a booklet devoted to voltage regulators for tapped transformers.

GENT AND CO., LTD., Faraday Works, Leicester, have published Book 7, section 26, relative to electro-motor syrens and far-reaching fog signals, and Book 1, section 16, dealing with electric bells and indicators.

RADIO INSTRUMENTS, LTD., 12, Hyde Street, London, W.C.1, have issued a novelty showcard relative to the "Hypermite" transformer. As will be seen from the accompanying illustration, the transformer forms an accessory to the showcard, making altogether an arresting sales aid for window or counter display.



A new showcard issued by Radio Instruments, Ltd.

The range of d.c. motors and generators falling under class "F" and manufactured by CROMPTON PARKINSON, LTD., Guiseley, Leeds, is dealt with in Specification A 302, the second edition of which has just been issued.

The report of a test carried out by Mr. W. A. Tookey on the "Petter Atomic" Diesel engine is the subject of publication No. 2 007, by PETTERS, LTD., Yeovil.

A new issue of "Aluminium Foundry Data" bearing No. 328 and superseding No. 213 has been published by the BRITISH ALUMINIUM CO., LTD., Adelaide House, King William Street, London, E.C.4.

The NORRIS WARMING CO., LTD., 11-12, St. Andrew's Hill, London, E.C.4, has sent us an artistically coloured calendar entitled "What Can I Do For You?" The subject is a charming girl artist sitting before an easel, armed with paint brushes and colours.

The latest publications of SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E., include a new catalogue No. 641 dealing with batteries and price list No. 648 concerning radio batteries for portable sets. The latter publication indicates which batteries are the most suitable for various well-known radio receivers.

CROMPTON PARKINSON, LTD., Bush House, Aldwych, London, W.C.2, have issued two new booklets, D903 and D904 dealing with the installation and maintenance of Parkinson a.c. and d.c. motors respectively. Both booklets are well illustrated with explanatory diagrams and adequate descriptive matter is provided.

MAVOR AND COULSON, LTD., 47, Broad Street, Glasgow, S.E. have issued a special brochure introducing their new driving gear for electric shaker conveyors.

The REVO ELECTRIC CO., LTD., has sent us a copy of a new catalogue which is a most comprehensive and interesting list. It contains very many new and scientifically designed fittings and should prove a very great assistance to street lighting engineers. The company believes that it is the most comprehensive list issued by any firm in the class of material covered by the issue and will be a useful addition to the bookshelves of most electrical people. The reference is No. 14. We have also received a leaflet dealing with the new "Matchless" fire fitted with a switching arrangement which gives even distribution of heat over the reflector even when the whole of the element is not switched on full. The reference of this leaflet is No. 161.

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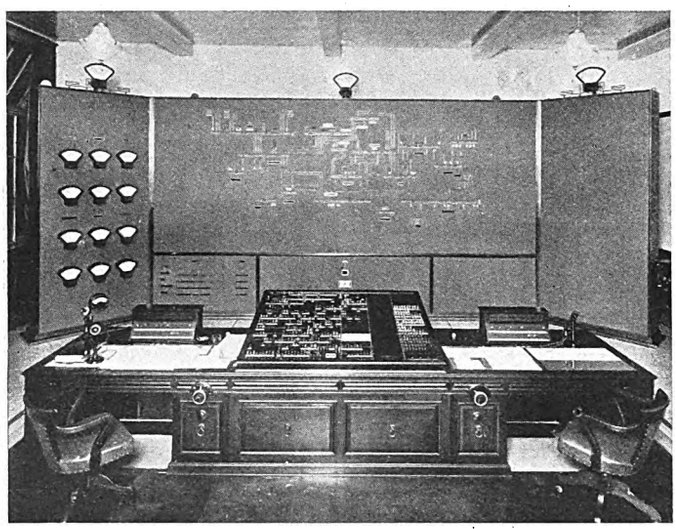
ELECTRICITY SUPPLY.

Withdrawal of Coventry Extension Scheme—Eston and Easy Purchase—Stirling and Bulk Supply—Hydro-Electric Development in India.

COVENTRY Corporation's scheme for the extension of the Longford generating station at a cost of £162 000 has been withdrawn in deference to the wishes of the Electricity Commissioners.

Sanction has been obtained by Bexhill Electricity Committee to borrow £6 117 for plant extensions at the northern sub-station. The committee has decided upon the provision of plant, etc., and replacement of distributor cables, at a cost of £7 420.



COMPLETE operating control and protection of the entire system of the London Power Company is maintained from Ergon House, Westminster, by means of control cables and pilot telephones which connect with main generating plants and the numerous sub-stations. Our illustration shows the interior of Horseferry Road sub-station, where a central control box is seen mounted on the desk. Lever settings indicate the bus bars to which various circuits are connected, while the Monel metal covering ensures a durable, non-corrosive surface of good appearance. Beyond the desk is situated the control panel consisting of slate slabs mounted in a Monel metal framework. The complete circuit diagram on the panel is of inlaid Monel metal strip, as are also the "label-frames," which appear as black slots in the board. The mountings for ammeters and voltmeters are likewise made from Monel metal, the whole lay-out being indicative of the work carried out by A. Reyrolle and Co., Ltd., of Hebburn-on-Tyne.

The Electrical Engineer has submitted to Eston Electricity Committee particulars of an easy purchase scheme which has been successfully operated by the Newcastle Electric Supply Co. in the north-east area. The system applies to all kinds of domestic apparatus and fittings, and can also include installations if desired. The Committee decided to adopt a similar scheme.

Lowestoft Electricity Committee has obtained all requisite wayleaves in connection with the proposed supply of current to Kessingland, and the Electricity Commission has sanctioned the borrowing of £414 for buildings, etc., in connection with the supply.—The Minister of Transport has consented to overhead lines at Oulton Broad for the transmission of electric energy at a pressure of 460/230 V.

Marylebone (London) Electricity Committee has decided to provide 61 circuit breakers for the d.c. feeders at the generating station, in place of existing fuse equipment, the positions of which will have to be altered to allow sufficient space for the erection of new e.h.t. switchgear, at a cost of £1 970, and to lay ducts for the diversion of d.c. and e.h.t. feeder cables incidental to the erection of new switchgear, at a cost of £4 600.

A party of motorists visited Lewisham, London, last week, to see a demonstration of systems of street lighting on the main road through the borough. The South Metropolitan Gas Co. have fixed a series of high-power gas lamps suspended over the middle of a mile of the road, and the South Metropolitan Electric Light and Power Co. has fixed electric lamps on high standards with brackets at points on the side of a second mile of road. The experiments are being made with a view to adopting the system which is considered most likely to minimise the number of road accidents.

The Shawinigan Water and Power Co. will shortly begin work on the development of the first six sites available for water power development on the Upper St. Maurice River. The site chosen for initial development is that of Rapide Blanc, where 160 000 H.P. can be obtained. There has been placed in operation a new transmission line connecting Thetford asbestos mines with the company's Quebec terminal station, which receives its power from the Ile Maligne plant of the Duke-Price Power Co. on the Saguenay River. This line is 55 miles long and is designed to transmit 20 000 kW.

Mr. F. Gordon Tucker, on behalf of the Ministry of Transport, held an inquiry recently into Liverpool Corporation's scheme to erect overhead cables in the Whiston district. For Huyton-with-Roby U.D.C., which opposed the granting of the powers, Mr. J. H. Peters, clerk of the Council, said the wires would spoil the countryside and be a source of danger. The inspector said the margin of safety in this country was largely in excess of that adopted anywhere else. Mr. D. Seymour, for the Corporation, said the cost of an underground line would exceed that of the overhead line by 200%.

The completion of the first stage of the scheme for the generation of electricity by utilising the waters of the Uhl river, in Mandi State, India, is expected to be achieved by the autumn of 1932. The first stage comprises plant to produce 36 000 kW, and it is estimated to cost from £4 000 000 to £4 500 000, compared with the original estimate of £3 200 000, the increase being due to unexpected weakness having been discovered in the mountain strata through which a tunnel is being driven, which also accounts for the extension of the estimated time of completion from 1930 to 1932. Ultimately the extension of the scheme so as to supply 120 000 kW is contemplated.

Stirling T.C. has been informed by the Central Electricity Board that it is not economically possible for the Board to give a supply of 250 kW to the Council, in view of the relatively large capital expenditure involved in the erection of transmission lines from the nearest grid point at Bonnybridge. Mr. M'Coll, on behalf of the Board, has suggested that the Council consider the closing down of its present power station and the taking of a bulk supply for the whole of its requirements. The Electricity Committee recommends that the Council should not agree to the closing-down of the power station, but should take a supplementary supply from the Scottish Central Electric Power Co., provided suitable terms can be arranged. The Council has decided to have a report prepared on the cost of generating the additional supply themselves, as against the cost of taking the supply from the Scottish Central Co.

At the meeting of Birmingham Corporation, on Tuesday, the Electric Supply Committee reported that in connection with the change of frequency, and so that the undertaking might be in a position to meet the demand for 50 cycle supplies as and when the change-over programme progressed, it had been found necessary, after conferring with the Central Electricity Board and the Electricity Commissioners, to provide new generating plant, switch-gear, buildings and cables. The estimated cost of the extension at generating stations and sub-stations was £519 050, and of mains £176 825, making a total of £695 875. The whole of this expenditure was necessary at this stage for the purpose of enabling the frequency-change programme to be proceeded with effectively; consequently the Central Electricity Board would provide the whole of the capital required. The Board would also bear the interest and sinking fund charges thereon until such time as the equipment, or portions of it, would have been required to meet the normal growth of the load on the undertaking. So far as could be seen at the moment, it would appear likely that the transfer of liability from the Board to the Corporation would commence in about five years and become complete in seven years. The Committee recommended the Council to give its approval of the scheme.

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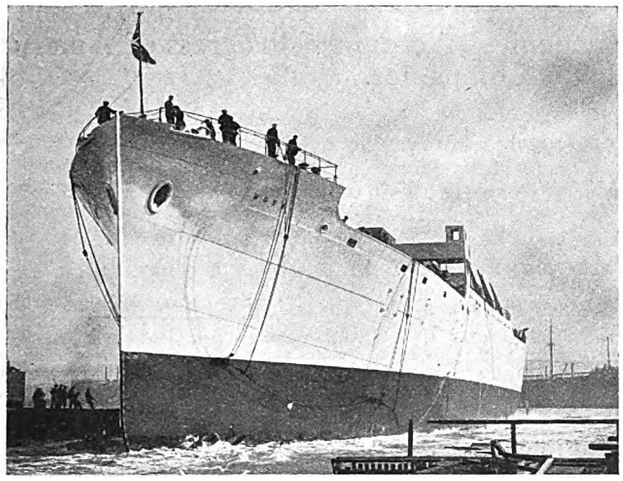
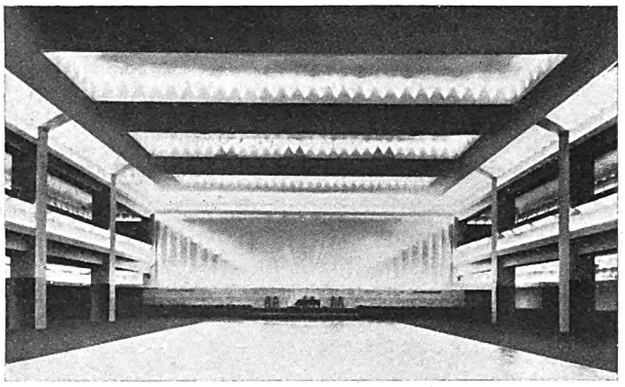
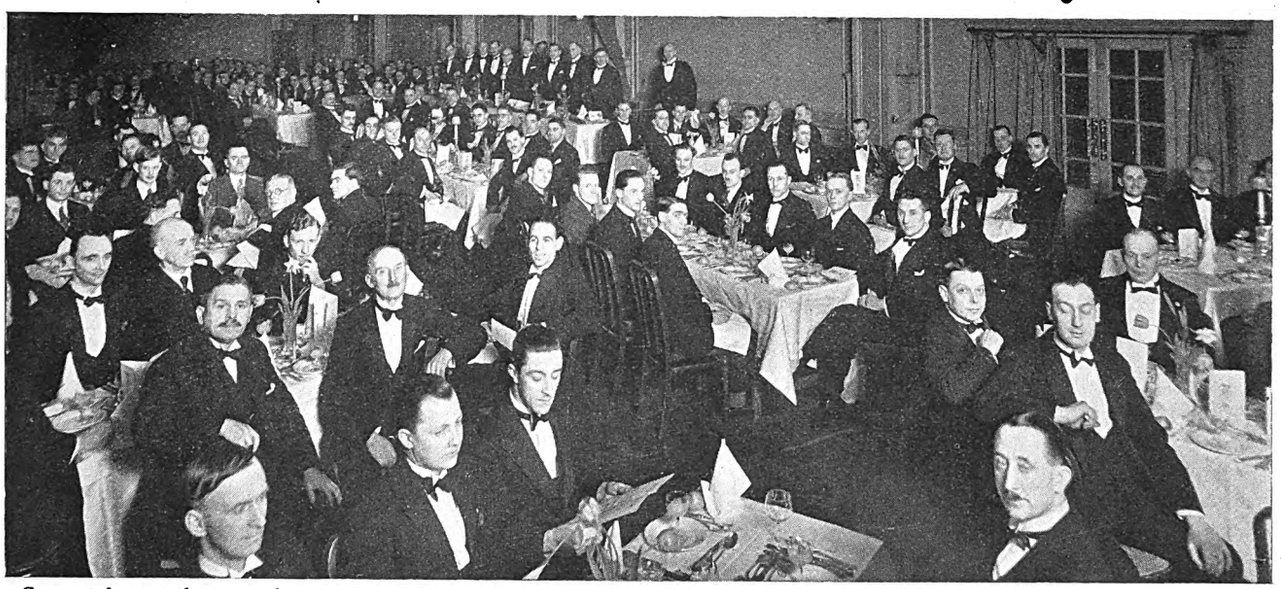
ELECTRICAL NEWS IN PICTURES.



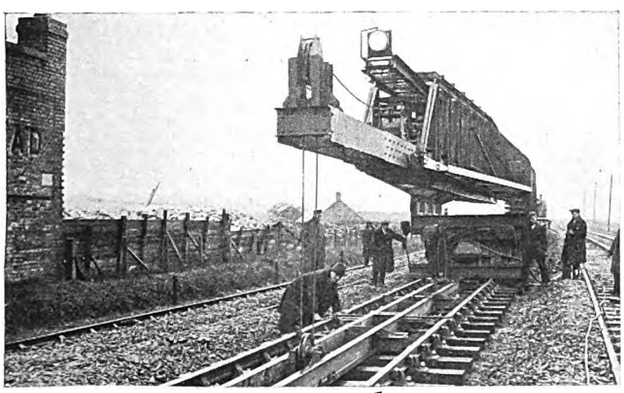
The new turbo-electric ship "Musa" was launched at Belfast on Saturday last, and here she is seen leaving the slipway. She is a 6 000-ton vessel built by Workman Clark (1928), Ltd., for Elders and Fyffes, Ltd., and is fitted with B.T.H. propulsion equipment. The "San Benito," the first turbo-electric vessel built in Great Britain, was also built by Workman, Clark, Ltd.

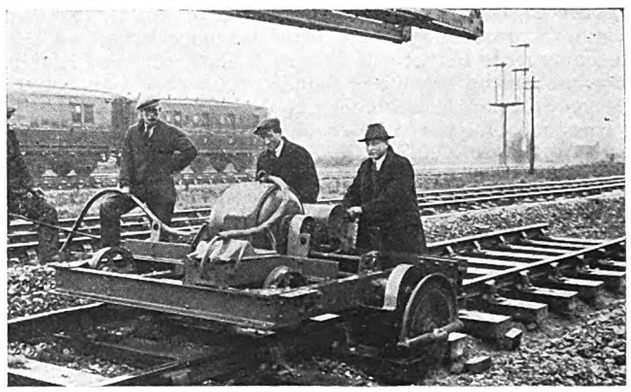


What is claimed to be the largest hotel ballroom in the world is found in the new Hotel St. George, in Brooklyn, N.Y., where the lighting arrangements can also claim to something out of the ordinary. Modernistic effects are obtained in the manner shown in the illustration above, while changing shadow and colour schemes in the form of laylights are also introduced.



Group taken at the seventh annual staff dinner of the Automatic Telephone Manufacturing Co., Ltd., held on March 21st in the Banqueting Hall of the Exchange Hotel, Liverpool. Covers were laid for some 160 members and guests and the function proved highly successful. The chairman of the company, Sir Alexander Roger, presided, other directors present being Mr. H. L. Harris, Mr. G. W. Moore, and Mr. Eric Taylor. "The Company" was proposed jointly by Mr. G. Male and Mr. T. R. Rayner, the Chairman responding. "Our Associates," proposed by Mr. G. W. Moore, was responded to by Mr. H. L. Harris, whilst "Guests" were toasted by Mr. H. H. Harrison and acknowledged by Mr. E. A. Ward, of Siemens Electric Lamps and Supplies, Ltd. Following the dinner appropriate entertainment was provided by Miss Gladys Sweeney, Miss Gladys Simcoe, Mr. Foden Williams, and Mr. Walter Jones and Partner, whilst Mr. John Pennington's Quartet rendered selections during dinner.





The L.N.E.R. has put into operation new equipment for the quick changing of rails. The plant consists of a special electrically operated cantilever truck, which lifts part of the old track and transfers it to a wagon. An electric winch is used in conjunction with the truck, and this pulls the new length of track into position ready for bolting up. The cantilever truck in actual operation at Cambridge may be seen in the left-hand picture, while an electrically-driven saw, used for cutting the sleepers into 8 ft. 6 in. lengths to facilitate their lifting by the cantilever, is shown on the right.

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FINANCIAL INTELLIGENCE.

Analysis of Electric Railway and Tramway Companies' Accounts—Progress of American and Canadian Telephone Companies.

By "AUDITOR."

BANK RATE (1929–1930).

1929.			1930.	
Feb. 7	5½%	Nov. 21	5½%	Feb. 6	4½%
Sept. 26	6½%	Dec. 12	5%	Mar. 6	4%
Oct. 31	6%			Mar. 20	3½%

AN ANALYSIS OF SOME 1929 RESULTS OF BRITISH AND FORFIGN ELECTRIC RAILWAY AND TRAMWAY UNDERTAKINGS, cet., IS TABULATED BELOW :—

1929 Accounts	Brt. Forwd. £	Profit, 1929 £	Total £	Crd. Forwd. £	Ann. Div.	Price	Yield	Notes
Bristol Tramways	3 786	163 566	167 352	4 277	—	—	—	At December 31st last, 34 miles of electric tramway routes were in operation. In November, 1929 the ordinary and preference shares were sub-divided from £10 to £1.
" " 4% Mort. Deb.	—	—	—	—	—	—	—	
" " 4½% Mort. Deb.	—	—	—	—	—	—	—	
" " 4% Cum. Pref.	—	—	—	—	—	—	—	
" " Ord.	—	—	—	—	10%	—	—	
City of Buenos Aires Trams	1 346	72 501*	73 847	501	5% £5 Shares	85/7½	5 1/16	An annuity from the Anglo-Argentine Co. is sufficient to provide the debenture interest and 5% dividend on shares. * Including annuity of £70 660 received from Anglo-Argentine Co.
" " " 4% Deb. Stk.	—	—	—	—	—	—	—	
Dublin United Trams	13 786	48 852	62 638	12 078	—	—	—	A policy effected with a leading insurance company ensures the payment to the company in 1939 of the discount of 5% at which the debenture stock was issued.
" " 3½% Mort. Deb.	—	—	—	—	—	—	—	
" " 3½% " B " Deb. Stk.	—	—	—	—	—	—	—	
" " 6% Non-Cum. Pref.	—	—	—	—	Pref. only	—	—	
" " Ord.	—	—	—	—	—	—	—	
Fife Trams	5 819	99 772	105 621	25 286	—	—	—	All outstanding 5½% five-year registered notes are being repaid as at March 31st.
" " 6% Cum. Pref.	—	—	—	—	—	15/9	7 1/8	
" " Ord.	—	—	—	—	4%	12/6	£6/13/1¼	
Liverpool Overhead Rly.	3 730	16 979	20 709	5 623	—	—	—	No rent is payable to the Dock Board until after the profits amount to 6% per annum on the cost of the undertaking.
" " 4% Deb. Stk.	—	—	—	—	—	—	—	
" " 5% Pr. Pref.	—	—	—	—	5% Pref.	—	—	
" " Ord. (£10)	—	—	—	—	—	—	—	
London & Sub. Traction	36 137	10 480	46 617	46 617	—	—	—	No dividend was paid last year, although £24 595 5% " A " Deb. Stk. was purchased and cancelled.
" " 4½% 1st M. Deb. Stk	—	—	—	—	—	65	—	
" " 5% " A " Deb. Stk.	—	—	—	—	—	96	—	
" " 5% Cum. Pref.	—	—	—	—	—	10/-	—	
" " Ord.	—	—	—	—	—	2/-	—	
London United Trams	—	17 384	—	—	—	—	—	A Bill seeking authority to equip trolley vehicles has been deposited.
" " 4% 1st M. Deb. Stk.	—	—	—	—	—	51½	—	
" " 5% Cum. Pref.	—	—	—	—	—	3/6	—	
" " Ord. (5/-)	—	—	—	—	—	7d.	—	
Metro. Elec. Trams	—	6 934	—	—	—	—	—	During 1929 £13 124 4½% Deb. Stk. and £11 441 5% Deb. Stk. were purchased and cancelled.
" " 4½% Deb. Stk.	—	—	—	—	—	—	—	
" " 5% " "	—	—	—	—	—	—	—	
" " 5% Cum. Pref.	—	—	—	—	—	—	—	
" " Ord.	—	—	—	—	—	—	—	
Metro. Rly.	23 888	844 515	868 403	32 014	—	—	—	There is every prospect of continued growth of traffic.
" " 3½% Deb. Stk.	—	—	—	—	—	71	4 1/16	
" " 3½% " A "	—	—	—	—	—	70	5	
" " 4% Deb. Stk.	—	—	—	—	—	—	—	
" " 3½% Pref. Stk.	—	—	—	—	—	63	6 5/8	
" " 3½% " A " Pref. Stk.	—	—	—	—	—	62	5 11/16	
" " 3½% Conv. Pref. Stk.	—	—	—	—	—	69	5 1/16	
" " 5% Pref. Stk.	—	—	—	—	—	88	4	
" " Cons. Stock	—	—	—	—	4%	65	6 2/13	
" " Surplus Lands Stk.	—	—	—	—	3½%	73¼	5 1/16	
Provincial Trams	3 679	15 479	19 158	3 649	—	—	—	
" " 5½% 1st Deb. Stk.	—	—	—	—	—	—	—	
" " 6% Cum. Pref.	—	—	—	—	6% (Pref.)	—	—	
" " Ord.	—	—	—	—	—	—	—	
Singapore Traction	2 539	51 098	53 637	3 367	—	—	—	Controlled by Shanghai Elec. Construction Co. The preference dividend arrears amount to 11%.
" " 6% 1st M. Deb. Stk.	—	—	—	—	—	—	—	
" " 7% Cum. Pref.	—	—	—	—	7% (Pref.)	17/10½	—	
" " Ord.	—	—	—	—	—	—	—	
S. Metro. Elec. Trams	11 139	57 651	68 790	11 790	—	—	—	Controlled by London and Sub. Traction Co.
" " 4% 1st M. Deb. Stk.	—	—	—	—	—	—	—	
" " 6% Cum. Pref.	—	—	—	—	—	—	—	
" " Ord.	—	—	—	—	5%	—	—	
S. Staffs. Trams	895	2 131	3 026	747	—	—	—	A perpetual lease of tramways has been granted to S. Staffs Trams (Lessee) Co.
" " 6% Non-Cum. Pref.	—	—	—	—	3%	—	—	
" " Ord.	—	—	—	—	—	—	—	
Torquay Trams	1 786	73 780*	75 566	2 026	—	—	—	The trolley system is to be substituted. * Including £50 500 profit on sale of shareholding in Devon Gen. Omnibus & Touring Co.
" " 5% Prior Lien Debs.	—	—	—	—	—	85	5 1/16	
" " 5% Deb.	—	—	—	—	—	—	—	
" " Ord.	—	—	—	—	9% Plus Bonus	—	—	
Bogota Tele. Co. (June 30th, 1929)	6 603	16 727	23 330	5 235	7	33/1	4¼	During the latter part of 1929, 1 000 additional stations were connected.

PARA ELECTRIC RAILWAYS AND LIGHTING CO., LTD.

The accounts of this company, which was registered in 1905 to acquire the tramway and electric lighting undertakings of the Compania de Estrada de Ferro Paraense, of Para, Brazil, show that during the year ended November 30th last, passengers carried amounted to 2½% more, and at £182 071, the gross receipts were £2 925 higher. Operating expenses showed no material increase and amounted to £107 958, and after taking credit for interest, transfer fees, and miscellaneous receipts, the net revenue for the year is shown at £74 305—an increase of £2 295. In 1928 nothing was deducted from the book value of the company's investments, but last year the sum of £3 189 was written off, consequently the net profit has suffered a reduction of about £700, the figure being £28 103. This amount has been allocated as under, after adding £5 002 brought in from the previous accounts :—

Brought forward from 1927-28 accounts		£5 002
Net profit for 1928-29		28 103
		33 105
Dividend of 6% on £325 000 cum. pref. shares		£19 500
Transferred to Depreciation and Renewals Reserve		10 000
Carried forward to 1929-30 Appropriation		3 605
		33 105

During the year £5 935 was debited to depreciation and renewals.

UNDERGROUND RAILWAYS GROUP.

The following are the sums placed to reserve, and the amounts carried forward in the 1929 accounts of the Common Fund Companies of the Underground Electric Railways of London :—

	To Reserve. £	Carried Forward. £
Metro. District	90 000	44 768
London Electric	157 198	177 152
City and South London	25 000	36 179
Central London	40 000	105 053
London. Gen. Omnibus	390 000	97 356
Assoc. Equipment	—	201 261
Underground Elec.	—	262 504

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.

Principal features of results for the last two years are compared below :—

	Dec. 31, 1929. £	Dec. 31, 1928. £
Gross Receipts	921 528	905 816
Net Profit	203 111	193 420
Ordinary Dividend	178 909	178 909
5% War Loan	381 952	515 120
Investments in Subsidiary Co.'s	273 178	291 949
Shares in Associated Co.'s	109 606	97 666
Cash	12 603	38 672
Carried forward	17 405	36 689
Dividend	15%	15%

At 43s., the shares yield about 7%.

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COMPANY NEWS.

Relapse in Cables and Wireless Stocks—Progress of Scottish Power Co.'s Works—Shropshire, Worcestershire and Staffordshire Co.'s Expansion—Directors' Reports, etc.

THE recent reply in the House of Commons by the Postmaster-General to the critics of his decision not to make use of the Marconi beam stations for his overseas telephone service, led to a relapse in the stocks of the Cables and Wireless company, and, although a recovery has set in, prices are lower than when we last wrote. American Telephone and Telegraph capital stock, on the other hand, has jumped up 15 points, and is now quoted at 270. Radio Corporation of America shares, though not closing at the best, show a rise of several points compared with a week ago. Hydro-Electrics and International Holdings have both been bought freely during the past week, and both show a considerable further advance in price.

Equipment favourites show irregularity. Enfield Cable Works ordinary at 92s. 6d. are 5s. down, and Callender's at 75s. have lost half-a-crown. General Electrics at 47s. 6d. and Siemens at 25s. have each gained 1s. 3d., while Ever-Readies have jumped from 18s. to 19s. 6d. Associateds have shed a shilling. Crompton Parkinson preference issues have changed hands at higher figures, and the quotation for 9% second preference is 2s. up.

The electricity supply section continues to show a cheerful appearance. City of London shares at about 34s. 6d. are 1s. 3d. up, Chelsea's have advanced from 25s. to 25s. 6d., and St. James's from 26s. 6d. to 27s. Yorkshire Electric Power ordinary shares are 1s. 3d. higher at 33s. 9d., and Shropshire, Worcestershire and Staffordshire preference are up from 22s. to 22s. 6d. Newcastle-upon-Tyne Supply shares have put on another 7½d., bringing them to 25s. Scottish Power shares have moved up 1s. from 30s. to 31s., and Clyde Valley 6% preference are 6d. better at 28s. Central Electric Supply and Folkestone debentures are both a point higher. Calcutta Supply shares have risen half-a-crown to over £2 10s., and an advance of 1s. 3d. brings the price of Victoria Falls Power shares over £3. London Power Co.'s debentures have gained a point, being now quoted at par.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	,, ,, "C" Cum. Pref. ..	21/-	21/-	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	62/6	62/6	78/-	29/9
6	,, ,, ,, 6% Cm. Pf.	22/-	22/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	50/7½	48/1½	60/-	32/6
5	,, ,, 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	82½	82½	81	77½
4	Central Elec. Sup. 4% Deb. ..	95½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	25/6	25/6	51/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/6	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	34/4½	33/1½	52/10½	26/-
6	,, ,, ,, 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	38/9	38/9	44/6	26/6
8	,, ,, ,, 8% Pref.	28/-	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	47/6	46/10½	68/6	25/9
6	,, ,, ,, 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(*g*)	Electric Supp. Corp. Ord. ..	45/7½	45/7½	59/6	29/6
6	,, ,, ,, 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	,, ,, ,, 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	,, ,, ,, 4½% 1st Mt.Deb.Stk.	88	87	92	80½
—	Hydro Electric Securities.. ..	51½	48⅝	87	20
—	International Holdings	6⅝	6½	35½	6
(*c*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	,, ,, ,, 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	,, ,, ,, 7% Part. Cum. Pf.	28/-	27/6	31/3	24/6
1/9⅛	Lon. Elec. Sup. Ord. (£1).. ..	28/6	28/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	100	99	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	29/-	29/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	32/6	32/6	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord..	25/-	24/4½	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10½	10⅝	11⅛	9⅛
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
c)	St. James' & P.M. Ord. (£1) ..	27/-	26/6	28/6	23/6
8	Scottish Power Ord.	31/-	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/-	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	95	95	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	60/7½	59/4½	69/-	46/3
1/9⅝	W'minster Elec. Sup. Ord. (£1) ..	26/-	25/-	52/9	24/-
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/6	24/3	25/4½	18/9
6	,, ,, 1st Mt. Deb. ..	101	101	106	97½
8	Yorks Elec. Power Ord.	33/9	32/6	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/-	23/-	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	92½	91½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	125½	125½	152	116
7·67	,, ,, ,, ,, 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/-
5	,, ,, ,, 5% Cum. Pf.	12/6	12/6	15/9	13/-
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	76	75	74⅜	54
4½	,, ,, ,, 4½ Pf.	79½	79½	85½	78
4	,, ,, ,, 4% Deb.	81	81	83	75
5	City & S. London, Cons. Ord. .	69	69	65½	52
4	,, ,, 4% Perp. Deb. ..	80	80	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	79	42½
4	,, ,, ,, ,, 4% Pf. Stk.	73	73	77	68
4	,, ,, ,, ,, 4% Deb. ..	81	81	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	,, ,, ,, 5% Deb. ..	73	67	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	64½	65	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	63	63	76	60½
3½	,, ,, ,, 3½% Deb. ..	71½	71½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77	77	81¼	52½
4½	,, ,, ,, 4½% 1st Pref. ..	80½	80½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	87½*	87½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
8	Underground Electric Rlys. Ord.	23/6	23/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86½	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	4/3	4/3	16/-	3/-
4½	,, ,, ,, 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	28/-	29/-	58/6	26/3
8	,, ,, ,, 8% C.P.	51/10½	51/10½	56/9	49/6
4	,, ,, 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	38/9	38/9	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/-	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	99/4½	56/-
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/6	23/6	24/9	19/7
7	,, ,, ,, 7% Deb.	105½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153⅜	120
15	Callender's Cable Ord.	75/-	77/6	91/3	63/9
6½	,, ,, 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
12	Consolidated Signal Ord.	35/-	35/-	52/-	6/6
5	,, ,, 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	24/7½	24/4½	27/-	14/-
6	,, ,, 6% Cum. 2nd Pf.	19/-	17/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	,, ,, 7% C.P. ..	18/9	18/9	22/9	20/-
4	,, ,, 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	92/6	97/6	112/6	60/-
7½	,, ,, ,, 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	,, ,, 6% C.P.	7/6	7/6	18/9	5/-
5½	,, ,, 1st Mt. Deb. ..	89	86	103½	86
6	,, ,, Conv. Deb... ..	65½	65½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/6	18/-	92/3	17/10½
10	,, ,, 7% Partic. Pref. ..	29/-	28/9	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	47/6	46/3	81/3	26/6
6½	,, ,, "A" C.P.	23/-	23/-	26/-	22/-
7½	,, ,, "B" C.P.	25/6	25/6	27/9	22/9
7	,, ,, 1st Mt. Deb. ..	103*	102	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	127/6	127/6	136/10½	69/3
10	International Auto. Telephone Ord	37/6	37/6	50/6	35/-
10	Johnson & Phillips Ord.	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	23/9	36/6	23/6
10	,, ,, ,, Cum. Pref.	31/3	31/3	34/3	28/9
4½	,, ,, ,, Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	270	255	314½	144½
4½	,, ,, ,, Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	,, ,, 6% Prefd. Stk.	102½	102½	105½	91
1½	,, ,, Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	23/1½	22/6	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	61½	64½	90½	73½
—	"B" Ord. Stk.	31½	33½	104	33
—	5½% Cum. Pref. Stk. ..	98	99	99	90
3½	Eastern 3½% Pref. Stk.	65½	65½	70½	58½
4	,, 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	32	31½	43½	26
—	International Teleph. & Teleg. ..	$66½	$65½	161½	48½
15	Marconi Int. Mar.	45/-	45/-	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	100½	100½	102½	96
12	Oriental Telephone Ord.	56/3	56/3	65/-	41/-
—	Radio Corporation of America ..	55½	52	115⅜	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	78	78	82	73

(*a*) 19⅞d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2½d. per share. (*h*) 88s. 2·136d. *Ex dividend.

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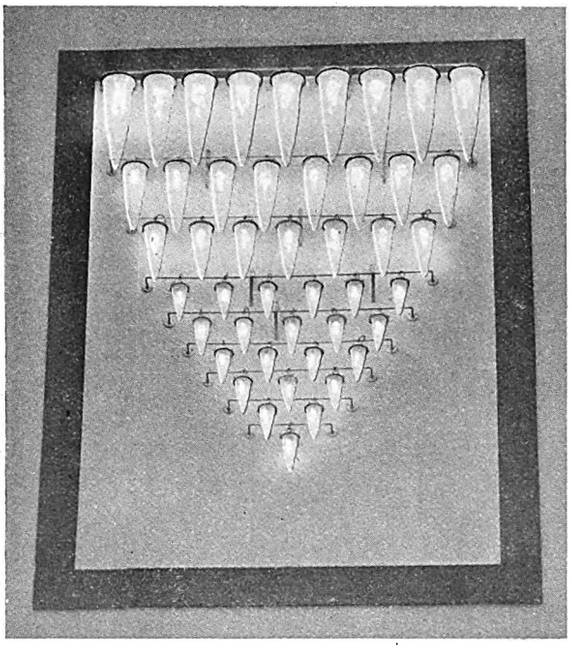
Directors' Reports, etc.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—£150 000 of 5½% con. deb. stk. was placed in the market last week at the price of 96½.

WEST GLOUCESTERSHIRE POWER CO.—Gross rev. for 1929, £80 307, agst. £60 321. Electy. sold, 13 263 745 kWh, agst. 10 947 341.



ONE of the four "Icicle" panels, by H. G. Ascher, Ltd., which may be seen each side of the archway at the west end of the main hall at Olympia, London, during the Ideal Home Exhibition.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON, LTD.—It is reported that company has placed privately £750 000 of 5% 1st mtge. debs.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—Fin. div. of 9%, less tax, makg. 15% for year (same as last year) is announced.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Qrtrly. div. of 60 cents p. sh. on common (same as last year) will be payable on April 30.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Fin. div. of 6%, less tax, on ord. shs., makg. 9% for year, agst. 8½%, is announced.

ABITIBI POWER AND PAPER CO.—Operatg. profits for past year, $8 377 246, against $7 380 963; net surplus $4 111 804, against $2 846 041, plus $59 145 391 brt. in.

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO., LTD.—Fin. div. 7% on ord. shs. for year 1929 is announced, subject to audit, makg. 11% for year (same as previous year).

BRITISH ENGINE, BOILER AND GENERAL INSURANCE CO., LTD.—After placing £20 000 to pensn. fund, £15 000 to a contingency fund and £1 334 to res., blce. to pft. and loss acct. is £20 139. Fin. div. 15s. p. sh., less tax, makg. 30s. for year.

SHAWINIGAN WATER AND POWER CO.—Gross earngs. for 1929, $13 475 863, agst. $11 562 331, net earngs. $5 907 979, agst. $4 848 524. After provision for divs. on common shs. ($2.12½ agst. $2.00) and other appropriatns., carry fwd is $1 314 027, agst. $1 928 344.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—Net pft. for 1929, £45 820, agst. £54 909. Standard div. on ord. shs. for year, 8·833%, agst. 8⅞%. To res. for ord. shhldrs. proportn. of consumers' benefit, £7 947; co-partners. sh. of consumers' benefit, £2 565. Fwd. £21 818, agst. £24 039.

AMERICAN CITIES POWER AND LIGHT CORPORATION.—Net income for 1929, $9 899 172. Net income equal to $4.24 p. sh. on average amt. of class "B" common stk. outstandg. It is stated that since Dec. 31, 1921, market value of investmts. has increased by over $5 000 000.

OXFORD ELECTRIC CO., LTD.—Net rev. for 1929, £80 803, includg. £6 449 brt. in., agst. £51 548 and £6 166. Ord. div. 7%, agst. 8½%; to res. and renewals, £15 000, agst. £25 000; fwd. £42 803, agst. £6 449. Appeal by company in regard to judgment obtained by Oxford Corporation will probably come before the Court at an early date.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—Blce. from net rev. acct. for 1929, £35 639, plus £16 579 brt. in. After paying fin. div. on 7% pref. shs. to Dec. 31, 1929, a div. of 10·477d. p. sh. on ord. shs. is recommended makg., with the intm. div. of 10d. p. sh. already paid, the standard div. for the year; to specl. res. for ord. shhldrs.' proportion. of consumers' benefit £10 610; fwd. £6 485. Electy. sold 10 392 914, increase 20·21%.

Company Meetings.

BATH ELECTRIC TRAMWAYS, LTD.—Mr. E. H. R. Trenow, presiding at the meeting on Monday, said the decrease in traffic and other receipts of £2 782 was more than offset by economies in costs of £3 168. Much of the traffic was to and from the railway stations. The new areas were served by the omnibus company, which acted in the closest co-operation with the tramways company, and, as the latter was interested in the omnibus company, it would be seen that the situation was one in which the tramways company reaped some advantage as a set-off to the loss of traffic. A dividend of 3½% was recommended on the preferred ordinary shares, leaving £703 to carry forward. The report was adopted and the dividend approved.

TORQUAY TRAMWAYS CO., LTD.—Mr. H. T. Barnett, presiding at the meeting on March 26th said, in reference to the company's Bill in Parliament, owing to the rapid growth of traffic in Torquay, due to its popularity, the congestion in the main streets had become acute, and the corporation had approached the company with various suggestions to relieve congestion. Finally, both parties had agreed that the substitution of the trolley vehicle system for the tramways was the most desirable solution. An agreement had been arrived at with the Corporation of Torquay, negotiations with Paignton U.D.C. pointed to an early settlement, and in all probability an unopposed Bill would be the result. The report was adopted, and the company's Bill was unanimously approved.

SCOTTISH POWER CO., LTD.—Mr. George Balfour, M.P., presiding at the meeting last week, said during the last 10 years their investments in subsidiary companies had increased from £353 858 to £3 440 173. Rapid progress was being made with the construction of the hydro-electric works at Loch Rannoch. The generating station would have an initial capacity of 32 000 kW, and would be available for supply towards the end of the current year. The generating plant in their various power stations, with the addition of the hydro-electric plant of the Grampian Co., gave them a total plant installed of about 80 000 kW, the load connected at December 31st, 1929, was 63 790 kW, and the maximum load during 1929 was 22 207 kW. Electricity sold was about 70 000 000 kWh, an increase of nearly 50% compared with five years ago. The report and accounts were adopted and the dividend of 8%, less tax, on the ordinary shares was approved.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Mr. J. B. Braithwaite, presiding at the meeting last week, said their sales of current in 1926 increased 4 000 000 kWh; in 1927 5 000 000; in 1928 8 400 000; and for 1929 the increase was just over 9 000 000, in spite of the reductions which they had made in prices. The profit showed a small increase, that for 1929 being £473 972, compared with £451 587 in 1928. For 1929 the average price paid by their consumers was 2·1d. The reduction in price led, of course, to an increase in the so-called consumers' benefit. In 1928 that was £275 937, and in 1929 it was £348 253. During the four years in which that arrangement had been in force their consumers had benefited to the extent of £930 000 compared with what they would have paid had they been charged the standard price. The increase in the consumers' benefit led to an increase in the one-sixth share which the company was allowed to retain and add to the reserve fund. They were able to retain for the past year £58 052, and the reserve fund now stood at £243 137. The report and accounts were adopted.

TILLING-STEVENS MOTORS, LTD.—At the meeting last week, Mr. H. E. Carter, chairman, said, in reference to the order for petrol-electric vehicles which he had told the shareholders last year they had every hope of obtaining, they designed and built trial vehicles for test purposes, and they understood the vehicles gave satisfaction. Later on the question of

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fitting four-wheel brakes was raised and of additional luxury in upholstery. They found themselves confronted with a great difficulty, as the weight of the petrol-electric vehicle was greater than that of a gear-driven vehicle by just a sufficient amount to prevent them from constructing a satisfactory vehicle with the additional weight of four-wheel brakes and the extra weight of luxurious upholstery. Finally their friends were compelled to place a trial order for 100 gear-driven vehicles elsewhere, but the Minister of Transport had since stated that he would increase the weight forthwith by 10 cwt. This was ample to make up the margin required for the items he had referred to. Now that the difficulty of the weight question had been removed, they would do their best to obtain orders for the balance of the renewal of the fleet. Other old friends who had used petrol-electric vehicles for many years had recently placed other orders with them for the new type.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—At the meeting last week, Mr. E. Garcke, chairman, said, in May last year, soon after the last annual meeting, the majority of the "A" and "B" ordinary shares were acquired by the Greater London and Counties Trusts, a British company representing American industrialists and financiers who understood the position of the company and the potentialities which it is the purpose of the company to develop. He was authorised by the chairman of the Trust to make a statement to the effect that the Trust had the intention of making a large issue of its capital to British investors as soon as the arrangements were completed and the time was opportune; that such issue would include the whole of their American electrical interests in this country, and that the British investing public would be afforded an opportunity to participate to the extent to which they might wish to avail themselves. The Shropshire, Worcestershire and Staffordshire Co. had acquired the electricity undertaking of the Corporation of the City of Hereford as from March 31st last year. They had also acquired the undertakings supplying electricity in Hook Norton, Bromyard and Blockley situated in their existing statutory area; and also those in Builth Wells, Presteign, Talgarth, Hay and Knighton. They were applying for a Special Order to enable them to supply electricity generally throughout the counties of Radnor and Brecknock, and also in the rural district of Newent, in Gloucestershire. Over £816 000 had been spent during the year on new capital works and the acquisition of undertakings. It was proposed to pay dividend for the year on the 6% cumulative preference shares, dividend of 8% for the year on the "A" ordinary shares, and dividend of 7½% for the year on the "B" ordinary shares, and to place to reserve appropriation account £57 895. The report and accounts were adopted.

BRITISH ALUMINIUM CO., LTD.—Lt.-Col. S. H. Pollen, presiding at the meeting last week, said net profit for the year was £443 102, compared with £441 383. The trading profit amounted to £407 977, against £399 498. The electrical industry, like the transport and chemical industries, consumed an ever-increasing quantity of aluminium. Their metal was being adopted as a substitute for non-magnetic iron in many instances, such as in the large casings for metal-clad switchgear, and the metal was also used for transformer radiators, shields for turbo-alternators, controller frames, junction boxes, bedplates, gear-cases, quick break switchgear parts, fans and innumerable other applications in economic substitution for other metals. Steel-cored aluminium cable was the standard cable employed on the British "grid" system, and it was in demand throughout the world. The most important event in the period under review was the completion of the first stage of the Lochaber works, which was effected before the close of the year, subject only to the finishing off of a few minor items. The Lochaber Power Co. was set up by the 1921 Act to carry out these works and to be responsible for the statutory obligations attaching thereto. Later they found it necessary to form an intermediate company—the North British Aluminium Co., Ltd.—to facilitate the hydro-electric development and to establish and operate the aluminium producing factory. The undertaking, when completed, would develop 120 000 H.P. and would be by far the largest hydro-electric installation in the British Isles. The period granted by the 1921 Act for the construction of the whole scheme was ten years, and it was necessary that they should obtain an extension of time in order that they might proceed with the remainder of the works, which had not yet been begun. The Lochaber Power Co. had therefore promoted a private Bill for obtaining an extension of time for the construction of the remaining works. During the year they disposed of the Orsières Power Co., a partly developed water power undertaking in Switzerland which was acquired prior to the reconstruction of their company. The report and accounts were adopted, and a final dividend of 6% on the ordinary shares, less tax, making 10% for the year, was approved.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.—The Earl of Selborne, presiding at the meeting on March 27th, said the net profit declared for 1929 amounted to £77 801, and, adding £114 122 brought forward, there was a total of £191 923. An interim dividend of 2½% had been paid, and the directors now proposed to distribute a further dividend of 7½%, free of income-tax, carrying forward £102 283. The declaration of a profit and the payment of the usual dividend for the year had only been made possible by a transfer from reserves, and it was not proposed on this occasion to add any further sum to the present reserve fund of £365 000. Although they had succeeded in securing most of the orders given for submarine cable during the past year, the volume of work had been so small and at such competitive prices that the result was an actual trading loss. During the past two or three years there had been considerable consolidation in the varied interests of telegraphic intercommunication, involving both submarine cables and wireless. Naturally, the altering conditions would take some time to adjust themselves, but it was encouraging to note that among those best qualified to judge there was no lack or even lessening of faith in the future of submarine telegraphy. The coming of the so-called loaded cable was a great advance in transoceanic telegraphy, especially as it could be duplexed, and they were now considering a still further advance inasmuch as they anticipated the manufacture of super high-speed telegraph cables which would provide not only a far higher capacity for ordinary telegraphic traffic, but which should also, if required, be capable of being used for telephonic speech and facsimile reproduction. He was glad to report that the year 1930 had opened with better prospects, and they had already in hand a substantial order for the Italcable Co. of Rome to manufacture and lay a loaded cable between La Panne, in Belgium, and Lisbon, a distance of about 1 100 miles. This cable would be similar in type to the one they laid in 1928 for the Western Union Telegraph Co., which was capable of being duplexed at a speed of 1 400 letters a minute in each direction. The directors were not prepared to take a gloomy view of the prospects of the company. They were constantly effecting economies and improving the organisation. They were in a position to carry out submarine cable work of any magnitude; there were already signs of improvement in the outlook, and they did not lack confidence in the future. The report and accounts were adopted.

METAL AND CHEMICAL PRICES.

		Price.	TUESDAY, April 1st. Inc.	Dec.
Copper—				
Best Selected	per ton	£75 10 0	—	15s. 0d.
Electro Wirebars	,,	£84 5 0	—	—
H.C. Wire, basis	per lb.	11⅛d.	—	—
Sheet	,,	11⅛d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£20 10 0	10.s. 0d.	—
Foreign or Colonial	,,	£18 17 6	2s. 6d.	—
Tin—				
Ingot	per ton	£170 15 0	£1 0s. 0d.	—
Wire, basis	per lb.	2s. 4d.	⅛d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£18 10 0	—	12s. 6d.
Mercury	per bottle	£22 15 0	—	2s. 6d.

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2⅛d.
Sodium Bichromate—Per lb., 3⅛d.
Rubber—Para fine, 8⅛d.; plantation, 1st latex, 7 11/16d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

The market opened last week with an active tone, and according to James Forster and Co. a considerable business was transacted chiefly for forward delivery. Demand has since declined and prices slipped back. A better demand has been experienced in America, which resulted in the official price being raised 25 points to 5.75 cents per lb. Closing prices on March 28th were £18 16s. 3d. for all positions, 3s. 9d. to 1s. 3d. per ton up on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BONAS, L. M., and WESTCOTT, K. A., 178A, High Road, Kilburn (trading as SAVOY RADIO CO), wireless dealers. £39 16s. 5d. January 27th.

BROOKS, Francis Edward, 9, Castle Street, Rugby, dealer in wireless parts. £25 7s. 6d. February 6th.

ELECTRAMONIC CO., LTD., 1, Budge Row, E.C., wireless manufacturers. £20 13s. 3d. February 11th.

JENCO LIGHT CO., 33, Garstang Avenue, Breightmet, Bolton, electric lamp dealers. £15 16s. 11d. February 26th.

NORTH SURREY ELECTRICAL FACTORS, LTD., 77, Sedge Street, Croydon, electrical factors. £18 11s. 3d. February 18th.

NUTTER, G. M., 246, Yorkshire Street, Rochdale, electrical dealer. £16 5s. 5d. January 31st.

PHILLIPS, Mr. W. W., 5, Station Road, Burry Port, wireless dealer. £10 2s. 7d. January 22nd.

SOLDERING FLUIDS, LTD., 2, Wells Street, Jermyn Street, S.W., wireless dealers. £22 16s. January 16th.

THOMAS AND STINCHCOMBE, LTD., Narrow Wine Street, Bristol, electrical engineers. £15 3s. 2d. February 25th.

WEINBAUM, Philip, 9, Old North Street, W. (trading as BLOOMSBURY WIRELESS SUPPLIES). £52 8s. 3d. January 27th.

YELDON, Gerald, 58B, London Road, Portsmouth, wireless dealer. £21 11s. 8d. January 30th.

Deeds of Arrangement.

JEFFERY, Albert Leslie, 180, Charnwood Street, Leicester, electric and wireless expert. Dated March 21st, filed March 27th. Trustee, F. Simkin, 16, New Street, Leicester. Secured creditors, £3; liabilities unsecured, £330; assets, less secured claims, £233.

WHITE, Herbert Daniel, trading as H. D. WHITE, Roden Street, Ilford, electrical engineer. Dated March 26th, filed March 31st. Trustee, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C. Liabilities unsecured, £1 128; assets, less secured claims, £685.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HALCYON WIRELESS CO., LTD., 313, Regent Street, London, W., radio manufacturers. At a further meeting of the creditors held on March 27th, Mr. Gisborne, solicitor, representing the Six Sixty Radio Co., the largest trade creditors, who presided, said it had been hoped that the same group of gentlemen who were interested in the matter before might be able to put forward some offer, but the only definite offer that had been received was one of £10 000, out of which £5 000 would have been required to pay off the bank and there might have been a net balance of about £3 000 left to be dealt with in regard to the trade creditors' claims. Naturally they could not seriously consider such an offer as that. Other negotiations had been proceeding, but it was found that those with whom they negotiated were cognisant of the position and this, of course, handicapped them considerably. The committee thought that they might have had to come before the creditors that day and be compelled to recommend liquidation as the only alternative before them, but Mr. Emby had, in the meantime, been very active in trying to get friends and relatives to rally round him and come to the rescue in a difficult situation, and was prepared to make an offer to the creditors which was equivalent to 5s. in the £ to all the unsecured creditors. If the company were closed down on the figures as they stood, it did not look as if there could be more than 3s. 6d., or at the outside 4s. in the £. Mr. Emby said the committee had done everything that was at all possible to protect the interests of the trade creditors and to-day they had an offer which he submitted was a very generous offer in all the circumstances. If the company did go into liquidation, they would most likely get no more than 2s. 6d. in the £. Mr. Emby said that the Halcyon Company had had a good name in the past and while it was not ntended to manufacture in future, it was simply desired to keep the name and perform certain repair work, etc., which would be done at Pembridge Villas. The meeting discussed the matter for a considerable time, one or two creditors taking up a somewhat hostile attitude because printed particulars had not been supplied them. Eventually, a resolution was put to the meeting and carried, with three dissentients, in favour of accepting from Mr. J. H. Torring a sum equivalent to 5s., payable within twenty-one days and conditional on acceptance by all creditors within fourteen days.

VANDER-DE-VLIES, Charles Frederick, radio engineer, trading as RADIO HOUSE, 510, Stockport Road, Longsight, Lancs. Creditors were called together recently, when a statement of affairs was submitted which showed liabilities of £409 (£306 due to the trade and £103 to loan creditors), and net assets estimated to realise £143, or a deficiency of £266. It was pointed out that the assets in the statement of affairs were at estimated values, and in the event of a forced realisation would probably not realise the amounts shown. It was explained that owing to pressure by creditors, it was deemed advisable for the debtor to execute a deed of assignment in order to protect the assets for the general body of creditors, and that had been done, Mr. A. T. Eaves, of Harry L. Price and Co., 47, Mosley Street, Manchester, being appointed to act as trustee. After discussing the position, the creditors resolved that the deed of assignment already executed should be confirmed, and that the trustee should endeavour to sell the estate as a going concern.

London Gazette, etc.

Winding-up Petition.

ELECTRAMONIC CO., LTD. A creditor's petition for winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, W.C., on April 7th.

Companies Winding-up Voluntarily.

MERSEY RADIO AND GRAMOPHONE CO., LTD., Liverpool. Statutory meeting of creditors, Common Hall, Hackins Hey, Liverpool, Thursday, April 3rd, for the purpose, if thought fit, of nominating a liquidator and appointing a Committee of Inspection.

MORTLOCK (C.), LTD. Statutory meeting of creditors at the office of C. Eastlake Smith, chartered accountant, 29-30, King Street, Cheapside, E.C.2, Tuesday, April 8th, at 4 p.m.

Bankruptcy Information.

GOODRICK, John, Terrington Offerton Lane, Stockport, Chester, electrician. Receiving order, March 26th. Debtor's petition. First meeting, April 8th, 2.30 p.m., Official Receiver's Offices, Byrom Street, Manchester. Public examination, April 25th, 10.30 a.m., Court House, Vernon Street, Stockport.

MELVILLE, Ernest James, lately trading as JAMES MELVILLE AND CO., Dudley Chambers, Angel Row, Nottingham, electrical contractor. Receiving order, March 26th. Creditor's petition.

Notice of Dividend.

HUDSON, Rex Chadwick, 1 and 2, Bridge Road, Chatburn, Lancashire, electrical contractor. First and final dividend, 10d. per £, payable April 4th, Official Receiver's Office, District Bank Chambers, Blackburn.

Bankruptcy Proceedings.

BENJAMIN, Ernest Emanuel (trading with another as JOHNSTONE, BENJAMIN AND CO.), 10, Ascham Street, Leverton Street, Kentish Town, London, N.W. The affairs of this firm who had carried on business as wire and metal merchants and as electrical wire and cable manufacturers and was adjudged bankrupt in February, 1901, came before Mr. Registrar Warmington in the London Bankruptcy Court on March 26th on the hearing of an application for discharge by Ernest Benjamin. The Official Receiver said that the proofs of debt lodged against the debtors' joint estate amounted to £7 833, those withdrawn to £257 and the probable claims not yet admitted were £11 making a total of £8 101. The available assets of the joint estate were estimated at £5 912 and mainly consisted of shares in Johnstone, Benjamin and Co., Ltd. The trustees in bankruptcy afterwards filed a notice of motion for a declaration that the transfer by the debtors of their business and other assets to a company shortly before their bankruptcy was fraudulent and void and should be set aside and the Court made an order sanctioning a compromise submitted by the company whereby a sum sufficient to pay all preferential debts and 10s. in the £ on all provable debts owing to the unsecured creditors of the joint and separate estates was to be paid to the trustees, and dividends amounting to 10s. in the £ were in fact paid. In evidence the debtors had stated that the applicant began business as a wire merchant in 1890 and two years later added to the business that of manufacturer of electrical wires and cables and that of metal merchant. He was afterwards joined by his cousin Lewis Benjamin and they traded together as above. In August, 1900, the business was removed to the Crown Electric Works, 10, Ascham Street, and in the following year the debtors transferred the lease and goodwill of the business, etc., to the before-mentioned limited company in consideration of their appointment as managing directors and the payment to them of £9 200 payable in cash and shares although the cash (£500) never came into their hands. When they sold their business they were in financial difficulties and insolvent and unable to pay their debts as and when they became due, and although their trade debts exceeded £7 000, none of the trade creditors was consulted before the sale and no provision was made for the payment of their claims. The debtors attributed their insolvency to pressure by creditors, to loss in trading in consequence of the disturbance to their business through its removal in August, 1900, to lack of capital, to additional expenses occasioned by the removal, to bad debts and to inability to realise their shares. The Official Receiver opposed the application on the ground that the applicant had given an undue preference in favour of a creditor and having heard a solicitor on his behalf his Honour suspended the discharge for three months.

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EXPIRING PATENTS.

Below is a list of patents of interest to electrical engineers and which, unless extended, expire during 1930 :—

No.	Date (1914).	Name of Patentee.	Subject of Patent.
85	Jan. 1 ..	British Thomson-Houston Co. (General Electric Co., New York).	Centrifugal compressors.
252	Jan. 5 ..	Arco and Meissner ..	Relay arrangements for wireless telegraphy and telephony.
641	Jan. 9 ..	Buenos Ayres and Pacific Railway Co. (Jas. P. Harte, Argentina).	Signalling apparatus.
1 556	Jan. 20 ..	Hammond, jun.	Control of moving bodies by radiant energy.
1 969	Jan. 24 ..	Automatic Telephone Mfg. Co., and Newforth, jun.	Telephone systems.
2 323	Jan. 28 ..	Gimingham	Electric lamps.
2 713	Feb. 2 ..	Shaw	Globe holders for electric and other lamps.
2 827	Feb. 3 ..	Stone and Co., and Darker	Electric train lighting, etc., systems.
3 358, 3 359	Feb. 9 ..	Western Electric Co. (Franklin, Tuthill and Woodward, Belgium).	Machine telephone switching systems.
3 360	Feb. 9 ..	Western Electric Co. (Franklin, Tuthill and Woodward, Belgium).	Impulse control systems.
3 385	Feb. 9 ..	British Thomson-Houston Co., Young and Garton.	Motor control switches.
3 405	Feb. 10 ..	Gardner	Signalling devices.
3 596	Feb. 11 ..	British Thomson-Houston Co., and Whitaker.	Current collecting devices for electrical machines.
3 696	Feb. 12 ..	Schweitzer and Conrad ..	Fuse device for electrical circuits.
3 699	Feb. 12 ..	Western Electric Co. (Franklin, Tuthill and Woodward, Belgium).	Electromagnetic relays.
3 756	Feb. 13 ..	Peck	Ignition devices for engines.
4 235	Feb. 18 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electric conductors.
4 873	Feb. 25 ..	Kershaw, Haywood, and Saxby and Farmer.	Interlocking apparatus for railway signalling.
4 953	Feb. 25 ..	Möller	Rotary h.t. rectifiers.
5 455	March 3	British Thomson-Houston Co., and Wedmore.	Protective devices for a.c. generators.
5 513	March 4 ..	Hall and Co., and Nield ..	Electromagnets and their application.
6 088	March 10..	British Thomson-Houston Co. (General Electric Co., New York).	Power generating plant.
6 210	March 11..	Gotthilf Ansgarins Betulander.	Automatic or semi-automatic telephone systems.
6 439	March 13..	British Thomson-Houston Co. (General Electric Co., New York).	Filaments for incandescent lamps.
6 443	March 13..	Maley and Cadbury ..	Brakes for tramway rolling stock.
7 336	March 23..	Maitre and Martin ..	Electromagnetic means for vibrating piano strings, etc.
7 692	March 26..	Maitre and Martin ..	Contact breaker for electromagnetic vibrating members.
7 766	March 27..	Hochstaedter	Electrical conductors.
7 820	March 27..	British Thomson-Houston Co. (General Electric Co., New York).	Centrifugal compressors, pumps, etc.
8 118	March 31..	Hatfield and Hookham ..	Electrolytic meters.
8 173	March 31..	British Thomson-Houston Co., Clough and Whitcher	Protection of a.c. generators, rotary convertors, etc.
8 327	April 2 ..	Payne, and Bristol Tramways and Carriage Co.	Control apparatus for multiple speed gear.
8 473	April 3 ..	Siemens Bros. and Co., and Grinsted.	Indicating device for electrical installations.
9 367	April 15 ..	British Thomson-Houston Co. (General Electric Co., New York).	Coating metals, and apparatus therefor.
9 666	April 18 ..	Dickson	Synchronising systems.
9 840	April 21 ..	Betulander	Automatic or semi-automatic telephone systems.
10 172	April 24 ..	Parsons and Bennett ..	Reflectors for searchlights, etc.
10 415	April 27 ..	Davies, and Gallenkamp and Co.	Resistance furnaces.
10 532, 10 533	April 28 ..	Peter	Alternating current track signalling.
11 116	May 5 ..	Torchio	Electrical reactors.
11 355	May 8 ..	Edgar Allen and Co., and E. Larmuth.	Points for tramways, railways, etc.
11 801	May 13 ..	Salman and Dodgson ..	Absolute permissive automatic block signal system.
12 361	May 19 ..	Withers (K. C. Cox, Norfolk Is.).	Selenium cells.
12 555	May 21 ..	Wise	Mountings or fittings for incandescent lamps.
12 573	May 21 ..	British Thomson-Houston Co. (General Electric Co., New York).	Governing mechanism.
12 926	May 25 ..	Hamilton and Ferranti ..	Mercury motor meters.
13 076	May 27 ..	British Thomson-Houston Co. (General Electric Co., New York).	Manufacture of tungsten.
13 248	May 29 ..	Marconi's Wireless Telegraph Co., and Round.	Production of continuous electrical oscillations and their utilisation for wireless telegraphy and telephony.
13 348	May 30 ..	W. T. Henley's Telegraph Works Co., and Savage.	Electrically heated vulcanising apparatus.
13 538	June 3 ..	Strohmenger	Electric welding and fusian deposition of metals.
13 549	June 3 ..	British Thomson-Houston Co. (General Electric Co., New York).	Manufacture of metal wire.
13 933	June 9 ..	Waters, and Callender's Cable and Construction Co.	Electric cables.
14 108	June 11 ..	British Thomson-Houston Co. (General Electric Co., New York).	Compressors.
14 119	June 11 ..	Dinin	Accumulators.
14 229	June 12 ..	British Thomson-Houston Co. (General Electric Co., New York).	Manufacturing metallic bodies.
14 294	June 13 ..	West	Electric controllers.

(*To be continued.*)

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

322 526 Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline Impulse generators for use in telephone or like systems. (7/9/28.)
299 360 Associated Telephone and Telegraph Co. Electromagnetic relays. (24/10/27.)
322 533 Automatic Telephone Manufacturing Co., Ltd., and T. Blashill. Use of rectifier couples in telephone or like systems. (8/9/28.)
322 534 J. B. Hansell and Associated Electrical Industries, Ltd. Oil tanks for oil-immersed electrical apparatus, such as transformers. (8/9/28.)
297 039 Akt.-Ges Brown, Boveri, et Cie. Polyphase protective or regulating apparatus. (12/9/27.)
297 091 International General Electric Co., Inc. Over-load protective arrangements. (14/9/27.)
322 554 Edison Swan Electric Co., Ltd., and T. F. Stent. Formers for inductance coils and the like. (14/9/28.)
322 555 Callender's Cable and Construction Co., Ltd., L. G. Brazier and J. Urmston. Cores for electric induction coils. (14/9/28.)
298 603 Siemens-Schuckertwerke Akt.-Ges. Continuously-working absorption refrigerating-machines. (12/10/27.)
322 558 F. S. S. Wates. Electric meters. (20/9/28.)
322 559 State Railways Radio Co., Ltd., and L. Zoltan. Radio receiving-sets with a number of sets of headphones. (21/9/28.)
322 565 T. Bailey. Fuse insulators. (27/9/28.)
322 568 R. C. Graseby. Electric switches. (29/9/28.)
322 569 Igranic Electric Co., Ltd., and A. D'A. Hodgson. Intervalve transformers employed in radio apparatus. (29/9/28.)
322 578 J. G. H. Budd and British Automatic Totalisator, Ltd. Totalisators and like machines. (4/10/28.)
322 579 D. S. B. Shannon. Telephonic loud-speakers. (5/10/28.)
322 581 G. Simonis. Interrupters for electric ignition apparatus. (8/10/28.)
322 584 T. A. Biddington and R. Field. Wireless receiving-apparatus. (11/10/28.)
322 585 G. Pailin and Ferguson, Pailin, Ltd. Circuit-breakers. (11/10/28.)
322 592 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Means for regulating the phase displacement in an electric system. (18/10/28.)
322 595 Siemens Bros. and Co., Ltd., and J. R. Thorpe. Electrical condensers. (23/10/28.)
299 463 Anode Rubber Co., Ltd. Insulated joints for electric conductors. (28/10/27.)
322 600 British Insulated Cables, Ltd., and L. B. Wilson. Electrically heating rivets and other articles. (27/10/28.)
305 526 Condit Electrical Manufacturing Corporation. High-tension electric distributing and switching apparatus. (6/2/28.)
322 603 General Electric Co., Ltd., E. H. Croft, W. J. Paddock, and W. Wilson. Electric switches. (1/11/28.)
322 610 Siemens Bros. and Co., Ltd., F. Turner, and H. J. Hadlow. Recording-apparatus for measuring-instruments. (5/11/28.)
322 611 W. J. Pitt. Means for electroplating. (6/11/28.)
322 614 W. R. Everett. Radio or wireless aerials (antenna) for emission or reception. (8/11/28.)
322 615 T. Bailey. Fuse insulator. (8/11/28.)
322 622 R. A. Rothermel. Loud-speakers. (13/11/28.)
301 461 Associated Electrical Industries, Ltd. Contacts for circuit interrupters. (30/11/27.)
322 627 Whipp and Bourne, Ltd., and F. Whipp. Fusible-cut-outs. (20/11/28.)
322 634 D. R. Davies and Associated Electrical Industries, Ltd. Electrical switch gear. (26/11/28.)
301 839 Suddeutsche Telefon-Apparate Kabel und Drahtwerke Akt.-Ges. Electrical alternating-current rectifiers. (6/12/27.)
302 177 Suddeutsche Telefon-Apparate Kabel und Drahtwerke Akt.-Ges. Method of manufacturing alternating-current rectifiers. (10/12/27.)
302 184 Kalle and Co. Akt.-Ges. Production of light-sensitive layers by means of diazo compounds. (10/12/27.)
322 652 Siemens Bros. and Co., Ltd., and E. A. Forceville. Automatic telephone selector banks and selectors. (14/12/28.)
302 913 British Thomson-Houston Co., Ltd. Electric switch mechanisms. (22/12/27.)
322 662 British Thomson-Houston Co., Ltd. (W. D. Coolidge). Electrical discharge devices. (22/12/28.)
322 667 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Arrangements for modulating the frequency of electric oscillations. (1/1/29.)
322 670 Revo Electric Co., Ltd., and F. H. Reeves. Electric lamp fittings. (3/1/29.)
322 680 Radiologie Akt.-Ges. and F. Bennemann. Röntgen tubes. (19/1/29.)
322 682 Bullers, Ltd., and J. G. Miller. Insulators. (21/1/29.)
322 688 H. H. Berry. Electric imitation fires. (24/1/29.)
305 176 Associated Electrical Industries, Ltd. Relay systems for paralleling electrical circuits. (1/2/28.)
322 692 W. P. Digby and R. B. Fairthorne. Electric high-tension transmission systems. (6/2/29.)
305 581 B. Brammer. Contact-preventing devices for electric incandescent lamps. (7/2/28.)
305 938 British Thomson-Houston Co., Ltd. Electric switches. (10/2/28.)
308 716 British Thomson-Houston Co., Ltd. High-frequency signalling systems. (27/3/28.)
322 703 A. P. Lundberg and Sons, Ltd., G. C. Lundberg, P. A. Lundberg, and G. Pegg. Electric switches. (4/3/29.)
322 705 J. R. Stevenson. Mountings for electric switches, sockets, or other couplings or fittings. (9/3/29.)
311 243 Dr. P. Meyer Akt.-Ges. Mercury electric switches. (7/5/28.)
322 500 J. E. Pollak (Ganz-Fele Villamossagi Reszvenytarsasag. Apparatus for regulating voltage in alternating-current distributing systems. (12/6/28.)
322 776 J. L. Baird and Television, Ltd. Television apparatus and the like. (9/6/28.)
322 777 A. Marr. Methods of distributing sound waves from telephones, gramophones, and the like. (13/6/28.)
293 470 Brown, Boveri et Cie Akt.-Ges. Distance relays for electric lines. (7/7/27.)
295 287 International General Electric Co., Inc. Electric power stations. (8/8/27.)
295 637 Dr. S. Loewe. Heated filament for thermionic valves. (15/8/27.)
322 805 H. Antranikian. Radio direction indicators. (16/8/28.)
296 988 W. G. Poetzsch. Producing electrolytic deposits of chromium which adhere well and penetrate well into any recesses. (10/9/27.)
298 224 Fansteel Products Co., Inc. Supply of filament-heating current to the thermionic valves of radio receivers or the like. (6/10/27.)
322 740 British Thomson-Houston Co., Ltd., and T. H. Kinman. Radio apparatus. (10/9/28.)
307 482 Westinghouse Brake and Saxby Signal Co., Ltd. Light signals. (10/3/28.)
322 744 H. Vogt. Condenser telephones. (10/9/28.)
322 794 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic or semi-automatic telephone systems. (13/9/28.)
322 795 Standard Telephones and Cables, Ltd., and E.P.G. Wright. Automatic or semi-automatic exchange systems. (13/9/28.)

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322 811 Standard Telephones and Cables, Ltd., and P. E. Erikson. Electric communication cable. (14/9/28.)
322 813 C. Berrage-Moulton. Electrical pick-ups and like reproducing or recording devices. (14/9/28.)
322 816 J. G. North and W. J. North (legal representatives of R. B. North deceased) and A. Massey-Allen. Ignition apparatus for internal-combust ion engines. (15/9/28.)
322 714 E. Green. Aerials and aerial systems. (19/9/28.)
297 831 Siemens-Schuckertwerke Akt.-Ges. Tumbler switches. (29/9/27.)
322 814 H. Green and Celebritone, Ltd. Thermionic amplifiers. (21/9/28.)
322 826 H. Green and Celebritone, Ltd. Electrical reproduction of sound. (22/9/28.)
322 827 E. Y. Robinson and Associated Electrical Industries, Ltd. Vacuum electric tube devices. (22/9/28.)
322 828 English Electric Co., Ltd., and W. E. M. Ayres. Electrical condenser. (24/9/28.)
322 829 English Electric Co., Ltd., and E. H. H. Hassler. Dynamo-electric machines. (24/9/28.)
322 830 S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). Wireless receiving sets. (24/9/28.)
297 836 Electrolux, Ltd. Control devices for refrigerating apparatus. (29/9/27.)
322 845 Siemens Bros. and Co., Ltd., and W. G. Patterson. Telephone systems. (17/10/28.)
322 846 C. Whitter. Lamps for colour lighting purposes. (18/6/29.)
299 054 Associated Electrical Industries, Ltd. Electrical power systems. (20/10/27.)
322 851 General Electric Co., Ltd., and C. G. Eden. Electric switches for electric heating apparatus. (25/10/28.)
322 852 M. Schmidt (trading as Schmidt Elektrotechnische und Metallwarenfabrik, M.). Anode battery. (26/10/28.)
322 856 British Thomson-Houston Co., Ltd., and W. J. Pool. Electric motor control. (29/10/28.)
322 871 Electricars, Ltd., and J. F. Monnot. Vehicle bodies. (17/10/28.)
322 872 J. L. Gottlieb and Co., Ltd., and E. V. Kayley. Radio apparatus. (19/11/28.)

Applications for Patents.

November 21st.

35 550 Abba Electrical Co., Ltd., and E. Denholm-Young. Microphones.
35 674 Associated Electrical Industries, Ltd. Switchgear. (23/11/28, U.S.)
35 653 Associated Fire Alarms, Ltd., and A. H. McNeil. Automatic electric alarm systems.
35 697 Associated Telephone and Telegraph Co. Railway signalling arrangements. (5/5/28, U.S.)
35 696 Automatic Telephone Manufacturing Co., Ltd., G. A. Burns, and R. N. Saxby. Fire alarm apparatus.
35 629 H. C. Biggs, General Electric Co., Ltd., and R. F. Proctor. Electric furnaces, etc.
35 595 G. Bowman. Electric switches for use with internal combustion engines.
35 647 British Thomson-Houston Co., Ltd. Electric regulating systems. (21/11/28, U.S.)
35 561, 35 562 G. B. Burnside and Electric Central Heating and Ventilating Co., Ltd. Ventilating and electric heating apparatus.
35 638 G. H. Crook. Electric signs.
35 620 B. Davies. Electromedical apparatus.
35 126 Electricars, Ltd. Vehicle bodies.
35 567, 35 568 Ericsson Telephones, Ltd., and F. Limb. Totalisators.
35 689 Federal Telegraph Co. and H. O. Storm. Selector systems.
35 545 J. W. Fenton. Anode cleaning apparatus.
35 651, 35 652 L. Flandrin and G. C. Lévy. Mercury break switches. (22/11/28, France.)
35 628 General Electric Co., Ltd., and G. C. Marris. Loud speakers.
35 645 A. H. Haeseler. Device for filling accumulators, etc.
35 581 B. Hesketh. Variable electric condensers.
35 660 H. H. Jeffcott. Electric variable speed power transmission systems.
35 552 W. de L. Lauder. Electric lamp reflectors.
35 672 Rheinische Metallwaaren und Maschinenfabrik. Electric time fuses. (29/11/28, Germany.)
35 579 C. J. Turner. Electric fires, etc.
35 687 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.) Braiding machines.
35 663 B. Williams. Means for generating electric oscillations.

November 22nd.

35 833 British Thomson-Houston Co., Ltd., and J. G. Wellings. Insulation of electric conduits.
35 834 British Thomson-Houston Co., Ltd. Electric switches. (22/11/28, U.S.)
35 767 W. Engelke and H. L. Read. Circuits controlled by light sensitive cells.
35 742 M. B. Field. Magnetic compasses.
35 799 Forges des Ateliers de Constructions Electriques de Jeumont. Automatic starting of asynchronous electrical machines. (29/11/28, France.)
35 781 Landis and Gyr Soc. Anon. Means for stopping electric clocks. (26/11/28, Switzerland.)
35 790 W. Ludenia and Telefunken Ges. fur Drahtlose Telegraphie. Generator for short electric waves. (22/11/28, Germany.)
35 791 W. Ludenia and Telefunken Ges. fur Drahtlose Telegraphie. Receiver for short electric waves. (22/11/28, Germany.)
35 746 A. Lawton. Electrical plug switch.
35 873 N. V. Philips' Gloeilampenfabrieken. Apparatus for taking stereoscopic X-ray photographs. (24/11/28, Holland.)
35 874 N. V. Splendor Gloeilampenfabriek. Thermionic valve circuits. (30/9/29, Holland.)
35 717 I. H. Parsons. Electric bells.
35 876 H. Philpot. Electric switch indicators.
35 732 J. Power. Ignition switches for engines.
35 752 F. H. Reeves and Revo Electric Co., Ltd. Holders for electric filament lamps.
35 842 J. Robinson. Wireless receiving apparatus.
35 820 M. Smart. Apparatus for applying electrical currents to the body.
35 722 G. Wilkinson. Electric heating elements.
35 715 E. Williams. Portable electric motors. (19/12/28, U.S.)

November 23rd.

35 958 J. Bethenod. Electric motor for phonographs, etc. (8/12/28, France.)
35 952 W. Canning and Co., Ltd., and G. A. Pope. Suspension of articles in electroplating baths.
35 936 D. A. Christian and Siemens Bros. and Co., Ltd. Switches for telephone systems.
35 935 G. F. Dutton and Siemens Bros. and Co., Ltd. Electric bells.
35 957 Felten and Guilleaume Carlswerk Akt. Ges. Long distance electric cables. (20/12/28, Germany.)
35 894 J. T. Rothwell and Co., Ltd., and G. Yates. Cooling transformers.
35 895 J. T. Rothwell and Co., Ltd., and G. Yates. Oil cooling device for transformers.
35 883 W. Schmidt. Sorting out defective dry battery cells. (3/1/29, Germany.)

November 25th.

36 042 W. K. Alford and Igranic Electric Co., Ltd. Inductance coils.
36 092 Allgemeine Elektricitats Ges. Attachment of end connections of rotating windings of electrical machines. (24/11/28, Germany.)
36 084 Automatic Telephone Mfg. Co., Ltd., and L. M. Simpson. Electrical indicating device.
36 069 British Thomson-Houston Co., Ltd. Electric discharge devices. (23/11/28, U.S.)
36 064 D. F. Campbell, and Electric Furnace Co., Ltd. Induction furnaces.
36 006 W. L. Colassi. Electromagnetic devices.
36 078 General Electric Co., Ltd., and W. W. Warren. Manufacture of vitreous rods, etc.
36 063 Gramophone Co., Ltd., and W. F. Tedham. Electric discharge devices.
35 977 T. R. Gubbins, and Standard Telephones and Cables, Ltd. Telephone systems.
35 978 L. E. Hibbs. Electric stand lamps, etc.
36 096 L. Mellersh-Jackson (Burgess Battery Co.). Electric flashlight.
36 016 Landis and Gyr Soc. Anon. Magnet adjusting device for electric measuring instruments. (22/1/29, Switzerland.)
36 087 London Electric Railway Co. Rivet-removing machines.
36 066 R. Postlack and M. Zetland. Induction coil and coil-winding apparatus.
36 028 D. N. Sharma. Television systems, etc.
36 093 Siemens-Schuckertwerke Akt.-Ges. Production of a conducting electrical connection. (5/12/28, Germany.)
35 975 W. A. Stevens. Means of regulating regeneration in electric vehicles.
36 017 J. C. Wood. Electric water heater.

November 26th.

36 178 Akt.-Ges. Brown, Boveri et Cie. Diesel-electric ship's drive. (10/12/28, Germany.)
36 209 Associated Electrical Industries, Ltd., and N. R. Davis. Induction furnaces.
36 218 Associated Telephone and Telegraph Co. Telephone systems. (26/11/28, U.S.)
36 263 C. E. G. Bartey, and Gramophone Co., Ltd. Wireless receivers.
36 191 C. J. Beaver, N. Dixon, and W. T. Glover and Co., Ltd. Armouring of electric cables.
36 152 G. G. Blake. Apparatus for demonstration of ionisation, etc.
36 205 British Thomson-Houston Co., Ltd., C. G. Mayo and J. G. Willings. Measurement of voltage, etc., of transformers.
36 206 British Thomson-Houston Co., Ltd. Ignition devices.
36 262 R. E. H. Carpenter, F. G. G. Davey, M. Trouton and Wireless Music, Ltd. Electric magnetic vibratory devices.
36 157 R. Davy. Electric lamps for vehicles, etc.
36 167 H. J. Dean. Electric heating apparatus.
36 180 Felton and Guilleaume Carlswerk Akt.-Ges. Deep sea cables. (13/12/28, Germany.)
36 211 General Kontrolar Co., Inc. Electric circuit controllers. (26/11/28, U.S.)
36 207 International General Electric Co., Inc. Protective arrangements for windings of electrical machines. (26/11/28, Austria.)
36 205 International General Electric Co., Inc. Surface condensers. (28/11/28, Germany.)
36 246 Marconi's Wireless Telegraph Co., Ltd. Picture, etc., telegraph systems. (26/11/28, U.S.)
36 210 E. D'E. Moss. Electric lighters for cigarettes, etc.
36 229 M. A. Rowe. Thermal control for electric circuits
36 149 N. Simpson. Electric cutting knife.
36 163 F. Smith. Electric lamps for advertising signs, etc.
36 182 U. C. Tainton. Electrodeposition of zinc.
36 248 Telefunken Ges. fur Drahtlose Telegraphie. Direction finding apparatus. (16/1/29, Germany.)

COMING EVENTS.

Friday, April 4th (To-day).

Institution of Electrical Engineers (Meter and Instrument Section).—Victoria Embankment, London. Paper by Messrs. E. H. Rayner, W. G. Standring, R. Davis and G. W. Bowdler on "Studies in Low-Power-Factor Measurements at High Voltages." 7 *p.m.*

Monday, April 7th.

Society of Engineers (Inc.).—Geological Society, Burlington House, Piccadilly, London, W. Paper by Mr. R. Borlase Matthews on "Rural Electrification and Electro-Farming in Great Britain." 5.30 *p.m.*

Tuesday, April 8th.

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Corridor Chambers. Ordinary meeting. 2.30 *p.m.*

Institution of Electrical Engineers (Students' Section of the North-Western Centre).—Engineers' Club, Albert Square, Manchester. Annual general meeting. 7.15 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Royal Technical College, George Street, Glasgow. Annual general meeting. Paper by Messrs. H. A. Humphrey, D. M. Buist and J. W. Bansal, on "The Imperial Chemical Industries' (Limited) Steam and Electrical Power Plant at Billingham." 7.30 *p.m.*

Television Society.—Engineers' Club, Coventry Street, Piccadilly, London, W. Lecture by Dr. T. H. Harrison on "Photo-electric Cells and their Applications." 8 *p.m.*

Wednesday, April 9th.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting.

Electrical Contractors' Association (Eastbourne Branch).—Ordinary meeting.

General Electric Co.—Magnet House, Kingsway, London. Entertainment by the G.E.C. Dramatic Society. 7 *p.m.*

Television Society.—University College, Gower St., London, W.C. Second annual exhibition. 3 to 9 *p.m.*

Thursday, April 10th.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (East Yorks. Branch).—Ordinary meeting.

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Paper by Messrs. S. W. Melsom, A. N. Arman, and W. Bibby on "Surge Investigations on Overhead Line and Cable Systems." 6 *p.m.*

Institute of Metals (Swansea Branch).—Thomas's Café, High Street, Swansea. Annual general meeting. 7 *p.m.*

Friday, April 11th.

Physical Society.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington. Fifteenth Guthrie Lecture, by Prof. P. Debye, on "The Scattering of X-rays in Gases in Relation to Molecular Structure." 5 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Savoy Place, Victoria Embankment, London. Address by Col. Sir T. F. Purves. 6.15 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-upon-Tyne. Annual general meeting, 7.15 *p.m.*

Saturday, April 12th.

Institution of Electrical Engineers (London Students' Section).—Visit to the Deptford Power Station of the London Power Co. 2.30 *p.m.*

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THE ELECTRICIAN

Vol. CIV.—No. 2706. Friday, April 11, 1930. [Registered at the General Post Office.] Sixpence

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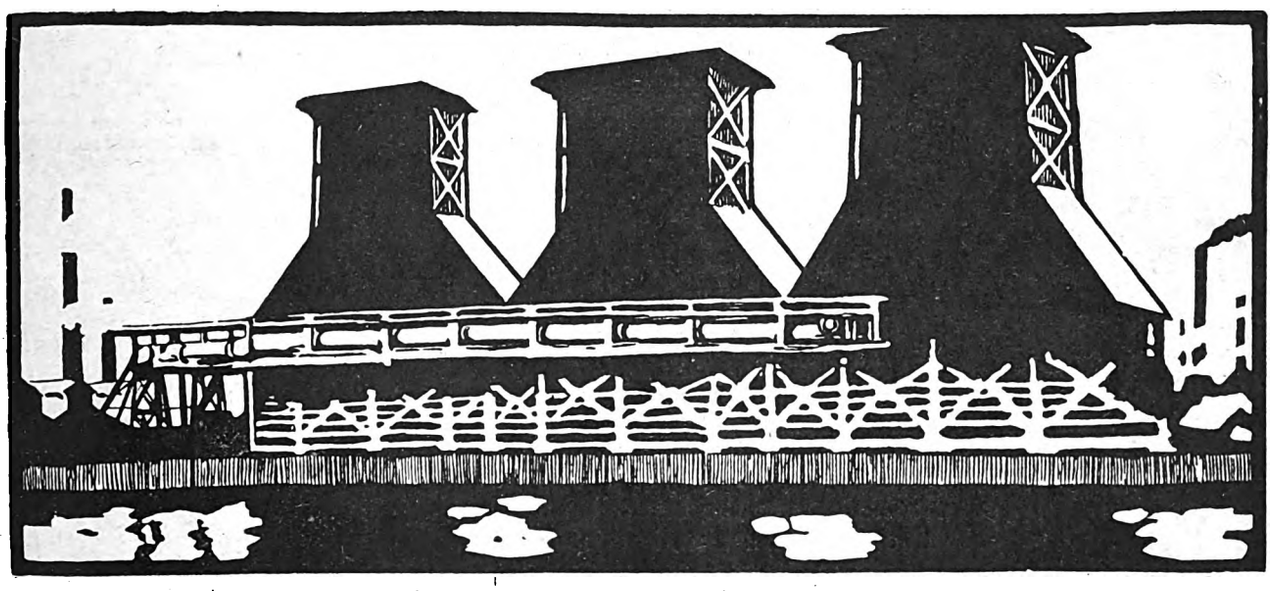

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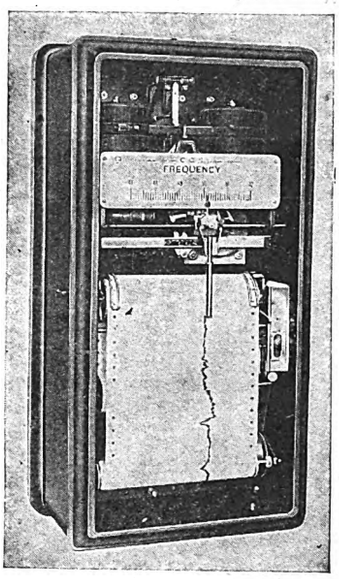

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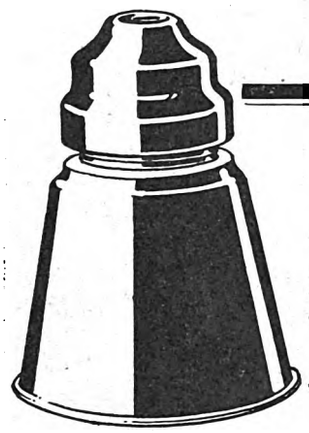

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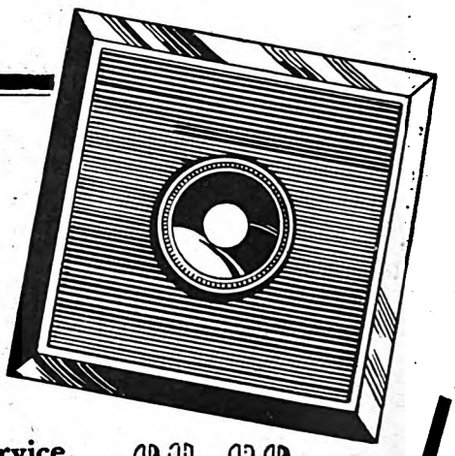

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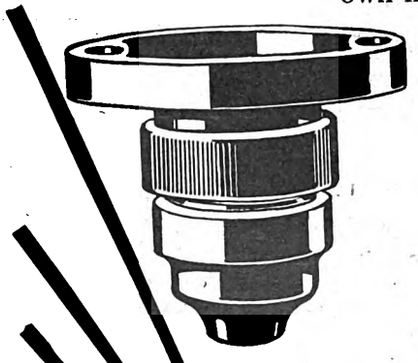

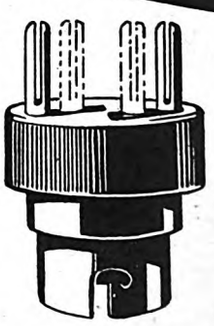

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THE ELECTRICIAN

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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EASTER HOLIDAYS.

The editorial, publishing and advertising offices of "The Electrician" will be closed for the Easter holidays from 6 p.m. on Thursday, April 17th, to 9 a.m. on Tuesday, April 22nd.

Russia.

BETWEEN the vast region which lies to the east of Poland and the Baltic States, stretching across Asia to the Pacific, and the Western world, a thick curtain has been drawn for more than fifteen years. The outbreak of war in 1914 severed the principal channels of communication on the European side and intercourse except between diplomats and military leaders was reduced almost to vanishing point. Three years later the Bolshevik revolution cut even these slender strands. Since then, Russia and Russian affairs have afforded an opportunity for the dissemination of a mass of fantastic statement and discussion in which facts are usually entirely subordinated to ideas. Hypnotised by the vast size and large population of the Soviet Union, and in spite of abundant evidence to the contrary, there are numbers of people in this country who believe that the Russian market is a Golconda for British industry, to tap which they are prepared to go to almost any length in condoning the most dishonourable and treacherous conduct. Repudiation of debts, amounting with accrued interest in the case of Great Britain alone to a sum that would almost liquidate our debt to the United States, brutal savagery, and an avowed determination to upset other forms of government leave these admirers of the Russian mirage unshaken in their views. The small extent of our pre-war exports to Russia, which then included Poland and the Baltic States—the most developed part of the old Russian Empire—is brushed aside with vague talk of "immense potentialities" regardless of the wholesale destruction of the never large purchasing power of this market which took place during the war and has been further reduced by the policy of the Soviet administration.

We print this week two views of Russia from different angles. One is an outline of the impressions gathered by Sir ERNEST BENN during his recent visit to the Baltic. The other is an American business man's account of the electrification programme that is being carried out under the Five Years' Plan. Sir ERNEST BENN did not enter Russia and his book, apart from its searching general criticism of Soviet economic policy, is particularly interesting as an indication of the views about Russia held by that country's nearest neighbours. That Soviet Russia is a most unpleasant and dangerous neighbour is very evident. It is also clear that the more money she has at her disposal the more dangerous and unpleasant she will become. Let us assume that the electrification programme described by Mr. DIBNER is completed and that extensive industrial production is thereby achieved. A new manufacturing area operating at starvation wages will then be competing with the industrial countries of Europe, and Russia, far from being a market, will be endeavouring to export manufactured products as well as foodstuffs and raw materials.

Mr. DIBNER points out that the great bulk of finance for the Five Years' Plan is derived from a population staggering under an enormous tax load. "To finance a total capital investment of nearly £7 000 000 000 under the Five Years' Plan from a population whose average monthly wage is only £7, with a purchasing power of only 59 per cent. of pre-war value requires a reinvestment of national income varying from 36 to 48 per cent. . . . The standards of living imposed by such heavy taxing allows only the most fundamental necessities." Yet it is an operation of this kind that the advocates of extensive credits to Russia are asking us to further. Sir ERNEST BENN'S book will, we hope, do something towards destroying popular illusions about Russia. One can, indeed, sell unlimited quantities of goods to purchasers if one is prepared to lend them the money without regard to eventual repayment, but trade so obtained is not worth having, especially if it is to be instrumental in helping the other party to the transaction in its plans to overthrow all who do not subscribe to its perverted doctrines.

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Current Topics.

Burden of Taxation.

IN answer to a question in the House of Commons on March 25th Mr. SNOWDEN gave figures relating to the burden of taxation in Great Britain, Germany and the United States which indicated that the amount payable per head of population in this country is about 60 per cent. greater than in Germany and 75 per cent. more than in the United States. The per capita figures given are: United Kingdom, £15 1s. 5d.; Germany, £9 12s. 8d.; United States, £8 14s. 3d. It is not surprising that our manufacturers find it difficult to compete for export trade and even to retain their home market. We are about to learn what Mr. SNOWDEN has in store for us but in view of these figures he will have a difficult task to justify any increase in the present burden on British industry and trade.

North London Railway Services.

HAVING had the electrification of its London suburban lines under consideration for a number of years the L.N.E.R. has produced a plan for the conversion of the Great Northern section as far as Welwyn and Hertford. In view of the facts that the scheme was not put forward until the Underground project for an extension of the Piccadilly tube from Finsbury Park to Cockfosters was well on the way to receiving Parliamentary sanction and that the L.N.E.R. is vigorously opposing the tube extension the attitude of the railway company has rather a dog-in-the-manger appearance. This impression is fortified by the intimation that a final decision by the L.N.E.R. as to its own electrification programme is likely to be delayed until the fate of the tube Bill is known, and possibly, if the latter is passed, until the effect of the tube extension on traffic has been ascertained. We believe that there is ample justification for both projects but in any event the L.N.E.R. has only its own timidity and dilatoriness to blame for the prospective competition in an area which has been very badly served for many years.

B.E.A.M.A. and the National Scheme.

MR. HUGH QUIGLEY, in the course of an article published by the "Financial Times" on Tuesday, of which we give an abstract on page 466, charges the Electricity Commissioners with undue delay in sanctioning extensions to generating plant, and suggests that another 500 000 kW should have been ordered last year to keep pace with the growth of demand for current. It is hardly possible to challenge Mr. QUIGLEY'S figures, though it may be pointed out that the percentage of 4·4 relating to the small increase in new plant in 1929, which adds greatly to the impressiveness of his case, is perhaps too isolated to form the basis of an indictment. It must be remembered that the present generating capacity is some 70% in excess of the maximum demand. A primary object of the grid is to secure a better utilisation of plant and therefore to reduce this excess capacity. Given a really marked industrial revival it is possible that a shortage of current might be experienced in three years' time, in spite of the existence of this surplus capacity, but the fact that such a large margin does exist must impose a certain caution in sanctioning extensions.

Effect of the Grid.

FURTHER, as the grid grows towards completion the linking up of stations must tend towards a slowing down in the provision of new plant. It can indeed be said that had the South-East England grid been six months or a year further forward an extension such as that which was opened at Kingston on Wednesday would hardly have been authorised. Taking the long view it would not be in the interests of manufacturers to discount the future too freely, for in that case a larger number of orders at the moment would probably result in a very dull patch in the near future. Some attempt to even out the rate of provision of new plant would therefore appear to be in the general interest. It is possible that the Commissioners were ultra-cautious last year, but whether they are right or wrong can only be definitely proved by experience. We hope that a trade revival will show them to have underestimated the actual needs. In any case Mr. QUIGLEY has done good service in drawing attention to the subject, and the figures which he has collected will doubtless lead to a re-examination of the position by the Commissioners.

Progress in Portugal.

UNDER the dictatorship Portugal, like Italy and Spain, has made a notable advance in the direction of modernising the mechanical equipment of the country. Several years of stable government have transformed the financial situation, and have paved the way for the execution of a vigorous reconstruction programme of which Portugal stood in great need. An excellent system of roads is replacing the dreadful tracks of a few years ago, and the Government is now able to raise internal loans at under 7%. In the electrical sphere progress is also to be recorded. Most of the important areas are now linked by trunk telephone lines with one another and with Great Britain and Continental countries. At the general meeting of the Anglo-Portuguese Telephone Co., Ltd., last week, the chairman, Sir Alexander Roger, said that in 1929 there were 3 665 new stations connected to the company's exchanges, an increase of 16% in the year. By September the Lisbon Trindade Exchange will have been converted to automatic working. Given a continuance of sound government, Portugal should offer a growing market for electrical goods, particularly if it should be found possible to put in hand the long-discussed Douro hydro-electric project.

Inter-planetary Television.

A CONTRIBUTOR to the April issue of the "Telegraph and Telephone Journal" humorously discusses past failures to achieve wireless communication with the Martians and makes a fantastic suggestion of a combination of telescopes and valves which would enable confirmation or refutation of scientific conjecture in regard to conditions on Mars to be attained. Although we have no great faith in the possibility of establishing communication with inhabitants of other planets—should there be any of sufficient intelligence and mechanical skill within the solar system—it is an interesting thought that television apparatus would be of much greater practical use for the purpose than either Morse signals or telephony. Assuming that waves could be induced to penetrate the Heaviside layers of the earth and Mars and travel in a beam between the two worlds, the transmission and reception of pictures would provide a method of establishing comprehension which would be almost impossible by any audio system. But we fear that the prospects of finding planetary neighbours equipped with the necessary apparatus are remote.

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EXTENSIONS AT KINGSTON-UPON-THAMES.

Opening by Sir John Brooke.—3 750 Brush Turbo-generator and 50 000 lb. Stirling Boiler Added—Output of 8 000 000 Units.

EXTENSIONS to the Royal Borough of Kingston-upon-Thames Central Electricity Station were opened by Sir John Brooke, K.B.E., C.B., on Wednesday, the new 3 750 kW turbo-generator being started up by Lady Brooke.

The company was subsequently entertained to luncheon at Nuthall's Restaurant by the chairman, Councillor A. A. Gregory, and members of the Borough Electricity and Lighting Committee. The Mayor, Councillor W. H. Bowskin, presided.

Proposing the toast of "The Kingston Electricity Undertaking," Sir John Brooke said that the Kingston Electricity Committee had been ready to co-operate with the London and Home Counties Joint Authority and was assisting neighbouring undertakings. It was already supplying Walton, and he understood that it was going to assist Twickenham and Teddington, and there might be further schemes maturing in which Kingston would be concerned. In the course of time the whole of the generation of the country would be worked substantially as one unit. This development would be no good unless we were able to use it to the full and rapidly increase consumption. Industrial success and civilised comfort in the future would depend on the cheapness and availability of electricity. He congratulated Mr. Kingham, the Borough Electrical Engineer, on the aggressive vigour of the administration of the Kingston station. Mr. Kingham was one of the band of progressive engineers in the area around London who were determined to keep their undertakings in the front rank. He suggested the formation of a branch of the Electrical Association for Women in Kingston.

Originally designed by Sir William Preece, the Kingston station was opened in 1893, and contained Belliss Siemens reciprocating sets with a total capacity of 225 kW, generating at 2 100 V, single phase, 77 cycles. The total output for the first 15 months of the undertaking was 128 267 units. It is estimated that sales in the year ended March 31st, 1930, reached 8 000 000 units. The maximum load has grown since 1894 from 100 kW to 4 630 kW, and the number of consumers has increased from 77 to 6 500. Belliss Siemens reciprocating sets were added, but no individual set was above 200 kW.

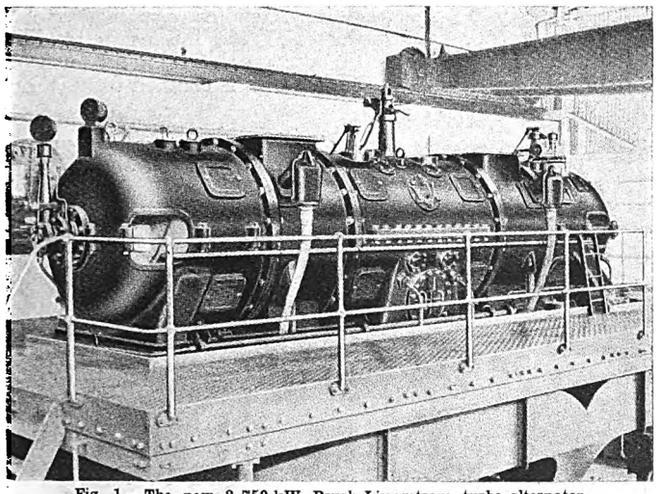

Fig. 1.—The new 3 750 kW Brush-Ljungstrom turbo-alternator, Kingston-upon-Thames.

In 1913 it was decided to instal two Diesel engines, one of 500 H.P. and one of 400 H.P., manufactured by the Maschinenfabrik Augsburg Nurnberg A.G., each of these direct coupled to a 270 kW alternator manufactured by Siemens Bros. of Woolwich. These were the first slow speed horizontal Diesel engines erected by this firm in England.

In 1918 the first two 1 000 kW turbo alternators were installed; these were of Brush-Ljungström make, manufactured by the Brush Electrical Engineering Co., Ltd., Loughborough, generating at 3 300 V, three phase, 50 cycles. In conjunction with this plant two five-drum Stirling boilers, each with an evaporative capacity of 21 000 lb. per hour, were installed.

It now became necessary to change over the supply in Kingston to 240 V for lighting, and 415 V, three phase, 50 cycles and 240 V, single phase, 50 cycles, for power. As it was anticipated that this work would take some years, it was necessary to instal temporarily two 1 000 kW frequency changing motor generating sets, manufactured by the Brush Company, the first of that type to be made in this country.

Owing to the greatly increased load in 1923 it was necessary to instal a further 2 000 kW Brush-Ljungström turbo alternator, and in the boiler house one 30 000 lb. horizontal tube Vickers boiler. This Vickers boiler was fitted with the first Illinois mechanical stoker to be erected in England.

The growth in output was so great that within a short time a further 3 000 kW set, also of Brush manufacture, had to be installed. During the time this set was being erected negotiations were begun with the London and Home Counties Joint Electricity Authority for a supply in bulk to Walton-upon-Thames, and on April 1st, 1929, that area first began to take current. A sub-station was erected at the electricity works, complete with transformers and switchgear, by the General Electric Co. In this sub-station were three 800 kVA transformers stepping up from 3 300 to 11 000 V.

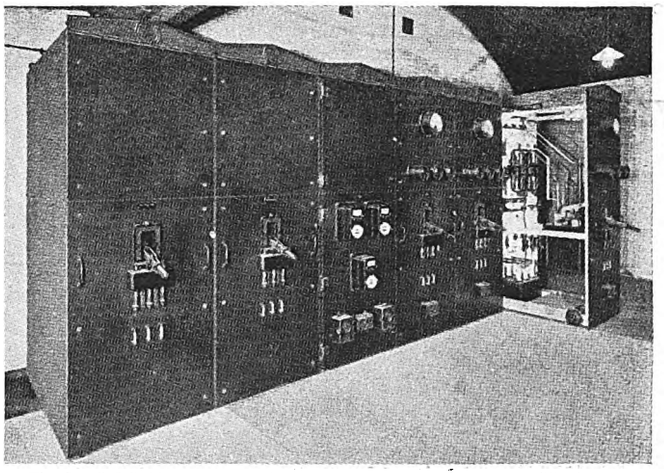

Fig. 2.—G.E.C. 11 000 V truck type switchgear showing one truck withdrawn.

The maximum demand from Walton in the initial stages far exceeded the original estimated requirements, and it was found necessary to instal the additional plant now running.

The Hackbridge Construction Co., of Walton-upon-Thames, are receiving from this station a supply of current for testing the 132 000 V transformers which they are manufacturing in connection with the National Grid Scheme, and this supply is given to them without interference with the network of either Kingston or Walton.

The present extension comprises additions to the boiler house; foundations, etc., by W. H. Gaze and Sons, Ltd., of Kingston; boiler by the Stirling Boiler Co., Ltd.; turbo-alternator by the Brush Electrical Engineering Co., Ltd.; e.h.t. switchgear and l.t. switchgear by the General Electric Co.; and cables by the Union Cable Co., Dagenham Dock.

The foundations for the boiler, owing to the nature of the ground, presented some difficulties, and the entire boiler and boiler sub-structure are carried upon a concrete raft having in places a total thickness of 9 ft. The boiler plant is of the Stirling five-drum type, with patent integral superheater and a Green's tri-tube economiser. The boiler is capable of producing 50 000 lb. of steam per hour, with an extremely large overload capacity. Under the boiler are two Babcock and Wilcox stokers of the enclosed type.

The turbo alternator of the Brush Ljungström type is most economical at an output of 3 000 kW when supplied with steam at a pressure of 225 lb.

The l.t. switchgear is enclosed in a cubicle of the steel plate type, and operated from a marble control panel on the switchboard above. The alternator cubicle is equipped with an oil immersed circuit breaker of 50 000 kVA maximum breaking capacity with the necessary instruments.

Additions to the coal conveyer were by W. J. Jenkins and Co., of Retford, who supplied the original coal conveyor.

The feed water system is driven by one Weir steam turbo-feed pump, and the centrifugal pump for the condensing water is manufactured by Messrs. Mather and Platt.

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VULCANISED FIBRE.

A Misnamed Product—Method of Manufacture—Physical Properties—Mechanical Strength—Electrical Applications—Working Recommendations.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

THE use of the term "vulcanised" in the common name of vulcanised fibre is a strange anomaly, for no process in any way connected with, or even resembling, vulcanising is employed in its manufacture. Whatever its origin, the designation is of long standing, and appears firmly established both in common use and in technical specifications.

In its composition and processes of manufacture the material is closely associated with high-grade paper, and even more closely with pressboard, for it is a product of cotton rags which are first converted into absorbent paper. After further chemical treatment the material is rolled up on cylinders to the required thickness and put through finishing processes.. The processes of manufacture, unlike those of paper and

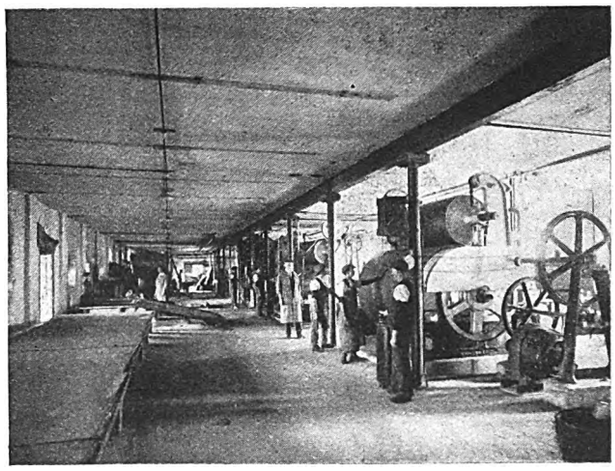

Fig. 1.—Fibre Making Machines, Maidstone Works of the Diamond Fibre Co. (see also Figs. 2 and 3).

pressboard, include what is termed an "acid" treatment actually a process using zinc chloride, and require a long soaking process for final cleansing.

Fibre had its origin in the United States, where the earliest patents on it were granted in 1859 to Thomas Taylor, whose successor, Edward Mendinall Taylor, founded at Wilmington, Delaware, the Diamond State Fibre Company. This was the first, and is still to-day, probably the largest firm of fibre manufacturers. The source of supply has remained chiefly in America. Independent British manufacture has not been developed to any great extent, but important manufacturing and development work is being done at Maidstone, in Kent, by the Diamond Fibre Company, which is associated with the American firm. Continental products are, generally speaking, of inferior grade.

The output of fibre finds extensive use in many directions. It is used extensively for electrical work, though probably not so extensively as before the development of bakelite and pressboard. In electrical manufacture, as will be seen later, its use is limited to mechanical service and low voltage insulation. Fibre boards are made from about $\frac{1}{32}$ in. to about $1\frac{1}{2}$ in. in thickness. In sheets thinner than $\frac{1}{32}$ in. the same material is known as leatheroid.

The pulp is produced from selected and cleansed rags, which are put through rotary cutting machines and rotary boilers. From the boilers the rags are delivered to washing machines, in which they are further macerated, and thence to beaters which draw out the fibres and form the pulp. From the beaters the pulp passes through continuous paper-making machines, where it is formed into flat wet sheets which travel over large drums for drying. In this stage the material is soft and velvety, resembling high-grade blotting paper. The sheets are wrapped into rolls and then delivered to the fibre-making machines (Fig. 1), where they are unwound, run through a zinc chloride bath for parchmentising, and rewound on drums or mandrels to the required thickness for the sheets or tubes.

The material, still soft and pliable, though now more dense and tough, is taken from the machines, the large cylinders for sheets being slit longitudinally and straightened out. The final treatment consists of a succession of soakings in solutions of zinc chloride, gradually diminishing in strength to pure water (Fig. 2). This process is a long one, the thin sheets taking about a week and the greater thicknesses requiring as much as a year or more to complete. Hurrying the process leads to the formation of blisters, which are usually relieved by pricking. Sheets which show evidence of having been pricked should be avoided by electrical manufacturers. The B.E.S.A. specification requires that the finished material should not contain more than 0·02 per cent. by weight of chloride.

In the final air drying the sheets shrink about 50 per cent. in thickness, 10 per cent. in length, and 15 per cent. in width. Drying warps the sheets so that it is necessary to flatten them in steam-heated hydraulic presses, after which it is put aside for several months in a dry, ventilated room to season. Before shipping the sheets are calendered to exact thickness (Fig. 3).

Fibre is ordinary supplied in natural (grey) colour, red or black. The red and black colourings are obtained to some extent by the use of selected coloured rags and to some extent by the addition of colouring matter. In general, material of the natural colour is preferable for electrical purposes, though red fibre is also used to a large extent. Research observations extending over fifteen years on machine slot wdeges of red and grey fibre in alternate slots in the same machines and examined after varying periods of service, have clearly demonstrated the superiority of the grey material. Regarding the varieties of fibre manufactured, it should be mentioned that two distinct kinds, designated respectively "hard" and "flexible," are made, the latter in two varieties, glycerine fibre and calcium fibre. Flexible fibre often contains a large proportion of jute. It is extremely hygroscopic, and is quite unsuitable for insulation. Consideration is therefore given here to hard fibre, only of high quality and high density.

Fibre rods are produced by turning up square sections cut from sheet. Wherever possible tube material should be used in preference to rod, since the concentric lamination gives less tendency to splitting and to warping. It is interesting to note that there has recently been placed on the market a form of fibre, in rod and special sections, which is claimed to have no

Fig. 2.—Fibre Washing Plant.

laminated structure, and therefore does not burr across lamination planes in threading. Specimens of the material certainly show very fine thread cutting. The new material also appears to have a lower moisture absorption characteristic than the usual material, and also to have exceptionally low shrinkage. It may prove to be an important development.

The physical properties of fibre are mostly good. It is unaffected by oil, grease and most solvents, including spirits, turpentine and acetone. Moderate dry heat does not affect it, and it does not melt under any conditions. At high temperatures it becomes brittle, but retains its other mechanical pro-

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perties and electrical strength until it chars at about 180 deg. C. The weakness of the material lies in the effect water has upon it. It absorbs moisture readily, as shown in Fig. 4, which, with Fig. 5, is reproduced from "Electrical Insulating Materials," by Monkhouse. Under the influence of moisture the fibre swells, warps and loses much of its mechanical strength and practically all its electrical strength. For this reason it should be given a varnish or other protective coating, and even with this protection should not be used as insulation beyond the recommended limit of 20 V per mil, as mentioned in the notes on electrical strength.

The mechanical strength of fibre is probably its most remarkable feature. No other material, it is claimed, can favourably compare with high-grade fibre in the relation of its tensile strength to its weight. The mechanical strength characteristics of fibre are indicated by the curves reproduced in Fig. 5. The makers' claims approximate to the values shown as do also the minimum permissible values recommended in B.E.S.A. Spec. 216, the latter values being in general a little lower. It will be noted that somewhat sharp irregularities occur in the curves at a thickness of about ·25 in. These are due to the fact that about this thickness a change is usually made in the paper used in the manufacture of the fibre.

The electrical strength of fibre for boards of different thicknesses is indicated by the lower curve in Fig. 4. The makers' claim in this respect is 200 to 400 V per mil. It should be noted, however, that the values given are those obtained on thin specimens which have been subjected to a 24 hours' conditioning treatment of drying at a temperature of about 80 degs. C.

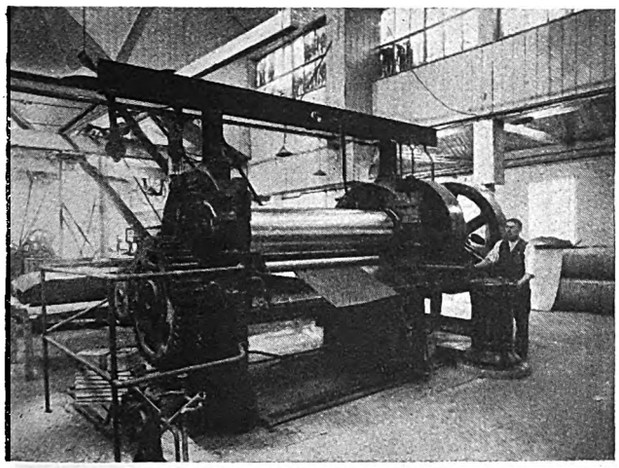

Fig. 3.—Fibre Calendering Machine.

The admitted tendency of fibre to absorb moisture causes great reduction of electric strength under humid conditions, and for this reason the British and Continental standard specifications recommend a limiting service stress of 20 and 15 V per mil respectively.

Some of the more important applications of fibre in electrical work are indicated in the following notes, together with some recommendations based on research work and manufacturing experience with regard to special methods of treatment and testing.

Washers for Supporting the Windings of Field Coils, Solenoids, etc.—Though some electric strength is desired, the mechanical strength consideration predominates. The material, after being cut to shape, is often given a treatment of varnish.

Spacing Blocks and Radial Segments for Supporting the Stator Windings of Turbo-alternators.—This is one of the principal uses of thick fibre board. Exceptional care should be taken to ensure the use of well-matured material, so that no shrinkage may take place in service. There is a tendency to use synthetic resin boards for this purpose, but experience has shown that fibre can be used satisfactorily.

Slot Wedges for Machines.—This is one of the most common uses of fibre, and it is one in which only the highest grade material should be accepted. The B.E.S.A. specification emphasises the importance of strength for this work by including a special test. In this test measurement is made of the pressure required to dislodge a slot wedge specimen from a slot. The types of specimen and the test apparatus used are such as to reproduce as far as possible the service conditions. Two sizes of wedge are suggested, both of round-edge section, one specimen ·66 in. wide and $\frac{1}{8}$ in. thick, and the other ·88 in. wide and $\frac{1}{4}$ in. thick. The minimum permissible pressures required to displace the wedge from the slot in a compression testing machine are given as 3 000 lb. per in. length for the smaller specimen, and 5 000 lb. per in. length for the larger. Since, however, there must be a relation between the results of this test and those of the shearing test, and test results have confirmed that this relation exists, the

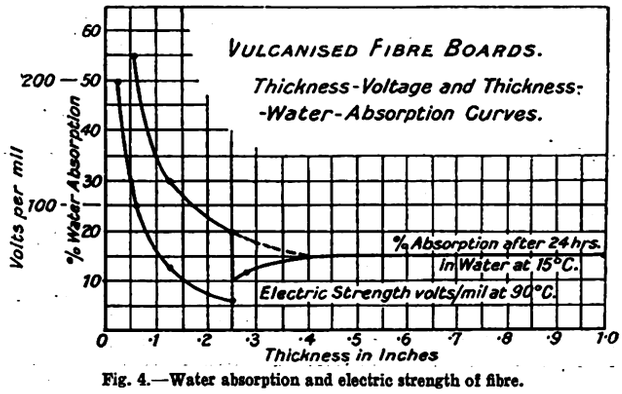

Fig. 4.—Water absorption and electric strength of fibre.

use of the special apparatus advocated can be dispensed with, provided that the shearing strength is not below 14 000 lb. per sq. in. for material of $\frac{1}{8}$ in. thickness, and 12 000 lb. per sq. in. for material of $\frac{1}{4}$ in. thickness.

The question of shrinkage is of vital importance where slot wedges are concerned, and, therefore, not only should the material be specially selected, but in almost all cases it should be shrunk by a curing heat-treatment prior to service, and treated with varnish immediately after the curing. It is interesting to note here that observation of the amount of shrinkage in the curing process will give a direct indication of the quality of the material; the poorer the quality the higher the percentage of shrinking.

Fuses, Bases and Tubes.—The suitability of fibre for this service is due to its remarkably good behaviour under fuse-wire charring tests. It withstands repeated explosions without appreciable carbonisation "tracking." Its excellent properties in this respect are indicated by Fig. 6, which shows comparative specimens of fibre, bakelite paper board and micanite subjected to the standard E.R.A. test. It should be noted that the fibre specimen has been subjected to ten explosions, the micanite to three, and the bakelite only to one.

The following recommendations given by the makers regarding methods of working the material are helpful, since in general the material is hard on cutting tools, and has a resilience which renders some operations difficult if too light a cut is attempted. Another important point is that, owing to the low heat conductivity of fibre, a tool which tends to bind will rapidly overheat.

Punching.—A plain punch and die may be used on sheets up to $\frac{3}{8}$ in. thick, but a smooth edge cannot be obtained on

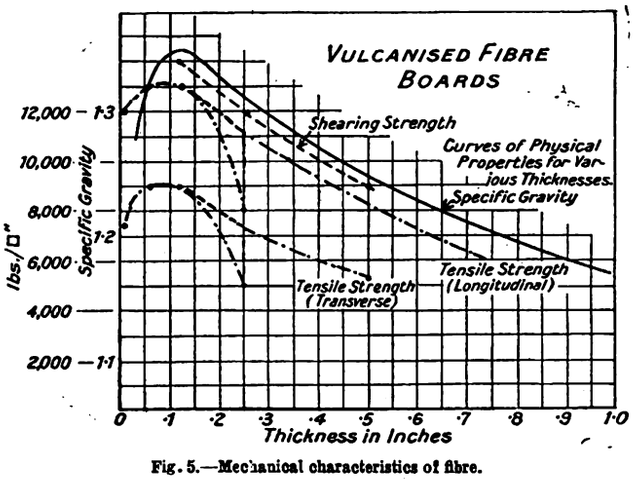

Fig. 5.—Mechanical characteristics of fibre.

sheets over $\frac{1}{8}$ in. thick. Sheets thicker than $\frac{3}{16}$ in. should be warmed to about 55 deg. C. A plain die will cut about 100,000 pieces before re-grinding is necessary.

Turning.—The peripheral speed should be 30 per cent. faster than for cast iron. The tool should be wide-nosed, with

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a large clearance but no rake. The cut should remove at least $\frac{1}{8}$ in., as a light cut will not give uniform diameter. The tool is dulled quickly. No lubricant is needed.

DRILLING.—Fibre should be drilled dry, using a fast feed. The hole will be about ·003 in. undersize, hence, to prevent excessive heating, the drill should be removed from the hole as soon as possible. To make a hole the exact drill size or a little larger, the drill should be ground with one lip a little

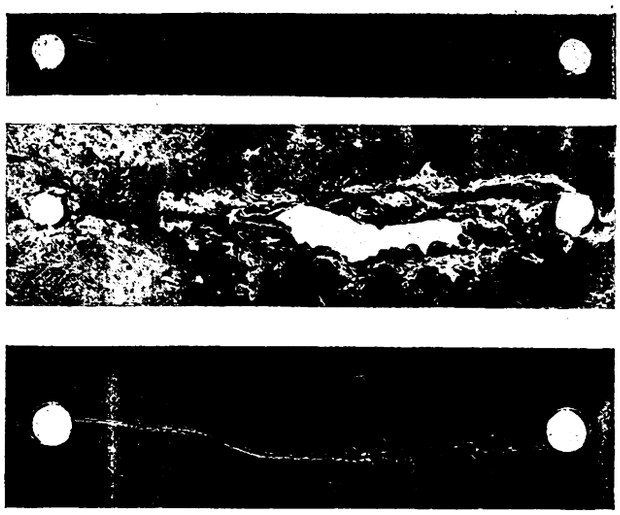


Fig. 6.—Comparative results of fuse wire tests. Top—Fibre, 10 explosions; Micanite, 3 explosions; bottom—Bakelite, 1 explosion.

longer than the other. A drill will last about three-quarters of an hour before re-grinding is necessary.

REAMING.—Fibre cannot be reamed. Two or three operations will dull the reamer and the hole will not be to size.

THREADING.—Ordinary taps and dies give good results. A very little oil should be used.

MILLING.—Use a high-speed and coarse feed, so that the cutter throws the chips away. If possible mill in one operation.

PLANING.—Use a high speed and take a deep cut, which should never be less than $\frac{1}{16}$ in.

SAWING.—Band and smooth saws of wide pitch, made specially for fibre, can be obtained from most manufacturers. A smooth saw will last $\frac{1}{2}$ hour on $\frac{1}{4}$ in. fibre, 20 min. on $\frac{1}{2}$ in., and 15 min. on 1 in. before being re-sharpened. A band saw will last 1 to $1\frac{1}{2}$ hours on $\frac{1}{8}$ in. fibre, and $\frac{1}{2}$ hour on $\frac{3}{4}$ in.

BENDING.—Sheet fibre can be bent if it is first immersed for 5 to 10 min. in a steam bath at atmospheric pressure. When cool and dry, it will re-harden and retain the given shape.

The authors' acknowledgements are made to the Diamond Fibre Company for information on manufacture and machining and for Figs. 1, 2 and 3; to Sir Isaac Pitman and Sons, Ltd., for Figs. 4 and 5; and to the Metropolitan-Vickers Electrical Company for permission to publish information gained in research work.

RIVERSIDE "B" STATION, SHANGHAI.

THE new Riverside "B" station of the Shanghai Power Co. has a capacity of 40 000 kW, raising the total capacity of the company's plant to 161 000 kW. Riverside "B" comprises two Metropolitan-Vickers turbo-alternator sets, each of 20 000 kW maximum continuous rating, twin cylinder, 3 000 r.p.m., arranged for stage bleeding; two Babcock and Wilcox Stirling boilers with normal evaporation of 140 000 lb. per hour and maximum of 185 000 lb. per hour, fitted with steel tube economisers, air preheaters and Lopulco pulverised fuel firing equipment, supplied by the International Combustion Co., England.

Records covering the four weeks ended December 25th show that during this period over 26 000 000 units were generated in the new station, representing 49% of the combined output of the Shanghai Power Co.'s stations. The fuel consumption was 14 498 B.Th.U.'s per kWh generated, giving an overall thermal efficiency of 23·55%. The fuel used has a calorific value considerably below 11 000 B.Th.U's. This is the first pulverised fuel plant to be installed in North China.

TELEPRINTING.

Teleprinter Service for Subscribers through Telegraph Exchanges.

WE learn that the Post Office is making preparations, which have reached an advanced stage, for the introduction of an entirely new development in telegraphic service. This will take the form of a public telegraph exchange, operated on the same lines as a telephone exchange, by means of which subscribers will be able to telegraph typewritten messages direct to one another. This innovation should revolutionise the telegraph service since it will eliminate all delay other than that which occurs through a desired connection being temporarily engaged, obviate the necessity for sending telegrams to a public telegraph office for despatch and enables a typewritten reply to be received almost immediately.

At the outset it is proposed to confine the new service to the London area but it will eventually be extended to all the larger centres if it proves sufficiently popular.

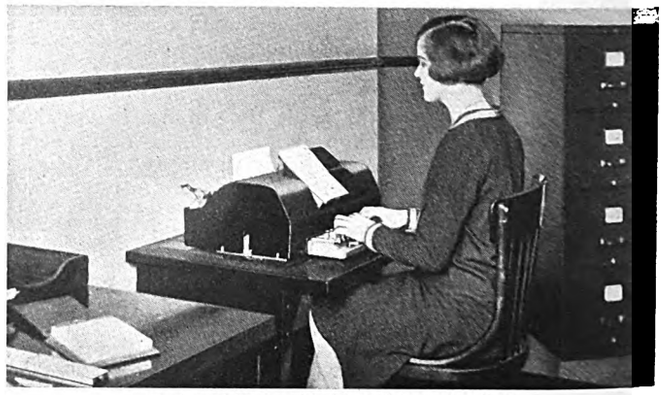
The London exchange switchboard will be installed in the Central Telegraph Office. Each subscriber will be provided with a teleprinter of the column-printer (not tape-printer) type, which any typist can use after a little preliminary instruction. The machines will be modifications of the Creed 3A machines now used in large numbers by the Post Office for high speed telegraphy. These machines receive on tape instead of in column, but otherwise are much the same as those to be supplied to subscribers.

Each subscriber will be allotted a number, and by depressing a button on the teleprinter will call the exchange operator. The number of the required subscriber will then be dialled, as in the case of automatic telephony. When the required connection has been made by the exchange operator, the indication "THRO" will be typed on the subscriber's teleprinter. The two subscribers may then proceed to typewrite to each other, and when they have finished, the depression of another button will notify the exchange operator of the fact and the connection will then be severed.

There will be automatic means for ensuring that subscribers are connected with the correct number asked for, i.e., when the two lines are connected, the exchange number of the called subscriber will be automatically printed at the receiving point of the calling subscriber's instrument.

Subscribers will be able to forward telegrams to the C.T.O., and, it is hoped, to all telegraph companies, without fee beyond the normal charges for the telegraph service. They will also be able to receive their incoming telegrams on their teleprinter instruments.

The subscription to the exchange contemplated at the outset is a flat rate of about £70 per annum where the subscriber's premises are within a two-miles radius of the C.T.O., and £75 per annum if the premises are beyond the two-miles radius but within a four-miles radius of the C.T.O. There will be an additional payment where the premises are beyond the four-miles radius.



Typing a telegram direct to a distant subscriber.

This subscription will cover the installation and maintenance of the lines and instruments and all communications with other subscribers on the Exchange. Additional instruments in the same premises will be obtainable for a further subscription of about £50 each per annum.

Owing to the amount of work involved, it is not likely that the Exchange will be in working order in much less than twelve months.

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THE B.T.H. LABORATORIES.

Works Testing and Development—The Engineering Laboratory (Rugby)—General Electrical and Physical Work—Insulations and General Work—Chemical and Metallurgical Research—Million Volt Testing Equipment—Radio Development.

By H. WARREN and A. E. SMITH

THE multifarious activities of the B.T.H. Company necessitate very comprehensive investigation and testing arrangements. The design and construction of machinery and apparatus ranging from the largest steam turbines, generators, motors and switchgear, to talking film equipments, fractional horse-power motors, magnetos, radio and domestic appliances, and electric lamps call for an exact knowledge and control of all the materials used and principles involved, the march of progress demands daily improvement, and a continual striving after new things. Only by maintaining an efficient works testing corps and a separate expeditionary investigational force can advance be ensured, and these services entail the establishment of personnel and equipment of special interest and importance.

Fig. 1.—Experimental laboratory for synthetic resins, varnishes, etc.

The materials with which the manufacturing organisation is fed are specified to conform to the standards necessary for the service to which they are to be applied, these standards having been previously established by investigation and experience. The conformation to the critical standard is proved by constant acceptance tests on the raw materials, and successive tests in various stages of manufacture confirm the initial examination. These tests in the B.T.H. factories are, generally speaking, carried out in the works' chemical and electrical testing laboratories. The former undertakes all routine tests—physical, mechanical and chemical, and the latter takes care of routine electrical and magnetic testing.

These arrangements apply particularly to the main Rugby works; but the other factories specialising in specific lines of apparatus have, to some extent, developed testing and experimental arrangements appropriate to their main products; such a condition being the logical outcome of considerations of expediency and geography. The Coventry Works, for example, manufacture magnetos, radio sets and components, fractional horse-power motors, and moulded insulations; and the peculiar problems and materials associated with this combination require electrical, physical and chemical tests and experiments on the spot, augmenting the general information and service available from the central Rugby laboratories.

The Birmingham works, specialising in motors, uses metals proved in the Rugby laboratories, but tests its own insulating materials as delivered. The Willesden switchgear factory, with its special high voltage problems, requires its own high tension facilities, and so, logically, the million volt laboratory is there.

These works' testing laboratories take care of all the routine material testing required by the company, and certain of them also, as indicated, do a proportion of experimental and development work necessary in connection with problems of factory production and design. The general investigational and fundamental work on electrical, physical, insulation, chemical and metallurgical matters is carried out in the engineering laboratory at Rugby. No routine testing of any kind is done in this laboratory. It is wholly devoted to the investigation of problems connected with present and future electrical and allied manufacture, and constitutes a self-contained entity drawing its problems from the various departments and factories, and pursuing original lines of experimenting to the point where they become of manufacturing importance.

The engineering laboratory occupies two floors of a steel frame and brick building. There are 39 rooms of various sizes, and of these five are used for administration and offices, one is a library and records department, another is an experimental workshop, and the remainder are laboratories. The floor area is 20 000 sq. ft. There is also a large separate acoustical laboratory especially designed for work in connection with talking film equipment.

The insulation and chemical and metallurgical laboratories in which the chemical processes are carried out are provided with fume chambers connected to shafts extending to the roof of the building, and the radio laboratories are connected to a multiple 180 ft. aerial on the roof, as well as to other experimental aerials of various lengths and heights.

When these laboratories were established, the equipment was undertaken on rather unique lines; no attempt was made to acquire a collection of the usual testing and academical apparatus, but the current problems were specially considered and appropriate apparatus for grappling with them was designed and constructed, for the most part in the laboratories themselves. The vacuum physics laboratories have a complete manufacturing equipment exactly the same as that upon which radio valves are regularly produced in the factories. The insulation laboratories, in addition to special experimental machines, have small replicas of the regular works' plant, and as examples of special apparatus, constructed in the laboratory, a high frequency and high voltage oscillator, special high temperature measuring apparatus, loud speaker output, characteristic plotting gear, and carborundum squirting apparatus may be mentioned.

The special work undertaken in the engineering laboratory naturally necessitates very careful choosing of the staff, which is drawn mainly from the Universities and from the company's apprentices.

Work is constantly being carried out in connection with many special and diverse matters, such as batteries, carborundum resistances, fabrication, the development and improvement of factory products such as wire and coreplate insulation, vitreous enamelling, synthetic resins, textolite gears, radio valves, transformers, analysers, rectifiers, talking film apparatus and radio circuits. The instructions issued to the various factories give fundamental data upon which certain engineering designs are based. Manufacturing processes developed in the laboratory are covered by works' instructions, and these new manufactures are controlled in consultation with the works' authorities.

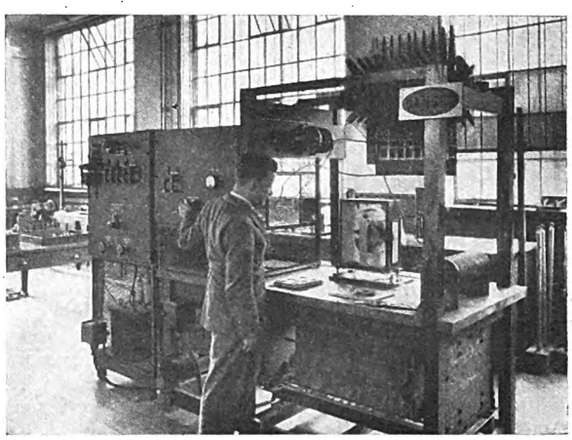

Fig. 2.—H.F. and H.V. apparatus in Insulations Laboratory.

Taking Laboratory No. 118 as an example, it may be mentioned that this room is used generally for electrical work involving specially accurate measurements. In addition to

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a potentiometer and Wheatstone bridge for the calibration of special instruments, the room is equipped with apparatus such as standard condensers, inductances and resistances, which can be set up to form circuits for the accurate measurement of capacity, inductance, magnetic properties of iron, small phase angles in transformers, reactors, etc., and various other electrical quantities. The determination of the amplification characteristics of intervalve transformers and amplifiers, the measurement of the permeability of iron at flux densities of only a few lines per sq. cm., and also at extremely high flux densities, and the measurement of the phase displacement between high and low tension circuits of potential transformers, are among the more difficult observations made

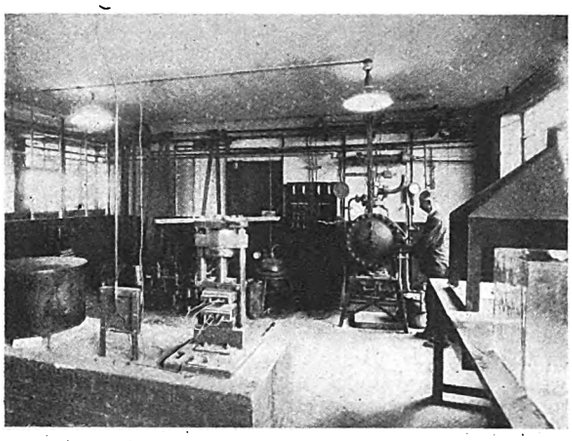

Fig. 3.—Insulation Process Laboratory.

in this room. In this laboratory, a sound-proof room is provided for the investigation of small motors, loud speakers, amplifiers, etc., and apparatus has recently been installed which enables the "frequency-output" characteristics of any amplifier or loud speaker to be projected upon a screen.

In Laboratory No. 124, the work is principally in connection with sound recording and reproducing apparatus. A range of power amplifiers capable of delivering from 1 to 50 W of undistorted power has been developed for the reproduction of sound from gramophone records, and up to 160 watts in the case of talking films. Special work has also been done on the theory of loud speakers, including large moving coil apparatus. A considerable amount of attention has been devoted to the reproduction of sound from photographic films, and this has resulted in the development of the "B.T.H. Reproducer," a 40 W talking film equipment which has been installed in many theatres. Such work as recording the sound on films is also in hand, and the characteristics of selenium and photo-electric cells are being closely studied. Telephotographic reception from America is also conducted.

In another laboratory work associated with small thermionic valves and rectifiers is carried out. Investigations in connection with new types, and special work in regard to the modification of existing types, as well as special life tests on valves are also undertaken. Certain special investigations are conducted such as those arising from difficulties with standard lines of vacuum devices; and observations of their characteristics are constantly being made.

The principal work carried out in Laboratory No. 117 is in connection with the production of new rectifiers, etc.; such devices are constructed on a small scale basis, and preliminary measurements of their characteristics are made, the work culminating (in collaboration with the works) in the issuing of the necessary data. Problems of general vacuum physics are also investigated as they arise.

In Laboratory No. 125 experimental reception and measurements on short wavelengths from America are periodically carried out by arrangement with the I.G.E. Company. The laboratory includes a special draped audition room for acoustical work, an optical laboratory, the equipment of which includes an optical bench and a quartz spectrograph, and adjacent photographic dark rooms. There is also a large acoustical laboratory provided with means of projecting and playing talking films.

Laboratory No. 111 is used generally for the experimental development of synthetic resins, varnishes, moulding powders, etc., and, in addition to this, experimental spirit and oil varnishes, lacquers, paints, filling compounds and cements are produced here. All the requisite testing gear to ascertain the chemical and physical properties and to aid the development of these new products is provided. Laboratory No. 11 is specially equipped with hydraulic steam and vacuum plant for the small scale synthesis and moulding of synthetic resinous compounds. Laboratory No. 21 is a process laboratory provided with electrical presses, experimental wire enamelling and cotton sleeving machines, a fabric treating tower, controlled atmosphere chambers and ovens, and experimental impregnation plant.

Laboratories Nos. 17 and 19 are respectively completely equipped for the high tension testing and the mechanical testing of experimental insulations.

Laboratory No. 16 is an e.h.t. testing laboratory in which sustained tests are carried out for protracted periods, and special apparatus is also set up for battery and electrical resistivity testing. Laboratory No. 12 contains special equipment for the experimental production of ceramic and refractory materials. In this laboratory a complete investigation of the production and properties of carborundum products is in progress, and new ideas in connection with electric fires are being pursued.

Many unclassified investigations are undertaken in the Insulation section of the laboratory such as the production and general applications of new resins; the improvement and development of sound producing records, and investigations of new processes and new non-metallic materials. Improved manufacturing processes relating to insulation and insulating methods are being constantly worked upon and an engineering sub-section of the insulation group deals specifically with troubles associated with manufacture and design as well as the conducting of new factory processes.

The work of the Chemical and Metallurgical section is conducted in the following laboratories:—

Analytical (Inorganic and Metallurgical).
Analytical (Organic).
Mechanical Investigational.
Microphotographic.
Physico-Chemical.

In addition there is an external laboratory equipped with plant for large and small scale melting, casting, annealing and other metallurgical processes requiring high temperatures. This laboratory is also equipped for pyrometric work. The work undertaken includes investigation into the causes and prevention of chemical and metallurgical difficulties, corrosion troubles, etc., either in the B.T.H. Company's works or in connection with outside installations. There is also a continual demand from the engineers for experimental investigation of the mechanical, physical and chemical properties of materials required to meet the new and ever increasing demands of the industry, and for other pure or applied researches.

The experimental investigation of metals (ferrous and non-ferrous) involves chemical analysis, mechanical testing, and

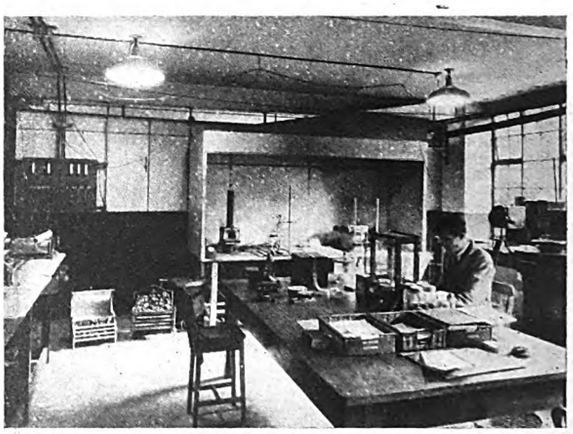

Fig. 4.—Experimental laboratory for Ceramics, Refractories, etc.

examination under the microscope, and a room possessing two special fume chambers and necessary equipment is devoted to such matters as organic and metallurgical chemical analyses. In other rooms testing machines are available for the mechanical examination of materials in tension and compression at normal and at elevated temperatures, for resistance to shock and vibratory stresses, also for examining hardness.

The microphotographic laboratory is provided with the necessary metallographic and petrological microscopes and optical bench, together with camera for recording observations

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on the structure of metals, rocks and minerals, and apparatus for polishing the surfaces to be examined and a dark room suitably fitted up for developing and printing are available.

A considerable amount of work comes into the Chemical and Metallurgical section in regard to boiler problems, and this involves water analysis. A special room is devoted to this and to other research work of a miscellaneous character. The section possesses an up-to-date refractometer, a spectrometer, and other special apparatus.

The organic analytical laboratory deals with a variety of problems arising out of the use of oils for insulation in switchgear and transformers, also for the lubrication of turbines and other machinery. Other organic investigations are carried out in this laboratory in co-operation with the insulation laboratories.

Every investigation undertaken in the laboratory is allocated a number. A job sheet is made out carrying at its head the title of the investigation ; it is filed in the worker's note book in front of his notes relating to the work. As the work proceeds the changes in the position of the job are noted on the sheet, and at intervals every sheet is reviewed by the section leaders or chief of the laboratory. Every job sheet has a duplicate, kept up to date, in the library, and thus at any time the jobs in hand in the laboratory, and the position of each man's work, can be ascertained in the library.

Instructions are issued to the works on the following forms :—

(1) Material Process Specifications.—These cover such things as the manufacture of all kinds of compounds, enamelling of wire, vitreous enamelling, etc.

(2) Material Inspection and Test Sheets.—These relate to the inspection and tests of materials. (These tests are carried out by the works' testing departments.)

(3) Treatment Specifications.—These cover treatments of insulations and machines.

(4) Engineering Laboratory Instructions.—These record certain fundamental design data.

The common practice of having permanent clerical or general abstractors has not been followed. The men engaged in the ordinary work of the laboratory are best qualified to do the abstracting, and the whole staff has been organised for this important work, every man being encouraged also to follow the general current technical literature in the library. Each man on the staff has allocated to him the duty of abstracting from one or two specific journals, and he is responsible for supplying to the Librarian the necessary references and abstracts, the Librarian filing and indexing all the material that he collects. This same routine applies to scientific papers and patent specifications, and a master index of abstracts is available in the library, under the following three headings :—(1) authors, (2) subjects and (3) patents.

The library was purposely started with empty book shelves. No attempt was made to acquire a collection of ordinary textbooks, as the Works' Data Department already had such a library. Any books required by the staff and bearing on current problems or modern scientific advance are purchased on request and in this way a collection of books of real live interest to the men using them has been established.

The Engineering Laboratory co-operates with all the various national research and standardising associations. It also operates in collaboration with the laboratories of associated concerns, and is in intimate touch with scientific and development work going on in America and on the Continent.

The Electrical Laboratory at Rugby has a total floor area of 4 161 square feet. This laboratory carries out the routine electrical and magnetic testing of metals, the mechanical and electrical testing of insulations, etc., and the repairing and standardising of all classes of instruments and meters used in the factories.

The Chemical Testing Laboratory at Rugby has a total floor area of 3 120 sq. ft. It is divided into three sections :—

(1) Mechanical testing section.
(2) Inorganic section.
(3) Organic section.

The mechanical testing section is equipped for carrying out mechanical tests on the various materials such as cast iron, steel, non-ferrous alloys and other metals used in the factory. The inorganic section is equipped for conducting analyses of all the non-ferrous materials and alloys used in the brass foundry, bearing metals, raw materials such as pig iron, coke, sand, etc., used in the iron foundry, steels, boiler water, etc. The organic section tests materials such as solvents, gums, filling compounds as well as transformer and lubricating oils.

The Rugby Measuring Room deals with the standards of measurement, and is responsible for checking and setting all works mechanical measuring devices. It is regarded as a department for the standardisation and maintenance of gauges, and so on, but it also functions occasionally in settling dimensional questions of an investigational character.

Gauges for large and important work are made in this department and are checked every time they are drawn from stores for a job. Screw gauges are also examined and checked. and a Cussens projector is provided. Standard profile gauges are finished with the aid of the projector, and it is now regular practice to make bucket blade drawings for turbines on millboard so that the drawings may be used as templates.

At the Willesden works, where switchgear is manufactured there is a high voltage laboratory used for routine production,

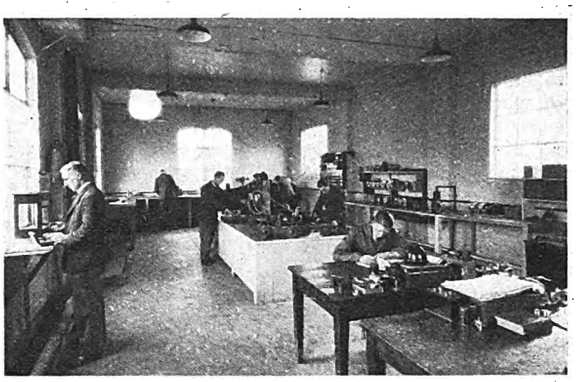

Fig. 5.—Magneto Development Laboratory—first floor.

testing of switchgear and component parts, as well as for experimental work at high voltages, especially where voltages above 100 kV are involved. The equipment in this laboratory includes a 300 kV testing transformer with the necessary control gear and oil testing tanks, for tests both in air and in oil, and if necessary for tests in hot oil, e.g. at 90° C. Provision is also made for testing insulators in the " wet " condition by means of artificial rain. A 1 000 000 V transformer has recently been installed to enable testing to be carried out at voltages up to this limit. A special motor alternator set is provided for supplying the transformer, and a sphere gap peak voltmeter is included in the permanent equipment to ensure accurate measurements of voltages during tests.

The Coventry organisation is concerned mainly with (1) magnetos and ignition devises for use with internal combustion engines, (2) lighting sets for motor vehicles, and the manufacture of fractional H.P. motors, (3) radio apparatus, and (4) the manufacture of moulded insulations.

The magneto development laboratory comprises a two storey building. The upper storey is provided with the usual modern laboratory equipment, and here the staff carries out all tests and investigational work appertaining to ignition apparatus. Provision is also made for the testing of motor cycle lighting sets, starting and lighting equipment for cars and fractional H.P. motors.

A room on the ground floor is equipped for the performance of endurance tests over extended periods on all these types of apparatus. A " moist " chamber is provided in which the temperatures and humidity can be controlled to give almost every atmospheric condition. An arrangement is also provided whereby ignition apparatus can be tested on engines, a Heenan and Froude dynamometer being direct coupled to the engine to give all working conditions of load and speed.

The radio development laboratory consists of four rooms, two of these rooms being devoted to testing and investigational work ; a third room is set apart for the construction of special experimental apparatus, and the remaining room consists of a conference room and library. Various pieces of apparatus which have been developed in the Engineering Laboratory at Rugby are utilised in this laboratory for testing, an instance of this being the apparatus for determining the frequency output characteristics of amplifiers and loud speakers.

The Moulded Insulation Laboratory, which is adjacent to the moulding shop, exists primarily for the purpose of assisting the manufacturing organisation to maintain proper control of the manufacturing processes in this department.

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RUSSIA'S ELECTRIFICATION EFFORT.

American Business Man's Impressions—£40 000 000 Spent Last Year—330 000 h.p. Dnieprostroy Hydro Electric Station—Difficulties of Finance.

MR. A. B. DIBNER, vice-president of the Burndy Engineering Company (United States), contributes an interesting article on "Russia as an Electrical Market" to the "Electrical World" of March 8th. Mr. Dibner visited Russia recently to study Russia as a market for American equipment. In the course of his survey he gives details of the extensive electrification work that is in progress under the Five Year Plan which was initiated on October 1st, 1928.

The total expenditure for electrification for 1929 was over £40 000 000, financed by the Soviet Union, the individual states and the communities, according to the relative national or local importance of the work. New plants already constructed and operating on a national basis generate 250 000 kW, of which 73 000 kW is by hydro, 140 000 kW by peat, and only 38 000 kW by coal and coal dust. At the termination of the "Five Year Plan" the value for peat and coal will be raised to 393 000 kW and 324 000 kW, respectively.

The reason for the predomination of peat as a source of energy is due to the fact that the rich anthracite beds are located in south-eastern Russia in the Donetz Basin, some 400 miles from Moscow, and similar large points of consumption. The rail haul over these long distances is, in the present condition of the railways, unwarranted, particularly in view of the presence of large peat beds comparatively near both Leningrad and Moscow. This peat is mined by a number of methods, varying from the primitive pick and shovel to the most modern hydraulic mining.

Plants under construction today are, however, largely coal-burning or hydro. This is made possible by developing the Dnieper River at Kichkas and concentrating many new industries close to the coal regions, as at Rostof and Stalingrad. The generating capacity of the group at present under construction totals 796 000 kW (initial output), with plans for ultimate extension to 1 285 000 kW. Of the present group, 473 000 kW will be hydro generated, 110 000 kW will burn peat, 170 000 kW coal and coal dust, and 43 000 kW will use petroleum from the extensive sources of supply in the Baku oil fields.

Plants still included under the "Five Year Plan," on which construction has not yet begun, but for which money has been appropriated, cover a total capacity of 1 021 000 kW, distributed among 22 stations.

There is an increasing list of concessions available for entire power plants of first-line capacity, totalling at present some 512 000 kW of national importance alone. This includes an 80 000 kW hydro and a 60 000 kW coal-burning station. These are among the 22 stations totalling 1 021 000 kW of plants forming part of the national scheme for immediate construction, but the financing of which has not yet been fully determined, although preliminary negotiations have been started.

Pre-eminent in this group is the Dnieprostroy hydro station, rising out of the wilderness on both banks of the Dnieper. Design and supervision of construction are under the direction of Col. Hugh L. Cooper. The river is dammed by a concrete structure that will raise the river level 160 ft. above the rock foundation. The immediate capacity of the four turbines will be 330 000 H.P. with an ultimate installation of 750 000 H.P. generated by nine units. Each of the four initial units is an American General Electric 77 500 kVA, 13 800 V 3-phase, 50 cycle vertical shaft waterwheel generator.

Large Area to be Served.

The energy generated will in all probability be distributed chiefly to vast local electrochemical works for the manufacture of aluminium, ferro-manganese, and electrical steel. The plant will also serve an area of some 300 miles radius, equivalent to that of the six New England States. A portion of the energy will also be sent at 220 kV to the Don Basin and to Ekaterinoslav, an industrial centre 60 miles north. It is contemplated that this plant will be completed by 1934 at a cost of about £22 500 000 for power and navigation facilities.

At the Krassny Oktiabre plant, which is being erected near Leningrad, the steam equipment is being installed under the supervision of the Metropolitan-Vickers Company, this organisation having received the major contracts for supplying this equipment. It is being equipped with the very latest construction in peat-burning equipment. Some 5 000 men and women are engaged in the work.

German and Swedish high-tension transformers and oil-circuit breakers are being installed in a well-laid-out outdoor yard. The outdoor high-tension buses are supported by Thomas-Hewlett insulators.

The magnitude of the entire Russian electrical programme is made greater by the dearth of technical materials and trained labour, the poor condition of transport facilities, and particularly the out-of-way locations of power plant sites. To this must be added the background of a national purchasing organisation with a future that is suspect abroad, where the bulk of the required equipment is to be purchased. The situation is one in which credit is limited and the great bulk of finance is derived from a population staggering under an enormous tax load. To finance a total capital investment of nearly £7 000 000 000 under the "Five Year Plan" for industrial development from a population whose average monthly wage is only £7, with a purchasing power of only 59 per cent. of pre-war value, requires a reinvestment of national income varying from 36% to 48%, graduated over the five years. The standard of living imposed by such heavy taxing allows only the most fundamental necessities.

One phase of the programme, according to Mr. Dibner, is the general interest of the citizens in electric power stations. It is in these embodiments of the technical ideals of the Soviets that the labourer and peasant see emancipation from the earthly labour that has been their lot through the long, dark years of Russian history. It is no uncommon holiday that finds 500 or 600 labourers and peasants being guided through the larger steam stations.

DIRECTION-FINDING APPARATUS.

Result of Tests at Slough—Superiority of Modified Adcock System.

AT the Institution of Electrical Engineers on Wednesday, a paper by Mr. R. H. Barfield, M.Sc. (Eng.), A.M.I.E.E., on "Recent Developments in Direction-Finding Apparatus" was read.

Part (1) describes a four-aerial direction-finding system erected at a site near the Radio Research Station, Slough, and gives details of the tests carried out on this apparatus at wavelengths of 300 to 600 m. The system is based on the Adcock principle, but a modification has been introduced to correct for the asymmetry of the aerial system with respect to its upper and lower portions which is unavoidable if the operating hut is at ground level.

The results of the tests show the new system to be considerably superior to the closed-loop system for conditions of "night effect." They indicate, however, a residual instrumental error of the system in the presence of downcoming waves. Finally, a further modification of the system by which it is hoped this will be eliminated is described.

Part (2) describes two distinct types of portable short-wave direction-finding apparatus and gives details of the methods by which they were tested and compared under working conditions at wavelengths of 12 to 60 m.

The first instrument is of the totally-screened closed-loop type. The second instrument is of the rotating Adcock type consisting of a single pair of spaced vertical aerials pivoted about a vertical axis.

The tests described are divided into four sections :—

Test (*a*) showed the Adcock to be much superior to the loop in the presence of downcoming horizontally polarised waves, while (*b*), (*c*) and (*d*) show that for observations on the ground ray both instruments are equally satisfactory and that with due precaution in the choice of a site their performance is much the same as that of longer-wave apparatus. For observations just outside the range of the ground ray both systems are equally useless, while at greater ranges (beyond the "skip distance") the results again demonstrate the superiority of the Adcock to the loop.

It is shown that the results generally confirm the conclusions with respect to the nature of the propagation of the waves arrived at by Eckersley* from somewhat similar experiments.

* T. L. Eckersley : "Short-Wave Wireless Telegraphy," "Journal I.E.E.," 1927, vol. 65, p. 600.

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SOME FACTS ABOUT RUSSIA.*

Sir Ernest Benn's Critical Survey of the Five Year Plan—Finland's Experience of Soviet Economic Policy—The Question of Credits—A Warning.

MANY British merchants and manufacturers have long hoped for a sharp increase in business following the resumption of diplomatic relations with Russia. Those hopes have not been fully justified as yet, and the unsettlement of Russia itself due to Government attacks on religion and the surviving landed peasantry seems to put off their justification to a future still more remote.

It is opportune, at a time when a British Government well disposed to the present Russian rulers is quite sincerely pinning much faith to the industrial capacity of the Soviet régime as a solvent for some of our unemployment, that a business man should publish his opinions on the subject. Sir Ernest Benn's new book will at once commend itself to those who heard gladly the confessions of a capitalist, marking with satisfaction a break in the traditional and too self-effacing silence of the British business man.

Communist Claptrap.

Sir Ernest Benn makes a close survey of the Five Year Plan of Industrial reconstruction, to which the Soviet Government is now devoting much energy. As his information is provided by Communist documents, his criticism is the more effective. A Communist pamphlet on the plan, quoted by the author, declares that "The productivity of labour, thanks particularly to the great development of mechanical energy of all kinds, will increase by 110 per cent., and the costs of production will decrease by 35 per cent., under the Plan. *But this will not prevent a further increase in real wages.*"

But how, asks Sir Ernest, "can we argue about the first two sentences of the above quotation? Production will increase by 110 per cent., costs of production will decrease by 35 per cent. Those are the premises, and then italics are used to emphasise the monumental truth discovered apparently in Moscow and in Moscow alone: '. . . this will not prevent a further increase in real wages.'

"If it were again possible, as it has often been possible in the past in industrial countries properly managed by industrial methods properly understood, to increase production by 110 per cent., costs of production would decrease certainly by 35 per cent., probably by a great deal more, and no power on earth has ever been able or would be able to prevent a doubling or trebling of real wages."

The assertion by the Soviet rulers of their desire for the welfare of the world's workers comes under the author's eye. He doesn't believe it. And the following reason (provided by Sir Ernest's recent tour of the Baltic States) presents a pretty problem for the theoretician who is apt to think of trade with Russia in terms of sentiment, not business:

"The liking of the Finnish workman for Bolshevism and its ways is not enhanced by the obvious fact that the Russian workers are keeping their fellows in Finland in a condition of very dire poverty. The Enso [timber] works to which I have referred have managed for some years to scrape out a 6 per cent. dividend on their capital, not an extravagant return from an industry which is conducted with great efficiency, but this figure is accompanied by wages to the women of about 15 shillings and the men of about 30 shillings a week, respectively. These figures, it is true, mean more than they seem, because life at Enso is very simple, rents are not worth mentioning, fuel is free, supplies (such as they are) cheap. Nevertheless women are working a twelve-hour day at strenuous tasks for 15 shillings a week, and even so, are threatened with unemployment because the Russians are supplying our and their markets at prices much lower than the Finns can accept. It is not pretended, even by the Bolsheviks, that the Finns could go lower. It is not suggested that there is any waste or lack of efficiency in the Finnish method or the Finnish equipment. It is universally agreed that with the marvellous system of water transport through the 36 000 lakes of Finland, with mills on the water's edge, with machinery of the most up-to-date description, the Finns are able to deliver timber to the world in competition with anybody who wants to live. They therefore argue, not without justice, but with considerable fervour, that the Russians do not want to live; that the Bolsheviks do not care whether the Russians live or not. They have one object, and one object only, in delivering timber to London or to any other market. That object is to get cash, not to pay Russian wages, but to conduct Communist propaganda."

Again, on the argument that Russian trade depends on "credits," Sir Ernest is particularly trenchant:

"The Bolsheviks have for years past, with and without recognition, sent to this country vast quantities of timber, oil, and other commodities, quantities which are well below the pre-war figures, but vast nevertheless. On the other side of the account, the Bolsheviks have made sundry purchases from us, very sundry and very few. In the year 1928 they shipped here £21 548 237 worth of materials, in respect of which (and this simple fact does require careful note by people who talk of credits) no less a sum than £21 548 237 sterling was placed to their credit in English banks. In the same year they bought from us £2 715 987 of English-made goods, and £2 084 762 of foreign and colonial goods purchased through London. In respect, therefore, of these purchases the sum of £4 800 749 was placed to their debit in their English bank accounts. There arose in this way, in this one year, a credit balance in favour of the Bolsheviks of nearly £17 000 000, available for any purposes they decide, but most easily available for the purchase of British goods and the provision of employment in this country. Seventeen million pounds in one year. The Bolsheviks have been going for ten years. The balance varies from year to year, but on the whole there has been nearly £150 000 000 in their favour which, during that period, has actually been in the hands of British bankers on their account. . . . We have freely and of our own will bought the timber and the oil from the Russian, the money belongs to him and, being lovers of freedom, we cannot reasonably complain if he spends it on any form of propaganda which appeals to him. But when he asks us to lend him more then we are in duty bound to take these facts into consideration."

Sir Ernest Benn as a business man, is contemptuous rather than fearful of the economic muddle of Communism. But as an Englishman and a patriot he is gravely concerned at the unwearying assault of Communist materialism upon our culture. "About Russia" is a hard-hitting, fearless book, which will flutter a good many dovecotes—and none too soon, as many will affirm.

* "About Russia." By Sir Ernest J. P. Benn, Bt. (Ernest Benn, Ltd., 6s.)

BOOKS RECEIVED.

"The Sea." By H. A. Marmer. (London: D. Appleton and Co.) Pp. x+312. 10s. 6d. net.

"Kraftverstärker." By Dr. E. Nesper. (Leipzig: Hachmeister and Thal.) Pp. 96. 4.80 marks.

"Design of Electrical Apparatus." By John H. Kuhlman. (London: Chapman and Hall.) Pp. xii+455. 30s.

"The Balancing of Engines." By C. C. Pounder. (London: Draughtsman Publishing Co.). Pp. 99. 4s. net.

"A First Electrical Theory for Schools." By H. W. Heckstall-Smith. (London: J. M. Dent.) Pp. xi+372. 4s. net.

"The Electric Wiring of Buildings." By F. C. Raphael. (London: Sir Isaac Pitman and Sons.) Pp. x+258. 10s. 6d. net.

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CENTRAL ELECTRICITY BOARD.

Report for 1929—Position of the Area Schemes—Temporary Arrangements.

THE second annual report of the Central Electricity Board (for 1929) has been published, and is obtainable (price 5s. net) from the publishers, Messrs. Whitehead, Morris, Ltd., Tower House, Holland Street, S.E.1, or through any bookseller.

During 1929 testing of towers has been carried out to ensure compliance with the regulations of the Electricity Commissioners. The Board's policy regarding types of discriminative protective gear to be used on transmission lines has been definitely settled. The switchgear required for the transforming stations is being manufactured on mass-production lines. The special instruments required for metering the Board's supplies have now been fully developed by British meter manufacturers.

During the year the Board placed contracts amounting to £8 004 705, making a grand total, at December 31st, 1929, of £10 899 692. They have been able to place all their contracts with British firms.

CENTRAL SCOTLAND.—Four sections of the 132 kV transmission lines and five transforming stations are now in service. The first lines were put into commission on May 9th, 1929.

On December 31st last 244 circuit miles of lines were under construction and 47·8 circuit miles were in operation.

SOUTH-EAST ENGLAND.—In the spring of 1929 a 10-mile section of 132 kV line between Bedford and Little Barford was completed and put into temporary use at 33 kV for a supply to the Bedfordshire, Cambridgeshire and Huntingdonshire Company. This was the first of the Board's lines in any area to be put into commercial service.

During last December the first section of the cable system in the London area (between St. Pancras and Hornsey) was put into service.

On December 31st last 81 circuit miles of primary lines, 27 circuit miles of secondary lines and 105 circuit miles of underground cable were under construction, and 10¼, 1¾ and 16 circuit miles, respectively, were in operation. During the year construction work has been proceeding on 14 transforming stations.

CENTRAL ENGLAND.—All the main contracts have been placed, and construction work has been begun on the primary line between the two Birmingham stations (Hams Hall and Nechells) and Ocker Hill. A secondary line, 14 miles in length, between Northampton and Kettering, was put into service in February of this year.

NORTH-WEST ENGLAND AND NORTH WALES.—The main contracts have been placed. A secondary line between Stockport and Macclesfield was put into commission on September 30th last.

MID-EAST ENGLAND.—Contracts have been placed for the overhead lines, and satisfactory progress has been made on the layout of the sub-stations and the manufacture of equipment.

WAYLEAVES AND SUB-STATION SITES.—During the year the Board obtained wayleaves for 2 099 tower sites on primary lines and 1 206 on secondary lines, making a total of 3 305.

The position at the end of the year was as follows :—

	Mileage Surveyed	No. of Towers to be Erected	No. of Wayleaves Obtained
Primary Lines—			
Central Scotland	246·6	1 472	1 472
South-East England ..	268·5	1 700	1 133
Central England	227·95	1 335	594
North-West England and North Wales	100·85	622	244
Mid-East England ..	72·0	452	242
Secondary Lines—			
South-East England ..	33·6	340	326
Central England	18·76	250	184
North-West England and North Wales	120·25	959	676
Mid-East England ..	28·3	317	143

The Board refer to the helpful and public spirit in which the majority of landowners are recognising the need of facilitating the Board's work, and also the help and co-operation they have received from the National Trust and other Societies interested in the preservation of public amenities.

The arrangements made, or under discussion, during the year include the giving of supplies to the following : Greenock Corporation, Ayrshire Electricity Board, Falkirk, Kirkcaldy and Paisley Corporations, North Metropolitan Electric Power Supply Co., the London and Home Counties J.E.A., Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co., Central Sussex Electricity Limited, Hastings Corporation, Aldershot Gas, Water and District Lighting Company, Kettering Urban District Council, Alderley Edge and Wilmslow Electricity Board, Lancashire Electric Power Co., Fleetwood Urban District Council, Bridlington Corporation and the undertakers for the Lincolnshire Special Order.

CHANGE OF FREQUENCY.—The standardisation of frequency necessary for the carrying out of the Board's schemes is proceeding in Central Scotland, Central England and North-West England. Motors aggregating 29 509 H.P. and rotary convertors of 21 405 kW capacity have already been changed.

In May, 1929, the Board made an issue of £3 000 000 Central Electricity 4% stock at the price of £83 per cent. In January, 1930, they issued £7 000 000 Central Electricity 5% stock at the price of £97 10s. per cent.

THE NATIONAL SCHEME.

B.E.A.M.A. Criticism of the Electricity Commissioners' Policy.

MR. Hugh Quigley, of the B.E.A.M.A. Economic and Statistical Department, in an article contributed by him to the "Financial Times" on Tuesday, charges the Electricity Commissioners with ultra-conservatism in the sanctioning of new generating plant. He gives figures which indicate that since 1926 there has been a steady fall in the amount of new plant sanctioned, and contends that if the new plant ordered had kept pace with the output of electricity in 1929, the electrical industry would have had an addition of at least 500 000 kW passing through its workshops, which would have given employment to 30 000 more workers, including subsidiary and auxiliary industries.

Mr. Quigley also claims that the expected closing down of private industrial plant has not taken place, but that industry has shown a greater tendency to meet its own requirements and develop apart from the national scheme. The orders placed by the private industrial firms in 1929 amounted to 170 000 kW, a post-war record.

Actually, therefore, the national scheme, so far as generating plant is concerned, is not adding to employment in the electrical and subsidiary industries, and is not promoting the conversion of the private plant to the policy of purchasing electricity in bulk from the public system. Mr. Quigley adds that the first essential of rationalisation is the provision of power at a low price so that the process of electrification can be accelerated and completely carried out.

We give below tables from Mr. Quigley's article :—

TABLE I.

ELECTRICAL POWER PRODUCTION IN FIVE COUNTRIES (from all sources). (Millions of Units).

COUNTRY.	1928.	1929.	Production per head of population in 1929. (Units.)
Great Britain	14 960	16 455	374
U.S.A.	114 000	126 000	1 050
Germany	28 100	33 000	525
Italy	10 100	10 850	272
Canada	15 936	17 628	1 820

TABLE II.

CAPACITY OF GENERATING PLANT IN GREAT BRITAIN.

YEAR.	Public supply stations, including non-statutory undertakings. Kilowatts.	New Plant sanctioned by Electricity Commission. Kilowatts.	Percentage of installed capacity.
1925–26 (March 31st)	4 415 000	585 700	13·2
1926–27	4 883 000	775 604	15·9
1927–28	5 535 000	668 357	12·1
1928–29	5 881 000	602 818	10·2
1929–30	6 450 000*a*	280 000*b*	4·4

a Estimated. *b* Ordered.

TABLE III.

INCREASE IN ELECTRICAL POWER PRODUCTION AND PLANT ORDERED.

YEAR.	(Percentages). Increase in production of electricity (over previous year).	New plant sanctioned or ordered as percentage of installed capacity.
1925–26	10·0	13·2
1926–27	4·0	15·9
1927–28	19·5	12·1
1928–29	10·5	10·2
1929–30	13·0	4·4
1925–30	71·0	66·0

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WORLD POWER CONFERENCE.

Provisional Time Table of Meetings—44 British Papers—Programme of Excursions—Addresses by Professors Einstein and Eddington.

WE give below particulars of the provisional time table that has been arranged for the second Plenary Meeting of the World Power Conference to be held in Berlin from June 16th to 25th, together with the titles of the British papers of electrical and allied interest which are to be read during the Conference.

On Sunday, June 15th, members of the Conference will be received in the Reichstag at 9 p.m. by the Honorary President and Chairman. The opening meeting will be held in the auditorium of the Kroll Opera House, Platz der Republik, Berlin, on Monday, June 16th, from 10 a.m. to noon. The technical meetings will be held as shown in the following table, I, II and III signifying the numbers of the reception halls in the Opera House in which the meetings are to take place :—

Day.	10 a.m.-Noon.	2.30 to 4.45 p.m.
June 16th	Opening Meeting	Electricity in the Household and in Agriculture—I Problems Relating to Water Rights—III
June 17th	Electricity in Crafts and Industry—I Heat, Fuel and Power Economies—II Research Work—III	World Problems of Power Supply—I Standardisation Problems and Rationalisation of Statistics—II Education—III
June 18th	Three Dimensional Load Models and Current Tariffs—I Power Supply on Ships—III	Individual Problems of Power Supply in Different Countries—II Power Transmission in Factories and on Machines and Vehicles—III
June 19th	Construction and Operation of Large Power Plants—I	Construction of Large Generators and Transformers, etc. Legislative and Political Economic Problems relative to Power Supply—II
June 20th	Cooperation of Different Power-producing Plants—I	—
	Steam and Electrically Operated Railways—II	—
June 21st	Transmission and Flow of Energy in Single and Multiple Connected Networks—I Stationary Internal Combustion Engines—II Dams—III	—
June 23rd	Rationalisation and the Technical and Economic Problems of Water Power Utilisation—II	Economic Problems relative to Power Storage on a Large Scale—I Earthing, Lightning Protection and the Effects of Power Lines on Telephone and Telegraph Lines—II
June 24th	Costs and Comparative Efficiency of Different Types of Energy from the Consumer's Point of View—I Water Power Industry in Individual Countries—III	—
June 25th	Combined Heat and Power Supply Plants—I Switchgear, including Automatic Control Apparatus and Remote Metering and Signalling Apparatus—II	Closing Meeting
June 26th	Beginning of official tours in connection with the Conference	

General addresses will also be given on June 16th (5-6 p.m.), June 17 (12.30 to 1.15 p.m.), June 19th (12.30-1.15 p.m.), June 23rd (5-6 p.m.) and June 24th (12.30-1.15 p.m.). Professor Einstein, Professor A. S. Eddington, Mr. Dunlop, M. Surruys and Dr. Oliven (who will deal with the problem of a European Grid), will be the speakers on these occasions.

On June 17th, at 8 p.m., there will be informal meetings of experts to discuss solid fuels, liquid fuels and electricity. At 10 p.m. on June 18th the official World Power Conference Festival and Banquet, with entertainment and dancing, will be held. Informal meetings of experts on gaseous fuels, steam power, I.C. engines, water power, education and legislative problems will take place on June 23rd, at 8 p.m.

The excursions planned include visits to various points of interest in and around Berlin during the Conference, especially during the week-end of June 21st-23rd, and six provincial tours to begin on June 26th. These are : (1) To the West and the industrial regions of the Rhine and Westphalia ; (2) through Central Germany to the South-West and Baden ; (3) to the South through the Central German lignite district to Bavaria ; (4) to the South-East, via Saxony and Lower Silesia to Upper Silesia ; (5) to the North-east via Pomerania and East Prussia, and (6) to the North—Hansa Towns (Bremen, Hamburg, Lübeck).

The British papers number 44, those of electrical or allied interest being :—

SECTION 1. ELECTRICITY IN THE HOUSEHOLD AND IN AGRICULTURE. "The Most Recent Applications of Electricity to Agriculture" (C. A. Cameron Brown) ; "Illumination as a Factor in the Sale of Electricity" (C. W. Sully).

SECTION 6. COSTS AND COMPARATIVE EFFICIENCY OF DIFFERENT TYPES OF ENERGY FROM THE CONSUMERS' POINT OF VIEW.—"Relative Places of Gas and Electricity in Industrial Heating" (Sir Robert A. Hadfield and R. J. Sarjant) ; "Comparison Between Compressed Air and Electricity for Use in Collieries" (Prof. D. Hay and N. E. Webster).

SECTION 7. CONSTRUCTION AND OPERATION OF LARGE POWER PLANTS.—"Mains and Cables in Highways" (S. Lacey) ; "Treatment of Flue Gases from Modern Power Stations" (Dr. S. L. Pearce).

SECTION 10.—STEAM TURBINES, GAS TURBINES AND RECIPROCATING STEAM ENGINES.—"Use in Power Stations of Steam Turbines having, with their Auxiliaries, Large Overhead Capacities" (Sir Charles Parsons).

SECTION 11. BOILERS AND FURNACES.—"Boilers to Meet Peak Load Conditions and the Application of Heat Storage" (A. Spyer).

SECTION 13. RATIONALISATION AND THE TECHNICAL AND ECONOMIC PROBLEMS OF WATER POWER UTILISATION.—"Automatic Hydro-electric Stations in Australia" (H. D. Cook).

SECTION 19. SWITCHGEAR, INCLUDING AUTOMATIC CONTROL APPARATUS FOR POWER STATIONS AND REMOTE METERING AND SIGNALLING APPARATUS.—"Remote Metering" (F. H. Clough) ; "Modern High Power Switching Stations" (R. W. Gregory and F. C. Winfield).

SECTION 20. TRANSMISSION OF FLOW OF ENERGY IN SINGLE AND MULTIPLE CONNECTED NETWORKS.—"The British Grid System" (Sir A. Page and C. W. Marshall).

SECTION 22. INDIVIDUAL PROBLEMS OF POWER SUPPLY IN DIFFERENT COUNTRIES.—"Some Economic Problems of the Electrical Industry" (H. Quigley).

SECTION 26. STEAM AND ELECTRICALLY-OPERATED RAILWAYS.—"The Economic Operation of Electrified Railways" (C. H. Merz and F. Lydall).

SECTION 33. STANDARDISATION PROBLEMS AND THE RATIONALISATION OF STATISTICS.—"The British Standardisation Movement and its Public Significance" (C. le Maistre).

SECTION 34. EDUCATION.—"Training of Engineers in the L.C.C. Scheme of Technical Education with Special Reference to the Instruction in Generation, Transmission and Economics of Power" (G. H. Gayer).

Copies of the provisional time-table, programme of excursions and a descriptive pamphlet are obtainable from the British National Committee, World Power Conference, 63, Lincoln's Inn Fields, W.C.2.

SHIPS' ELECTRIC DECK AUXILIARIES.

Mr. A. Read, Associate Member of the North-East Coast Institution of Engineers and Shipbuilders, read a paper on "Ships' Electric Deck Auxiliaries" at a general meeting of the Institution at Newcastle-upon-Tyne on April 4th.

The paper gave a short outline of the reasons for the introduction of electricity to the drive of deck auxiliaries. Reference was made to the good qualities of steam auxiliaries and the difficulty of reproducing some of these qualities electrically. The control of the various auxiliaries was made the principal feature of the paper.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Transport for Contractors."

[To the Editor.]

Sir,—For some years past The Electrician has courageously upheld the claims of the electric battery-propelled vehicle for use by traders for delivery purposes, and has, quite rightly, emphasised the point that progress will best be initiated by the industry itself making the greatest possible use of electric vehicles for its own purposes. A few firms, like the G.E.C., have long seen the value of using electrically-propelled vans for public deliveries of "Everything Electrical," and many others could derive similar advantage from such an obvious outward expression of confidence in the medicine which they regularly prescribe for others.

Noticing an article on "Transport for Contractors" in your issue of March 28th, I naturally expected to find therein some commendation of the various cheap and light types of battery-driven vans which are now available. Much to my surprise, however, I found that the article was devoted solely to the i.c. engine van!

Can it be, Sir, that your enthusiasm has waned, or that you have now concluded that there is no practical application for the light-weight, low-priced electric battery-driven delivery van?—I am, etc.,

Stockwell, S.W.9, April 1st. "Elevan."

[*We fully appreciate the virtues and capacities of the electric battery vehicle, and are convinced that it will find an increasing favour, particularly in the larger towns, as time goes on. But it is impossible to ignore the i.c.-engined vehicle—also to a not inconsiderable extent electrical in its mechanism and equipment. We shall be publishing other articles dealing with transport matters and costs, and can promise "Elevan" that the merits of the electric-battery vehicle will not be overlooked.*—Ed.]

Safety in Domestic Electrification.

[To the Editor.]

Sir,—Let me say at once that I agree with any campaign to improve the insulation of domestic apparatus. Were it possible to have no exposed conductors and nothing but good insulation enclosing every conductor, the maximum degree of safety would, doubtless, be assured, but in my article of March 18th, 1927, I had to deal with electrical apparatus as it then existed, and as it is much the same to-day, I think the points I made then are still applicable.

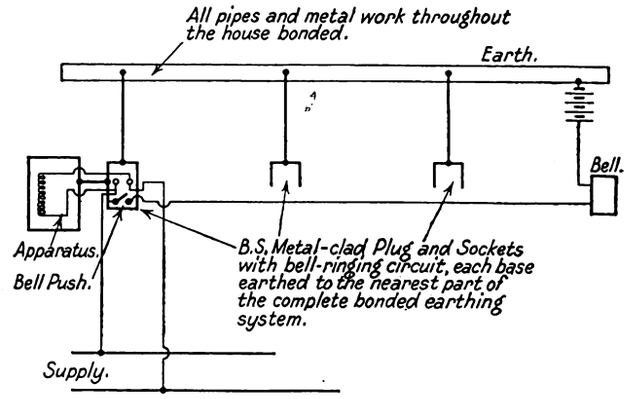
Mr. Gilbert quotes out of a paragraph in that article without giving the essential context. I may be allowed to quote what precedes Mr. Gilbert's quotation, namely:—

> A bad earth connection is worse than none at all, because it gives a false sense of security. In addition to this, two metallic parts of the earth circuit exposed in a house might have a difference of potential between them sufficient to cause arcing, and possibly even a fire; and, obviously, a shock could be felt by a person touching both of these points, even though he was quite remote from the electrical apparatus. Effective bonding of the metalwork in the earth circuit is, therefore, essential, and the best way of securing it is to use a bare copper wire leading from the sockets of the wall plugs to the nearest good "earth," such as a cold-water pipe, and to clamp it to any cable cleating or other metalwork that it may pass in its course. If the earth circuit is reasonably well made at the beginning, there is little fear that an open circuit will develop in it.

Then follows the part quoted by Mr. Gilbert, referring to a means of checking, particularly when being installed, the continuity of the earth wire, a break in which, if it is installed in the way described, is scarcely even remotely likely. The earth wire would bond all metal pipes, bath frames, gas pipes, central heating or hot water pipes and radiators, so that there is no metalwork in the neighbourhood of electrical conductors which would not be earthed. In the system I have tried, the press-button for the bell-push is itself metal-clad and earthed, and forms part of the base carrying a British standard (Specification 196) earthed plug and socket. This is shown in outline in my accompanying diagram, and I am sending you separately an experimental sample of the plug and press-button I have referred to.

With the bell-pushes shown in Mr. Gilbert's Fig. 2, and with the circuit of his diagram, it is clear that two simultaneous faults have to occur before there is any chance of personal danger. If one of these breakdowns occurs, namely, that in the earth wire, it would be discovered by the failure of the bell to ring, and the fact that the simultaneous occurrence of the second fault is highly unlikely, means that the system ought to give as practically certain safety as anything can.

Mr. Gilbert says that continuity of the earth circuit cannot be guaranteed; but I venture to say that a sound earthing circuit, plus the bell-system test, or something like it, gives



practically 100% safety in comparison with the danger of accident when there is no earth circuit.

In switchgear practice we learn that all metalwork in the neighbourhood of, or containing, live conductors must be earthed. Also, all metal framework of portable apparatus must similarly be earthed. If nothing but earthed metal is accessible, we have safety.—I am, etc.,

Hebburn-on-Tyne, March 31st. H. W. Clothier.

[*We have received several other letters on this subject and these will be printed in subsequent issues.*—Ed.]

Empire Radio Telephony.

[To the Editor.]

Sir,—In a comment on "Empire Radio Telephony" in your issue of March 28th you say:—

"There still remains grave doubt as to the wisdom or equity of separate control of long-distance telephony and telegraphy, and it is to be feared that such a division cannot fail to bring about a lot of friction that would be much better avoided."

The reference is to international communications, such as Anglo-Australian or Anglo-American services, and I think that you have scarcely given full weight to the essential differences between a telegram and a telephone message. The former is a concrete thing—a piece of paper—which can be physically dealt with at each point in its transmission, and which can be handed over from one operating authority to another, in the course of its transmission, without much delay or loss of efficiency, even though these authorities may employ systems fundamentally different in type.

A telephone message, on the other hand, requires the previous setting up of a complete chain of circuits which must function as a whole between the premises of the two parties to the conversation.

A long distance international call involves the use of many repeater stations connected together by sections of wire line, supplemented in certain cases by intermediate radio links. The complete chain must operate as one system, and the operating administrations have continuously to strive for the utmost possible uniformity of speech transmission characteristics and of maintenance procedure.

It is common ground among telephone engineers that the best results are obtained when the administrations of two intercommunicating nations can connect their systems directly one to another, and much capital has been spent in many lands with the object of providing direct routes which will avoid the intervention of an intermediate authority not concerned with the two local networks which obtain their mutual service over one international circuit.

To provide for the wedging in of a third authority, whose function it will be to connect the two local systems together when required, would not, therefore, be a step towards simplicity and smooth working, but would have an opposite tendency.—I am, etc.,

London, April 3rd. "Telen."

[*We appreciate the force of the technical argument put forward by "Telen," but our previous remarks, to which he refers, were based more on the financial aspect of dual control with its traffic diverting possibilities.*—Ed.]

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NEWS IN BRIEF.

Electric Ship-Welding — Rotherham School Lighting — Effects of Australian Tariff — Telephony between England and Brazil — Societies' Arrangements.

A FOREMAN is wanted in Malvern Urban District Council's electricity department.

A revised edition of the sixpenny leaflet "Facilities for Training Women as Engineers" has been issued by the Women's Engineering Society.

The annual report of the North Area Committee of the E.D.A. shows that during the year 78 lectures, apart from conferences, were given with a total attendance of 4 300.

Electric welding has been adopted in the construction of Germany's new cruiser, the "Koenigsberg." It is reported that, in view of this vessel's successful performance, electric welding is also to be used in two other cruisers, a battleship and a fleet of destroyers.

Hull Telephones Committee has decided that continuous lighting of kiosks be adopted.

Colchester Electricity Committee is to provide coal siding accommodation at a cost of £1 650.

The first telephone conversation between England and Brazil, nearly 6 000 miles, took place last week.

Guildford electricity department is now hiring electric cookers, water boilers, radiators, kettles and irons.

The Chief Constable of York says since the police call box system was adopted at York 68 operative public calls have been made.

The American Telephone and Telegraph Co. and the International Telephone and Telegraph Corporation opened a telephone service between North and South America last week.

Dr. Page, leader of the Australian Federal Country Party, speaking at Melbourne recently, said the Australian customs tariff should be scientifically adjusted so as to allow machinery not manufactured in Australia to enter free. The high duties on electrical machinery prevented the full exploitation of electric power.

The Australian Government has issued a proclamation prohibiting the import of electric heating and cooking appliances, wireless receiving sets, wireless headphones, batteries (including dry cells and accumulators), electric smoothing irons, and certain other goods, except with the written consent of the Ministry of Trade and Customs.

Contracts placed with Messrs. Richardsons, Westgarth and Co., Ltd., for electricity generating plant at Hartley Main Colliery, South Shields, and at Brighton have been cancelled at the request of the Central Electricity Board, on the ground that the contracts will be unnecessary in view of the expediting of the grid supply. The contracts referred to are said to amount to about £100 000.

Although three-quarters of the water power resources of the United States are located west of the Mississippi River, only one-quarter of the country's power requirements are situated in this area, according to the N.E.L.A. A review of the production of electricity in 1929 shows, further, that the output of power in the East and South is growing at a faster rate than in the North and West and that the proportion east of the Mississippi is increasing.

The summer meeting of the Meter and Instrument Section of the I.E.E. will be held at Leamington Spa on Saturday, May 24th. There will be a luncheon at the Crown Hotel, High Street, Leamington Spa, at 12.30 p.m. Other items of the programme will be a motor coach excursion, and tea at the Cadena Café, Leamington Spa. Members travelling by the 9.10 a.m. train (from Paddington) down and the 8.18 p.m. up can obtain railway tickets at the reduced charge of 11s. (to be sent to the Secretary of the Institution). Payments for lunch, tea and motor coach trip can be made to the stewards on the day of the meeting.

Heston and Isleworth U.D.C. requires a draughtsman for the electricity department.

The annual report for 1929 of the Television Society shows that membership increased during the year from 325 to 577. Steps have been taken for the society's incorporation.

The G.E.C. eleventh annual sports and gala will be held at the G.E.C. London Sports Ground, Preston Road, Wembley, on Saturday, July 5th. Full details will be published later.

The first annual dinner of the West Yorkshire branch of the E.C.A. was held at Leeds on April 4th, with Mr. Kenneth Shaw in the chair. Speakers included Messrs. H. Willoughby-Ellis, W. B. Woodhouse, A. Innes, C. F. Partridge, C. V. Walker, and J. D. Green.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of April 10th, 1880, contained an account of three months' experience of electric lighting at Blackpool, with some now amusing details of the frequent interruptions due to the jamming of the racks holding the carbons, which had to be remedied by jerking a line attached to the lamp. The man detailed to do this was ultimately saved the trouble by "the passing public and youths pulling the line as they went by."*

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of April 14th, 1905, it was reported that the second great pyramid of Ghizeh was struck by lightning on March 31st, several large stones being dislodged—this being the first occasion of the kind on record.*

It was announced that 28 German firms belonging to the Union of Electrical Manufacturers had organised a co-operative society to purchase raw materials.

Rotherham Education Committee proposes to continue the scheme of installing electric lighting in one school each year.

The architect is to report to Manchester Town Hall Extension Committee on the question of adopting electric thermal heating in the town hall.

Arc lamps at the Grand Union Canal Company's Regent's Canal Dock ship lock at Limehouse, enable work to proceed as efficiently by night as by day.

The manager of Hull Corporation telephones department reports that, to meet anticipated demands, automatic exchanges should be extended by 2 000 lines.

In Doncaster's new £70 000 Sanatorium and Infectious Diseases Hospital, which was opened last week, electrically-driven washing, drying, and cleaning machines are used.

The fifth annual conference of the Electrical Association for Women will be held in London on May 15th and 16th. The first day's programme includes a luncheon at the Park Lane Hotel; a visit to the H.O. Industrial Museum; reception by the Executive Committee, followed by a talk by Mr. Ll. B. Atkinson. The second day will include a visit to the Greenford factory of J. Lyons and Co., and a cabaret ball will be held at the Park Lane Hotel in the evening.

The March issue of "The Henley Telegraph" continues from the September issue the "Henley History," and contains many historical facts which are published for the first time. On page 117 is a note of the presentation of Long Service Certificates. "The Old Brigade," featured on pages 122–127, commenced with the September issue, and will be continued; and "Welfare—Woolwich," on page 130, gives an idea of the good work being done by a seldom-heard-of part of the Henley organisation.

Mr. Basil A. Pilkington, F.R.S.E., addressed the members of the Edinburgh Rotary Club last week on "Electrical Energy from Scotland's Natural Resources." He hesitated to say that hydro-electric power undertakings in the Western Highlands were a commercial proposition. It was probably only where the electrical energy available could be consumed within a short distance of the source of supply, and in those areas where coal might cost anything from £2 per ton upwards that its advantage was beyond cavil.

The Institute of Patentees (Inc.), in co-operation with the polytechnics and the Association of Principals of Technical Institutions, has decided to found a series of presentation courses at one or more of the recognised technical schools and polytechnics which exist throughout the country. The subjects taken will include physics, electrical and mechanical engineering, metallurgy, etc. The scholarships are open to candidates of both sexes, of all nationalities, and of any age over 16. They entail about three evenings' work a week, in addition to home work. Successful candidates will have the necessary fees paid for them and will be given Associate Membership of the Institute of Patentees and £1 for books.

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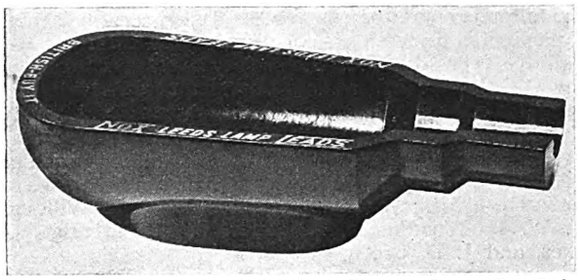
BUSINESS ITEMS.

THE new address of the Leeds office of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., is Permanent House, The Headrow.



THE latest novelty of the Nox Electric Lamp Co., Ltd. A lamp half-section made of bakelite and intended for use as an ashtray.

The BRITISH RESISTOR CO., LTD., announces that all communications should henceforth be addressed to the company's new premises at Trafford Park, Manchester.

The London address of HENRY WELLS CO., LTD., has been changed to 736-7, Salisbury House, Finsbury Circus, E.C.2. The address of the works remains, as hitherto, Salford, Manchester.

NEW DISTRIBUTORS OF EDISON STORAGE BATTERIES, LTD., Victoria House, Southampton Row, London, W.C.1, wish to inform our readers that their offices will be closed from 12 noon on Thursday, April 17th, until Tuesday morning, April 22nd.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., advise us that all correspondence formerly addressed to the London office, concerned with meters, instruments and relays should now be addressed to the company at Gorst Road, Park Royal Road, London, N.W.10.

A West Indian firm desires to communicate with British manufacturers of electric washing appliances, drying and ironing machines, overhead line fittings, galvanised iron bolts, brace and insulators for wooden pole work. The Department of Overseas Trade has all particulars. Reference A.X. 9 284.

SHIMWELL, ALEXANDER AND CO., 82, Fenchurch Street, London, E.C.3, have been appointed by the ALPHA ELECTRICAL APPARATUS CO., of Premier Works, Percy Road, Greet, Birmingham, sole distributing agents for domestic appliances for the counties of Kent, Sussex, Surrey, Hampshire and Dorset. Stocks will be held at 110, High Street, Southampton.

BRITISH INSULATED CABLES, LTD., of Prescot, have obtained the contract for the supplying and laying of the Post Office trunk cable from Liverpool to Colwyn Bay. About 54 miles of cable will be required for this contract, the value of which is approximately £60 000. Another order secured is for 150 000 rail bonds for the Southern Railway, the value being about £20 000.

The CRESSALL MANUFACTURING CO., of 31-32, Tower Street, Birmingham, informs us of the appointment of Mr. A. J. Taylor, 6, Colney Hatch Lane, London, N.10, as agent for the Eastern Counties—Lincolnshire, Norfolk, Suffolk, Cambridgeshire, Bedfordshire, Buckinghamshire, Huntingdon, Peterborough—and also Essex, Middlesex and Hertfordshire, outside the Metropolitan Postal District.

Radio telephone service over the first two-way circuit, linking the continents of South and North America, was established on April 3rd by the COMPANIA INTERNACIONAL DE RADIO (Argentina) and the AMERICAN TELEPHONE AND TELEGRAPH COMPANY, when more than 277 000 telephones in Argentina, Chile and Uruguay were connected with 21 600 000 telephones in Mexico, Cuba, the United States and Canada.

A beam telephone service has been opened to the public between Madrid and Rio de Janeiro. The stations conducting the service in Spain are of the short-wave beam type and were erected by MARCONI'S WIRELESS TELEGRAPH CO., LTD., at Aranjuez, near Madrid. In addition to the telephone service, a commercial telegraph service is in operation. For use in these circuits special receivers have been constructed by the Marconi engineers on behalf of Transradio Espanola, the Spanish Company to which these stations belong and which carries out the wireless services between Spain and other countries. The South American end of the service is controlled by the Companhia Radiotelegraphica Brasileira.

PERSONAL.

MR. S. A. Williams has now joined the engineering staff of the Bastian Meter, Co., Ltd.

Dr. R. S. Clay, principal of the Northern Polytechnic, has resigned, and will finish his duties in December.

Mr. Ian Scott Dalgleish, electrical engineer, of St. John's Hill, has been elected a member of the Woking Urban Council.

Hazel Grove and Bramhall Urban Council has appointed Mr. B. Lomax to the temporary position of electrical engineer and manager.

Bromley Town Council has appointed Miss Beatrice M. Goodchild as saleswoman demonstrator in connection with the electricity undertaking.

The Relay Automatic Telephone Co., Ltd., announce the appointment of Mr. H. K. Piggott as manager for the South-Western area, having his district office at Cardiff.

Mr. R. Auchterlonie, electrical engineer, Galashiels, has been elected to the committee of the newly formed Galashiels Merchants Association as the representative of the town's electrical engineers.

Mr. Alexander Brown, chief of the electricity department of the Stirling District Mental Hospital, Larbert, has retired after thirty-two years service and has been presented with a gold watch and albert.

Mr. Robert Aitken, superintending engineer for the West of Scotland District, has retired from the Post Office telephone service and was presented by his staff with a powerful wireless receiver and loud speaker.

Mr. William B. Woodhouse, the engineer and manager of the Yorkshire Electric Power Co. has been appointed a director of Electrical Distribution of Yorkshire, Ltd., to fill the vacancy caused by the death of Mr. Arthur Greenhow Lupton. See page 477.

The Chairman of the Electricity Commission, with the concurrence of the Minister of Transport and the other Commissioners, has appointed Sir John Reeve Brooke to be vice-chairman of the Commission on the retirement of Sir Harry Haward from that position on March 31st. See page 477.

Testimony to the personality and popularity of Mr. D. Maxwell Buist, late chief electrical engineer of the Synthetic Ammonia and Nitrates, Ltd., was reflected in a pleasant ceremony at Stockton on March 28th, when his colleagues and friends presented him with a grandfather clock and easy chair on the occasion of his appointment as engineer to the North-East England Electricity Scheme.

In pursuance of its policy of establishing Area Committees in various parts of the country, the E.D.A. last year organised two Committees in Scotland, one in the West, of which Bailie A. G. Logan of Falkirk is Chairman, and one in the East, the Chairman being Councillor J. Couston, of Edinburgh. In order to assist these two Committees, the E.D.A. have now appointed Mr. E. M. Hood as Officer to the two Committees, and he is established temporarily at 18, Quentin Street, Glasgow, S.1. Mr. Hood, who is an Edinburgh man, has been connected with the manufacturing and wholesale sides of the electrical industry in Glasgow for many years, and his appointment should lead to a great increase in E.D.A. activities throughout Scotland.

In connection with the death of Thorsten Von Zweigbergk, we are informed that he first made his mark in the electric traction world when with the Walker Electric Co. Under Prof. Sidney Short this company supplied traction equipment which was very successful in service and was well known in England. The company was absorbed eventually by the Westinghouse Company and Prof. Short brought his staff to England where they assisted in building up the Preston works of Dick Kerr and Co. in 1900. On Prof. Short's death in 1904 Zweigbergk became responsible for all the traction work of Dick Kerr and Co. His name will always be associated with the invention of the metallic shield blow-out and its application to tramway and railway controllers. This device is too well known to require description but it is interesting to know that controllers on this system gave excellent results in service even for currents up to 4 000 amps. Perhaps the best known of the earlier railway electrification schemes for which Zweigbergk was responsible were the Liverpool to Southport line of the Lancashire and Yorkshire Railway and the Liverpool Overhead Railway. Later he designed the first electrification of the Bury-Holcombe Brook line of the L. and Y. which was carried out at 3 000 V d.c. the traction motors being wound for 1 500 V and connected two in series. This, it is believed, was one of the first 3 000 V systems put into practical operation.

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ELECTRICAL PUBLICITY.

Annual Luncheon and Meeting of the North West Area of the E.D.A.

ALDERMAN W. WALKER occupied the chair at the annual luncheon of the British Electrical Development Association (North West Area), held at the Midland Hotel, Manchester, on March 31st. In proposing the toast of the E.D.A., coupled with the names of Mr. H. Marryat, chairman, Executive Committee, and Lt.-Col. W. A. Vignoles, director, the Chairman emphasised the necessity of publicity, and pointed out the benefit of doing it through one organisation rather than each unit doing it for itself. For a long time the manufacturers had borne the burden of E.D.A.'s work, but it was important that all sections should combine. He therefore appealed to the representatives of the various undertakings present to do all they could in this direction. A great deal had already been done, but as yet they had only touched the border of the possibilities, the advantages of which were apparent to all concerned. The Chairman also mentioned the usefulness of the E.D.A. conferences, which were a medium for spreading the experience of experts all over the country.

Mr. Marryat, in replying, showed a graph demonstrating the changes in the profits earned by the electrical and gas industries during the period since the formation of E.D.A. The gas profits were seen to have fluctuated somewhat but not increased to any marked extent, while the electrical profits had shown a steady expansion. This latter he attributed to the exertions of E.D.A. He extended upon the chairman's words about the activities of the Association, and said that the E.D.A. had come in for some criticism in regard to its methods of press advertising, on account of its extensive use of small 2-in. advertisements. He did not agree that these were inferior to more substantial ones. On the contrary, they represented maximum efficiency in this type of publicity. They were judiciously placed in a wide variety of journals, and thus reached all classes of readers. On the question of publicity, however, he did not believe that anything like enough was being spent.

Colonel Vignoles supported Mr. Marryat and was optimistic about the future. He gave an example of the industrial use of electricity in connection with a pottery furnace, and it had been proved that it was both cheaper and better than the old type heated by means of coal. It was therefore important to emphasise, when advocating electricity, that it was not only cheaper but better. The campaign carried out by the Electrical Association for Women last winter had been very successful.

After the luncheon, the annual meeting was held at the Demonstration Bureau, 4, Fountain Street, Manchester.

ELECTROTECHNICAL COMMISSION.

Preparations Well in Hand for British Participation in International Meetings.

THE British National Committee of the I.E.C., i.e., the Electrical Industry Committee of the British Engineering Standards Association, is now actively engaged in preparations for British participation in the forthcoming important meetings of the International Electrotechnical Commission. The Technical meetings will be held in Stockholm during the first week in July, after an opening meeting in Copenhagen. The closing Plenary Session, together with a meeting of Council, will take place in Oslo. There will be meetings of 15 Advisory Committees dealing with nomenclature; rating of electrical machinery; symbols; steam turbines; aluminium; voltages, including tests on high-voltage insulators; electric traction equipment; insulating oils; overhead lines; radio valves; measuring instruments; rating of rivers; tests for shellac; rating of oil switches; internal combustion engines.

A very influential delegation, consisting of representatives of Government Departments, the Institution of Electrical Engineers, the Institution of Civil Engineers, the Electricity Commissioners, the Central Electricity Board, and manufacturing, research, and supply organisations interested in the work of international standardisation in the electrical field, will be present from Great Britain, and delegates from the Dominions will also attend.

The Scandinavian National Committee of the I.E.C. is making arrangements for the visiting delegates to see some up-to-date hydro-electric and other plant, while for those who care to stay after the meetings, an interesting trip to view the Midnight Sun is being organised.

MILL LIGHTING.

Problems Connected with Artificial Lighting in the Textile Industry.

IN a paper read before the Illuminating Engineering Society on March 25th, Mr. S. Anderson said there were few industries for which the provision of suitable artificial lighting offered more varied problems that those associated with the manfacture of textiles. From investigation it was evident that the majority of mill executives were interested in their lighting, and while it was not difficult to convince them that the glare so universally found is objectionable it was extremely hard to make them feel the need for using higher intensities than at present employed. On the other hand, any suggestion that current consumption might be cut down and lamp breakages minimised by a modernised installation in certain cases arouse intense interest. The question of maintenance was rarely dealt with adequately, and many mills were visited where clear gasfilled lamps were so obscured by fluff and dust as to resemble pearl lamps in their diffusion of the light. In general, intensities at present prevalent were far below what could be considered good practice, and the majority of lighting installations were put up with little or no regard for the principles of good lighting. Quite 90 % of the mills employed electric light, and the standard of illumination in those employing gas was considerably below the average standard of those with electric light.

SUMMARY OF FINDINGS AND RECOMMENDATIONS.

Average intensity in foot-candles on work.

COTTON MILLS.	Mill A	B	C	D	E	F	G	Recommended Minima
Bale breaking, opening and scutchers	1·5	—	0·5	—	3	—	0·8	3
Carding	2	—	1·5	—	3	—	1·2	5
Drawing and roving	2·8	—	1·5	—	2·5	—	1·5	6
Spinning	2·8	—	0·6	—	7	—	2	6–9*
Warping and winding	2·5	1·2	—	3·5	2·8	—	5	6–9*
Slashing	—	2·5	—	5	6	6	—	8
Weaving	—	4	—	5	7	8	—	8
Cloth Room ..	—	3	—	4	5	6	—	6

WOOLLEN MILLS.	Mill A	B	C	D	E	F	G	Recommended Minima
Grading and sorting	—	5	—	4	3·5	—	—	10
Washing	—	2	—	0·5	0·8	—	—	5
Carding	—	1·5	—	6	2·5	—	1·8	5
Combing	—	7	—	—	2·5	—	—	6
Drawing	2	5	—	—	2	—	2·3	6
Roving	2·5	—	—	2	2·3	—	2·5	6
Spinning	4	—	—	3·5	2·5	—	2·5	6–9*
Winding	2	—	2·5	2·5	2·8	1·8	2·8	6–9*
Warping	3	—	3	2·3	4·5	2·5	3	8
Weaving	—	—	5	8	7	6	5	8–12*
Mending	—	—	8	15	14	7	10	15–25*

* NOTE.—The lower value is for light and the higher for dark material.

STAFF PENSION SCHEME.

Pension and Life Assurance Plans for the Lancashire Electric Power Co.

PARTICULARS are announced of a scheme for pensions and life assurance for the benefit of the employees of the Lancashire Electric Power Co. which has been secured by a contract with the Legal and General Assurance Society.

The plan is a contributory one, and membership is open to employees on the permanent staff over 18 and under 65 years of age, irrespective of their state of health, provided that not less than 75% join the scheme. It will be a condition of employment for all those entering the service of the company after the inception of the scheme, from April 1st, that they must join at the expiration of three months after their entry into the company and attainment of the age of 18.

The contributions of the staff will cover only a portion of the annual cost, the balance being payable by the company, which will also pay all the premiums for providing pension benefits in respect of past services. This arrangement will be applicable only to those employees in the company's service on March 31st, 1929, who joined the scheme on or before March 31st, 1930. Besides ensuring a pension from the age of 65, based on the annual salary or wage for each year of contributing service, life assurance, also based on the salary earned, will be provided to cover the risk of the death of an employee while in the service of the company or after he has retired on pension. The annual pension payable from the age of 65 for each year of contributing service rises from £1 in the case of employees earning £130 and less to £20 in the case of those earning £951 and more, while the life assurance similarly ranges from £100 to £800, and the employees' weekly contribution from 1s. to 20s.

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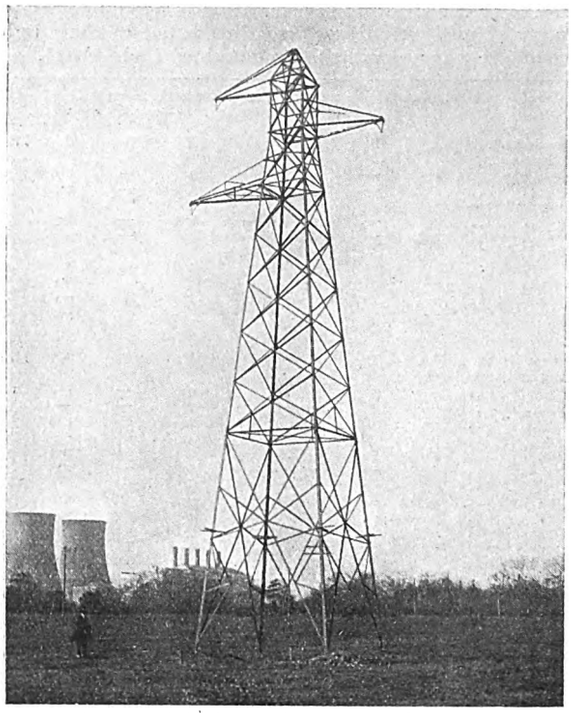
COPPER STEELS.

Non-Corrosive Transmission Towers.

IT is now fairly well established that the use of steel containing small percentages of copper (of the order of 0·2%) results in a metal offering considerable resistance against atmospheric corrosion. In tests carried out in Germany upon



A copper-steel transmission tower in the Central England electricity area.

steel sleepers for railway use, it was found that the loss of weight by corrosion of copper-bearing steels after a seven-years' period of test was very appreciably less than with corresponding steels having no copper. In shipbuilding, too, the use of copper-steel is expanding, especially for masts and funnels exposed to severe atmospheric corrosion.

One observer (Daeves, "Schiffbau," September, 1928, p. 423), estimates that the unpainted copper-steel has from two and a half to two times the life of ordinary steel, and his tests showed that where copper-free steel had lost 70% to 90% of its thickness, copper-steel, under identical conditions, had only 4% wastage.

In view of the high cost per mile of electrical transmission lines, and the necessity for prolonging their life and reducing upkeep, it is noteworthy that for the Central England electricity scheme transmission towers have been constructed of copper-bearing steel. The towers are manufactured by the Horseley Bridge and Engineering Co., Ltd., Tipton, from copper-bearing steel supplied by the Frodingham Iron and Steel Co., Ltd., Lincolnshire.

THE "MECHANICALS" BENEVOLENT FUND.

The report of the Committee of Management of the Benevolent Fund of the Institution of Mechanical Engineers, for the year 1929, states that during the year the names of 212 ordinary members and 30 life members were added. The decease of 14 members is reported, including three life members. Eleven resignations were received, and 24 memberships lapsed. The total membership on December 31st, 1929, was 1 420, 168 being life members. In addition to subscriptions from members of the fund, contributions have been received from about 306 other members of the institution during the year. The accounts for 1929 show that the total of the fund on December 31st amounted to £14 722 17s. 7d. The income was £1 636 15s. 5d., and grants to 40 applicants amounted to £1 995 10s. The committee reports an excess of payments over receipts of £431 2s. 1d. The amount of £1 300 (including a legacy of £200 from the late Mrs. M. Hill, widow of Mr. A. J. Hill) was invested in £1 663 16s. 3d. 3½% conversion loan. The special appeal issued to all members of the institution in November 1928 resulted in the receipt of donations amounting to £1 342 and annual subscriptions of £187 18s.

LEGAL INTELLIGENCE.

The Fencing of Electrical Machinery—Derby and Notts E.P. Co. and Factory Acts.

A KING'S Bench Divisional Court consisting of the Lord Chief Justice, Justices Avory and Branson on April 3rd heard an appeal by Mr. J. H. Warren, an inspector under the Factory Acts, against the refusal of the Derby magistrates to convict the Derbyshire and Nottinghamshire Electric Power Co., of the alleged offence of neglecting to fence, or make them in such a condition that they would equally be as safe as if they were securely fenced, certain high voltage conductors.

The Attorney-General (Sir William Jowitt, K.C.), in support of the appeal, said that at the respondents' generating station at Spondon, Derby, there was a trifurcating box which was usually covered by a cage, but in May, 1929, a workman named George James House was engaged in brushing down with a brush that contained a certain amount of metal. A portion of it and part of the front of the cage was removed. He was working within a foot of one of the leads that was insulated with empire tape. Touching one of the cables with the brush House received an electric shock and died. It was stated that the cage was only removed from the centre part of the apparatus and that part was "dead," but current ran through the conductors on each side. House was a man with technical knowledge and knew the dangerous nature of the work, and moreover had been warned. The justices declined to convict, holding that the conductor was protected. The contention for the inspector was that the "live" conductors were not sufficiently insulated, and that sufficient safeguards had not been taken to protect a workman even though he was careless.

Sir Henry Maddocks, K.C. (for the respondents) said House was employed by contractors who were adding to the plant for the Power Co. He received no instructions from respondents. The set of "live" cables next those which House was brushing supplied the works of the British Celanese Co., and it was not practicable to render those cables "dead." The empire tape used to insulate the leads was admitted to be an adequate insulator, and no fewer than six layers had been used.

The Lord Chief Justice said the question turned upon a tolerably clear point. The Act said that conductors should either be covered with insulating material and be sufficiently protected when necessary to prevent danger, or they should be placed and safeguarded so as to prevent danger so far as was reasonably practicable. The Derby justices in this case found that both those provisions had been carried out. But no transverse screens protected the workmen from the "live" cables, although that precaution could have been carried out so that on both sides House could touch live conductors. How exactly the man met his death was not known, but it seemed obvious that transverse screens might have prevented the accident. That fact was fatal to the respondents' case. Consequently there were no materials on which the justices could refuse to convict the respondents of an offence, and the case would go back for conviction.

Justices Avory and Branson concurred.

"HOW TO SEND AND SAVE."

A Useful Publication of Interest to Electrical Manufacturers.

THE Great Western Railway Company has published a particularly useful book dealing with the despatching and transporting of goods over the company's system. A feature of the publication is that times of delivery at the various stations are given together with the latest times of acceptance. Goods accepted at Birmingham any day between Monday and Friday up to 5 p.m., for instance, could be delivered at Trowbridge the next day, at York during the second morning, and so on.

Other subjects dealt with in the publication include: American Traffic; Bulking for Carriage Charges Purposes; Channel Islands Traffic; Container System of Transport; Continental Traffic; Country Lorry Services; Cranes; Freight Train Names; Freight Train Services; Irish Traffic; Overseas Traffic; Private Siding Connections; Railhead Distribution; Railway Classification; Rates and Charges; Rebates Allowed for Use of 20-ton Wagons; Registered Transits; Road Transport Facilities; Scottish Traffic, etc.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

ASHBY WOULDS URBAN DISTRICT COUNCIL.—Electric light wiring of eight houses at Albert Village. Particulars from the clerk, Mr. C. E. Crane, South Street, Ashby-de-la-Zouch.

MORECAMBE AND HEYSHAM EDUCATION COMMITTEE, April 11th.—Electric light installation at West End Council School Westminster Road. Particulars from the Borough Engineer; deposit £1 1s.

ATHERTON URBAN DISTRICT COUNCIL, April 14th.—Supply of five miles of 0·06 h.t. concentric, paper insulated, lead sheathed, served, steel tape armoured, and compounded cable manufactured in accordance with latest B.E.S.A. specification.

Rural Electrification.

BEDFORD CORPORATION, April 14th–May 5th.—Supply and erection of 11 000 V overhead lines, and auxiliary apparatus, other than transformers, for supplying an area of 100 sq. miles, under the Corporation's rural demonstration scheme. Only British labour and material may be employed. Specification, etc., from the Borough Electrical Engineer, until April 14th; deposit £3 3s. Tenders by May 5th.

COVENTRY CORPORATION, April 14th.—Electrically driven pumping machinery, for Whitley pumping station. Specification (£10) from Sir Alexander Binnie, Son and Deacon, Artillery House, Artillery Row, London, S.W.1.

EDINBURGH EDUCATION AUTHORITY, April 14th.—Electrical installation in proposed new primary school at Wardie. Specifications, etc., from Mr. J. M. Johnston, 47, Charlotte Street, Leith.

GLASGOW EDUCATION AUTHORITY, April 14th.—Electric lighting and electric heating installations in Ruchill Temporary School, Huxley Street, Ruchill. Specifications from Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s. each.

HASTINGS CORPORATION, April 14th.—Supply, erection, etc., of two-gallon ice cream freezer and cold storage cabinet. Specification, etc., from Mr. J. Norman Gray, White Rock Pavilion, Hastings.

HULL CORPORATION, April 14th.—Supply and drawing in of 600 V cable for tramway feeders, for the tramways department. Specification from the General Manager, Tramway Offices, Albion Street, Hull.

LONDON COUNTY COUNCIL April 14th.—Manufacture and supply of h.t. and l.t. cables; and reconstruction of existing l.t. cables. Specification, etc., from the General Manager of Tramways, 23, Belvedere Road, London, S.E.1; deposit £2.

MANCHESTER CORPORATION, April 14th.—Twelve months' supply of electricity meters (specification No. 264); potential and current transformers (No. 265); cables (No. 266); time switches (No. 268); auto-transformers and auto-balancers (No. 270); a.c. industrial electric motors (No. 271); and electric kettles (No. 274). Specifications from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; desposit £1 1s. for each.

MANCHESTER CORPORATION, April 14th.—Twelve months' supply of stores, etc., to the electricity department, including dry batteries for flashlight lamps, cable troughing, conduit for wiring, dynamo and copper tape brushes, fuse boxes, lamp columns, service boxes, wire, etc. Forms of tender, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

BIRKENHEAD CORPORATION, April 15th.—Twelve months' supply of c.i. house service boxes, mains joint boxes, insulating and rubber tapes, and electrical sundries. Specifications from the Borough Electrical Engineer.

GLASGOW CORPORATION, April 15th.—Supply of electric fittings and cables, etc., to the Housing Department, for 12 months. Form of tender (No. 3), etc., from the Director of Housing, 20, Trongate, Glasgow.

BATTLE URBAN DISTRICT COUNCIL, April 16th.—Electrically driven borehole pump, at Powdermill Lane pumping station, and two sets of electrically driven boosting pumps at Starr's Green booster station. Plant to be of British manufacture and complete with electrical equipment and cable connections. Specification, etc., from Messrs. J. Taylor and Sons, Caxton House, Westminster, S.W.1; deposit £5.

CENTRAL ELECTRICITY BOARD, April 16th.—Construction of site works and foundation works for the transforming stations at Ribble (Preston) and Lancaster. Specification (N.W.E.—P.F.1) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

FIFE EDUCATION AUTHORITY, April 16th.—Electrical work in new elementary school, Sinclairtown, Kirkcaldy. Schedules, etc., from Mr. George Sandilands, Education Offices, Wemyssfield, Kirkcaldy; deposit £1 1s.

BELFAST MUNICIPAL COLLEGE OF TECHNOLOGY, April 17th.—Supply and erection of a large, ironclad, three-wire, 440 V distribution board. Specification from the General Office, at the College.

ROMSEY CORPORATION, April 17th.—Electric lighting of town hall. Specification, etc., can be seen at the office of the Borough Surveyor.

WORTHING CORPORATION, April 21st.—One borehole pump, coupled to an electric motor. Specification, etc., from Borough Water Engineer, Chapel Road, Worthing.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC, April 22nd.—Supply of incandescent lamps. Forms of tender, etc., from the Controller of Supplies, His Majesty's Office of Works, etc., King Charles Street, Westminster, S.W.1.

DUNDEE EDUCATION AUTHORITY, April 22nd.—Electric lighting and central heating installations in new Central School at Rockwell, Lawton Road, Dundee. Specifications, etc., from Messrs. Allan and Friskin, architects, 26, Castle Street, Dundee.

DUNDEE CORPORATION, April 23rd.—One year's supply of stores and materials to the tramways department. Specifications, etc., from the General Manager, Transport Office, Dundee.

CENTRAL ELECTRICITY BOARD, April 28th.—Supply and erection of 33 kV, 11 kV and 6·6 kV switchgear, for connecting Board's supply to electricity supply undertakings, under N.W. England and North Wales scheme. Specification (No. N.W.E.–G.S. 4) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

ILFORD CORPORATION, April 28th.—Supply and erection of (*a*) rotary convertor plant of 500 kW capacity, with automatic control; or (*b*) rectifier plant. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Ley Street, Ilford.

CENTRAL ELECTRICITY BOARD, May 5th.—Supply and erection of 33 kV transmission line crossing of the river Witham, Boston, under Mid-East England scheme. Specification (No. M.E.E.–S.L. 3) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12th.—Supply and erection of 66 kV and lower voltage switchgear. Specification (No. M.E.E.–G.S. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12th.—Supply and erection of 66 kV and lower voltage transmission lines, under the Mid-East England scheme. Specification (No. M.E.E.–S.L. 2) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice essential.*

ANTWERP MUNICIPALITY, April 11th.—Supply and erection of two mercury rectifiers at transformer station, Quai 232. Further information (Fr. 6) from Hotel de Ville.

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African

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Iron and Steel Industrial Corporation, Ltd., c/o International Construction Co., Ltd., 56, Kingsway, London, W.C.2.

INDIAN STORES DEPARTMENT, April 14th.—Supply, erection etc., of three oil engine-driven d.c. generating sets. (Reference B.X. 6 231.)

VICTORIAN ELECTRICITY COMMISSION, April 14th.—Supply of 22 000 V switchgear and accessories, for sub-station "C" at Brunswick (specification No. 30/17). (Reference B.X. 6 182.)

NEW ZEALAND POSTS AND TELEGRAPHS, April 15th.—Supply, of 4-conductor cords (P. and T. 151/2 218). (Reference B.X. 6 303.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Supply of lead-covered switchboard cable (schedule C.574). (Reference B.X. 6 202.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 15th.—Cord type switchboards. (Reference B.X. 6 135.)

BELGIAN STATE RAILWAYS, April 16th.—Supply of armoured cables. Cahier des Charges Special No. 20 257 (fr. 2½) from Service du Materiel des Chemins de Fer Belges, 21, Rue Louvain, Brussels.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 22nd.—Supply of braided switchboard cable. (Reference B.X. 6 201.)

ORADEA MARE (RUMANIA) MUNICIPALITY, April 24th.—Lead covered, double steel tape armoured underground cables. (Reference B.X. 6 298.)

CHRISTCHURCH (N.Z.) MUNICIPALITY, April 25th.—Supply of electricity meters. (Reference B.X. 6 309.)

ST. GILLES (BRUSSELS) MUNICIPALITY, April 26th.—Supply of 6 000 metres of 10 sq. mm. armoured cable, 100 metres of 35 sq. mm. and 1 000 metres of 70 sq. mm. Cahier des Charges (fr. 5) from Service de l'Electricité, 40, Rue de Bethléem, St. Gilles, Brussels.

ANTWERP MUNICIPALITY, April 28th.—Supply of cables and junction boxes. (Reference B.X. 6 312.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, April 28th.—Supply and erection of electrically driven high lift and low lift pumping plants, etc., for South-West Tableland Water Supply (tender No. 51, 1929/1930). Reference A.X. 9 219.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

COPENHAGEN MUNICIPALITY, May 10th.—Supply of switchgear and rectifier plant for Eskildsgade sub-station (Reference B.X. 6 271.)

COPENHAGEN MUNICIPALITY, May 12th.—Supply and erection of two turbo-generators. (Reference B.X. 6 297.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed, self-cooled transformers, suitable for outdoor service. (Reference B.X. 6 096.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13th.—Supply of terminal strips (P. and T. 151/2 000). (Reference B.X. 6 209.)

CHILEAN MINISTRY OF MARINE, May 15th.—Supply of three metric ton travelling electric crane and four-metric ton stationary electric revolving crane. (Reference No. A.X. 9 186.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 20th.—Supply and erection of one 25 kVA, three-phase, 400/230 V, 50 cycle generator. (Reference B.X. 6 307.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20th.—Supply of terminal strips (schedule No. C. 578). (Reference B.X. 6 247.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20th.—Supply of telegraph instruments (schedule C. 579). (Reference B.X. 6 248.)

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22nd.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc. (Reference A.X. 9 212.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators, for Mangahao powe scheme, section 215B. (Reference B.X. 6 300.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of cable clamps, for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14th.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24th.—Supply of 110 kV outdoor steelwork and switchgear, for Waitaki power scheme—section 71. (Reference B.X. 6 238.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25th.—Supply of condensers (P. and T. 151/2 240). (Reference B.X. 6 308.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8th.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15th.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (£10 5s., not returnable.)

Tenders Accepted.

BINGLEY URBAN DISTRICT COUNCIL.—D. Greenwood, electrician's work in 92 houses on Ryshworth Hall estate.

GLASGOW CORPORATION.—English Electric Co., Ltd., supply of 450 hand-operated camshaft tramcar controllers, £26 000.

UNION CONSTRUCTION CO. (FOR LONDON UNITED TRAMWAYS).—English Electric Co., Ltd., supply of 94 maximum traction tramcar trucks, £14 000.

GENERAL POST OFFICE.—British Insulated Cables, Ltd., supply and laying of trunk cable from Liverpool to Colwyn Bay (about 54 miles), £60 000. (Approximate).

DUNDEE CORPORATION.—A. Fyall, electrical work in connection with erection of 54 three-apartment and 30 two-apartment houses in Corso Street, Dundee, £492.

GENERAL POST OFFICE.—Batteries: Douglas (Glasgow) Telephone Exchange, Alton Battery Co., Ltd.; telephonic repeater equipment: Aberdeen, General Electric Co., Ltd.

IRISH FREE STATE LOCAL GOVERNMENT AND PUBLIC HEALTH DEPARTMENT.—Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of Siemens electric lamps and batteries.

GLASGOW CORPORATION.—T. Bolton and Son, Ltd., copper bands; British Insulated Cables, Ltd., insulated bolts; P. R. Jackson and Co., Ltd., commutators for G.E.58 motors.

BOURNEMOUTH CORPORATION.—Bournemouth and Poole Electricity Supply Co., Ltd., lighting and heating equipment for police boxes, £341 10s., with maintenance charge, 9s. 6d. per box per quarter.

MAIDENHEAD CORPORATION.—Hewittic Electric Co., Ltd., rectifier plant for sub-station, £1 295; W. Lucy and Co., four transformer kiosks, £885; Drake and Gorham Wholesale, Ltd., sub-station switchgear, £268.

MANCHESTER CORPORATION.—Crypto Electrical Co., Ltd. (associated with Lancashire Dynamo and Motor Co., Ltd.), constant potential battery charging equipment; Nesta, Ltd., 100 sets of upholstered seats for tramcars.

BEXHILL CORPORATION.—Chamberlain and Hookham, Ltd., supply of meters, £1 030; Hewittic Electric Co., Ltd., supply of rectifier equipment, £1 492; A. Reyrolle and Co., Ltd., ring main switchgear, etc., £457 1s.; Bertram Thomas, feeder switchgear, £220 (all recommended).

CENTRAL ELECTRICITY BOARD.—Enfield Cable Works, Ltd., certain 132 kV overhead transmission lines in connection with North-West England and North Wales Electricity Scheme, 1928; Watsham's. Ltd., and W. T. Henley's Telegraph Works Co., Ltd., 33 kV overhead transmission lines in connection with South-East England Electricity Scheme, 1927. Approximate total value of the contracts, £320 000.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Twelve months' supply of stores and materials to the electricity department: General Electric Co., Ltd., electrical goods; Chamberlain and Hookham, Ltd., ordinary and two-rate meters; Metropolitan-Vickers Electrical Co., Ltd., prepayment meters; W. T. Henley's Telegraph Works Co., Ltd., meter boards; Dussek Bitumen Co., Ltd., insulating compound.

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TORQUAY CORPORATION.—Stirling Boiler Co., Ltd., supply and erection of two water-tube boilers, economisers, air pre-heaters, induced and forced draught fans, grit arresters, chimneys, etc., for the electricity department, £34 540. Also tendered: J. Thompson Water Tube Boilers, Ltd., £34 989; Yarrow and Co., Ltd., £36 315; Babcock and Wilcox, Ltd., £36 811; Spearing and Co., Ltd., £37 840; Simon Carves, Ltd., £38 000; Vickers Boiler Co., Ltd., £38 645.

LONDON COUNTY COUNCIL.—H. J. Cash and Co., Ltd., wiring and fittings for electric lighting, power, bells and telephones at new Homestall Road, Peckham, Secondary School, £1 354. (Recommended.) Also tendered: Smethurst and Co. (London), Ltd., £1 380; Electrical Installations, Ltd., £1 545; J. Briggs (Electrical Contractors), Ltd., £1 561; Ellis and Ward, Ltd., £1 759; T. W. Berkeley Electrical Engineering Co., Ltd., £1 786; Malcolm and Allan (London), Ltd., £1 793; Barlow Bros. and Co., £2 140; Heath, Pritchard, Ltd., £2 534.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—W. Lucy and Co., Ltd., one 5-way feeder pillar, £44; one 10-way, £59 10s.; one 6-way, £46; one 8-way, £48; one 8-way, £58 15s.; and one 6-way, £53, less 5%; W. T. Henley's Telegraph Works Co., Ltd., three 3-way disconnecting boxes, £20 19s. 3d.; two 3-way, £13 19s. 6d.; two 3-way, £13 19s.; one 3-way, £15 1s. 7d.; and one 3-way, £6 2s. 4d., all less 2½%; Callenders Cable and Construction Co., Ltd., three 3-way disconnecting boxes, £28 19s.; one 4-way box, £19 5s. Enfield Cable Works, Ltd., 5 000 yds. cable, £565; 500 yds., £102 10s.; 500 yds., £82 10s.; 980 yds., £1 185 16s.; 1 760 yds., £290; 880 yds., £102; and one 3-way disconnecting box, £8 15s., less 2½% (all recommended).

"THE LEGION BOOK."
A Remarkable Guinea's Worth in Aid of a Splendid Cause.

ONE of the first matters to claim the interest of the Prince of Wales when he returns from his visit to Africa will undoubtedly be the progress of "The Legion Book." This unique book, written and illustrated, at the Prince's personal invitation, by fifty of the most famous novelists, poets and artists in this country, was published in aid of the British Legion, and the King expressly desired that the money resulting from its sale should be regarded as a thanks-offering for his recovery.

In one of the last public speeches he made before sailing for Africa at the beginning of this year, the Prince warmly commended "The Legion Book" to the public. He declared it to be "a remarkable book," and added, "I would appeal to everyone who can afford to do so to buy a copy." It is strongly hoped that a particularly wide response to the Prince's appeal will be made during his absence. If his expectations are to be realised, at least 100 000 copies of the book must be sold. It is certain that nothing would be more gratifying to him on his home-coming than the knowledge that this mark had been reached.

The price of the book is one guinea—and it is well worth it. This royally-inspired composite work includes some of the finest things ever penned by Mr. Rudyard Kipling, Mr. John Galsworthy, Mr. G. K. Chesterton, Mr. Hilaire Belloc, Mr. Arnold Bennett, Mr. Aldous Huxley, Mr. Edgar Wallace, Mr. Hugh Walpole and Mr. Robert Bridges, the Poet Laureate, to name but a few of its universally known authors. Its illustrators include Sir William Llewellyn, President of the Royal Academy; Sir Arthur Cope, R.A., Professor William Rothenstein (who contribute, respectively, portraits of the Queen, the King and the Prince of Wales), Mr. Augustus John, A.R.A., and Mr. Max Beerbohm.

"The Legion Book" is in itself a most covetable treasure, but its worth is more than doubled by its added virtue of being a means of helping a splendid cause—the welfare of the men who fought and faced death, and who, having survived the fight, are now finding it an even greater test of courage to face life; and it is, too, the succouring of the widows and children of those who have died after serving their country. The proceeds go to the Prince's personal fund for the British Legion—a fund with the administration of which he is personally associated. Not only private persons but also public bodies, municipal libraries, schools, colleges, clubs and other institutions will, no doubt, be anxious to ensure the complete success of the Prince's appeal.

All letters in regard to "The Legion Book" should be addressed to Admiral Sir Lionel Halsey, G.C.M.G., St. James's Palace, London, S.W.1, and the envelopes marked "L." Cheques should be made payable to the Legion Book Fund.

TRADE PUBLICATIONS.

GENT AND CO., LTD., Faraday Works, Leicester, has published Book 7, Section 8, dealing with bell signals, relays-keys, etc.

Benjamin Reflector Fittings Catalogue No. 427 (superseding 190) has been issued by SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39, Upper Thames Street, London, E.C.4.

This year's calendar of the Metropolitan-Vickers Electrical Co., Ltd., has just been issued. The subject is Miss Helen Gilliland, whose charms are rivalled only by her fifteen predecessors.

The ELECTRIC CONTROLLER AND MANUFACTURING CO., of Cleveland, Ohio, has sent us a new leaflet dealing with magnetic controllers for crane operation.

The "Non-Fayl" electric operated coffee mill is the subject of a new list published by the MORECAMBE ELECTRICAL EQUIPMENT CO., LTD., Fahy's Buildings, Easton Road, Morecambe.

We have received from the UNDERFEED STOKER CO., LTD., Africa House, Kingsway, London, W.C.2, a copy of a new pamphlet giving brief particulars of the "Duo-Mass" vibro conveyor.

We have received from SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E.18, a copy of price list No. 649, entitled "The Big Stride Forward in Wireless Battery Performance."

"Take Care of the Seconds and the Hours will take Care of Themselves" is the title given to a new leaflet of the RELAY AUTOMATIC TELEPHONE CO., LTD., Marconi House, Strand, London, W.C.2.

A number of new items are illustrated and described in the l.t. fuse and switchgear catalogue, No. 2 130, just issued by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4.

INDIVIDUALIST LUNCHEONS.

Owing to the closing of the Hotel Cecil, new arrangements have been made for the last two luncheons of this season, to be held at the King Edward VII Rooms, Hotel Victoria, Northumberland Avenue, London, W.C.2, on May 14th and June 18th. The speaker on May 14th will be Dr. E. Graham Little, and on June 18th the Rt. Rev. the Bishop of Durham will give an address.

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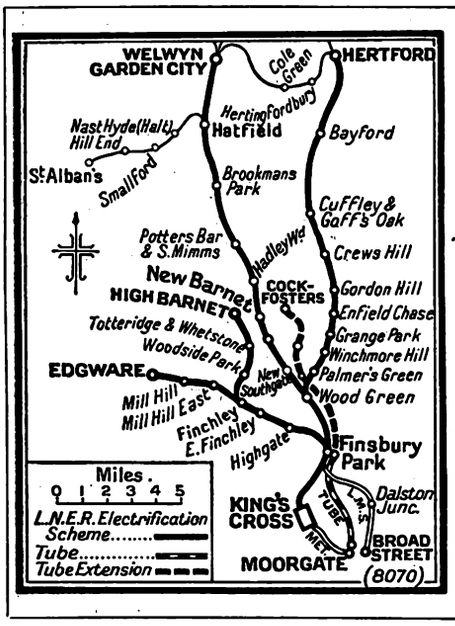
ELECTRICITY SUPPLY.

Bulk Supply in East Cornwall—Colchester Corporation to Purchase Walton Undertaking—Bexhill Extensions—Fixed Price System at Beckenham.

MAIDSTONE T.C. has received sanction to a loan of £3 500 for the erection of electricity showrooms in Middle Row.

Cheadle and Gatley U.D.C. is to supply electricity under a Fringe Order to premises in Northern Etchells.



THIS route-map reproduced from "The Times" indicates the electrification scheme of the L.N.E.R., and the Tube extensions referred to in our last issue. Though the L.N.E.R. scheme is now complete and has been laid before the Developments Act Committee, its carrying out is understood to be dependent to some extent upon the fate of the Bill for the Tube extension now before Parliament.

It is proposed by Halifax Electricity Committee to carry out work in connection with mains, etc., at an estimated cost of £30 564.

Great Ayton (Yorkshire) ratepayers have decided by a large majority to substitute electric lighting for the present gas lighting in the village.

Sanction to a loan of £9 092, for h.t. mains, and £1 633 for switchgear, transformer and kiosks has been received by Birkenhead Corporation.

Tamworth T.C. has decided, subject to the sanction of the Commissioners, to acquire the undertaking of the Tamworth Electrical Supply Co. for £1 500.

York Electricity Committee recommends application for loans of £4 000 for assisted wiring and £12 000 for the purchase of domestic apparatus to be let on hire.

Terms have been agreed between Plymouth T.C. and the Cornwall Power Co. for a bulk supply of electricity by the Corporation to the East Cornwall area, including the towns of Saltash and Torpoint.

Colchester Corporation has decided, conditionally, to purchase the electricity undertaking of Walton-on-the-Naze U.D.C. for £10 546, plus a sum not exceeding £450, representing unborrowed capital expenditure.

St. Pancras (London) electricity department has fitted special types of reflectors to a number of lamp standards in Camden Road and Crowndale Road for experimental purposes, in order that the effect upon the street lighting may be considered.

For the purposes of the national "grid" it is necessary for the Central Electricity Board to erect sub-stations in the vicinity of Birmingham Corporation's power stations at Hams Hall and Nechells. The Electricity Committee has arranged to provide the requisite sites.

The sum of £47 075 is to be spent by Burnley Electricity Committee in changing over from d.c. to a.c. the supply of electricity in certain parts of the town. It will be necessary at a later date for remaining districts to be changed over, the estimated cost being £90 000.

The electricity supply for the village of Longsdon provided by Leek U.D.C. was inaugurated on March 27th. The scheme has cost between £2 000 and £3 000, and the sub-station has been designed so that it may at a later date be able to provide supplies for Cheddleton and other neighbouring areas.

Sanction to a loan of £6 117 for plant extensions and for the Northern sub-station has been received by Bexhill T.C. Sanction is to be sought for loans for additional plant at the Little Common sub-station, estimated to cost £1 831, and an additional sub-station in Terminus Road, estimated to cost £2 613.

Beckenham U.D.C. is to proceed with a re-distribution scheme in the area of Church Road, Shortlands, including a new sub-station in Scotts Lane, at an estimated cost of £5 602. The "fixed price light" system of supply is to be extended to all houses in the district having a rateable value not exceeding £25.

Sheffield electricity department has received an application from Beighton P.C. for a supply of electricity throughout the parish, and the Committee has agreed to supply electricity on terms to be hereafter arranged.—The Committee is seeking an Order authorising the extension of the existing area of supply so as to include Dronfield urban district.

The Ballymoney Light and Power Co. has informed Ballymoney R.D.C. that the company has applied to the Electricity Commissioners for a Statutory Order to enable it to continue to supply electricity in Ballymoney and the district round about the Balnamore side of the town. The company desires to get a supply of electricity in bulk from Larne, from the Antrim Electricity Supply Co.

Mr. Borlase Matthews has informed Sleaford U.D.C. that the Electricity Commissioners have granted the Lincolnshire Electricity Special Order, though it has yet to be formally approved by Sleaford. He has asked whether the Council would be prepared to transfer its undertaking to the public utility company which it has been arranged to form to operate the Order. He predicts a lower price for electricity as one of the immediate advantages of the transfer.

A new transformer of 1 000 kVA has been put into service at Minffordd by the North Wales Power Co. to meet the increased demand of Bangor Corporation. This transformer is intended to take the place of one of the two existing transformers of 500 kVA. It is anticipated that there will be a substantial increase in the output, in consequence of the revised terms of the Power Co. for bulk supply, and especially in view of the reduced rates to domestic users under the two-part tariff.

Hull electricity department is eliminating the domestic prepayment system, which was a combination of the domestic tariff and a prepayment meter, involving the standing charge payment by a quarterly account and payment per kWh through a prepayment meter. Under that system the reduction of meter rents could not be applied, and the consumers concerned were prevented from taking full advantage of the ½d. per kWh rate.—The Electricity Committee has obtained sanction to borrow £68 386 in connection with the supply to the added area.

Southwark (London) Electricity Committee reports that a complete change-over from d.c. to a.c. throughout the whole area of supply would cost about £121 000, involving annual repayments of approximately £12 000 if no assistance was forthcoming from the Commissioners or any other source. The Committee considers therefore, that this course is not to be contemplated at present. It appears, however, that there is every justification when laying new mains for the provision of four-core cable, which could be used for three-phase current later. It is therefore recommended that in future alternative prices for three- and four-core cable be obtained.

The Borough Electrical Engineer has reported to Electricity Committee that extensions of mains in the Barking side, Seven Kings and Chadwell Heath districts are necessary and negotiations for kiosk sites have been. Engineer has submitted a scheme which he thinks will attract potential consumers who cannot avail themselves of the facilities already offered, and will result in securing sufficient consumers in practically every road in the borough where the mains are not laid at present, to warrant the capital expenditure in laying the mains. Under the scheme it is proposed to provide in existing houses a complete installation, including shades and lamps, the charges to be for six lighting points, 6s. per quarter, and for each additional lighting point, 9d. per quarter, the maximum number of lighting points to be 12. The Committee recommends that the scheme be put into operation in respect of roads along which the Council's electricity cables have already been laid.

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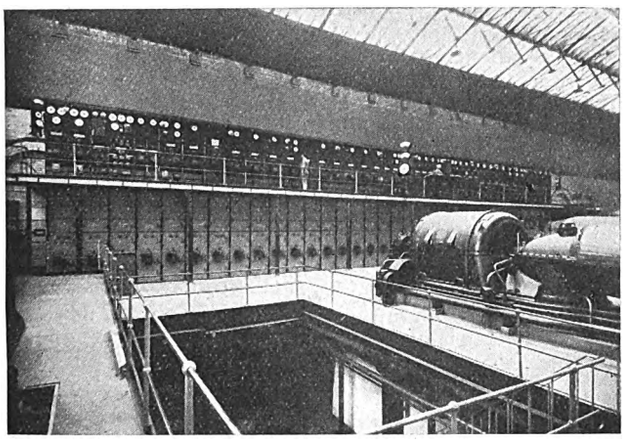
ELECTRICAL PICTURES.

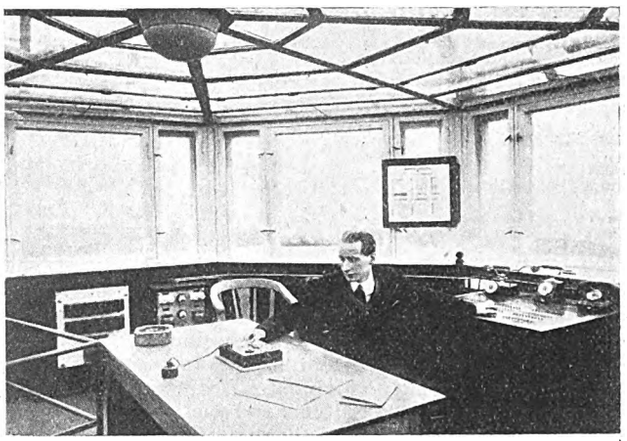
Sir John Brooke, whose appointment as vice-chairman of the Electricity Commission is referred to on page 470.

A new electrically operated rammer, which has made its appearance on the London streets.

Mr. W. B. Woodhouse, who has joined the Board of the Electrical Distribution of Yorkshire, Ltd. See page 470.



The control board at the Derby power station. The original and all the extension switchgear was manufactured by the British Thomson-Houston Co., Ltd., and the board illustrated is located in the turbine house, mounted on a gallery above the original bank of switchgear cubicles.



A "lighthouse" has been erected in Berlin whence an official, by means of press button switches, can illuminate all the thoroughfares of the city. From the lighthouse high above the buildings, the controlling officer has a comprehensive view of the whole city area.

On Thursday, April 3rd, over 400 members of the Electrical Association for Women visited the Ideal Home Exhibition, London, as the guests of the General Electric Co., and were afterwards entertained at luncheon at the Clarendon Restaurant, Hammersmith, London, where this photograph was taken. The London members of the Association were joined by contingents from Birmingham, Cheltenham, Cardiff, Ashford, Rugby, Gloucester and Bath. During the afternoon members were the guests of the Edison Swan Electric Co.

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FINANCIAL INTELLIGENCE.

Some Particulars of Accounts of Manufacturers of Telephone Equipment and Electric Cables—Analysis of Results of Electrical Undertakings.

By "AUDITOR."

BANK RATE (1929-30.)

1929.			1930.	
Feb. 7	5½%	Nov. 21	Feb. 6	4½%
Sept. 26	6½%	Dec. 12	Mar. 6	4%
Oct. 31	6%		Mar. 20	3½%

ANALYSIS OF RESULTS OF CERTAIN ELECTRICAL MANUFACTURING AND EQUIPMENT COMPANIES WHOSE 1929 ACCOUNTS HAVE ALREADY BEEN SUBMITTED.

1929 Accounts	Brt. Forwd. £	Profit, 1929 £	Total £	Crd. Forwd. £	Ann. Div.	Recent Price	Par Value	Yield	Remarks
Automatic Telephone Mfg.	93 483	118 802	212 285	118 285	12½%	39/-	£1	6 7/16	Controlled by International Automatic Telephone Co., Ltd.
British Insulated Cables	250 089	636 550	886 639	280 806	15	79/-	£1	3¾	As a consequence of the settlement of taxation and other claims, the sum of £300 000 has been transferred to a dividend equalisation reserve.
" " " 5% Mort. Deb. Stock	—	—	—	—	—	99	£100	5 1/16	
" " " 5½% "A" Cum. Pref.	—	—	—	—	—	21/-	£1	5¼	
" " " 6% Cum. Pref.	—	—	—	—	—	23/-	£1	5 1/16	
British Wagon	11 018	27 195	38 213	12 613	15	—	£3 Pd.	—	Controls British Railway Traffic and Electric Co., Ltd.
" "	—	—	—	—	—	—	£1 Pd.	—	
Canning (W.) and Co.	9 246	61 706	70 952	12 952	15	57/-	£1	5¼	Dividend maintained
Clarke, Chapman and Co.	16 548	77 186	93 734	23 962	11	—	£1	—	The capital was last increased in 1919 by creation of ordinary shares.
" " 7% Cum. Pref.	—	—	—	—	—	—	£10	—	
Consolidated Signal	673	25 259	25 932	840	12	32/-	£1	7½	The figure of £25 259 represents dividend received from Westinghouse Brake and Saxby Signal Co.
" " 6% Cum. Pref.	—	—	—	—	—	17/-	£1	7	
Davis and Timmins	21 316	26 068	47 384	20 819	20	46/6	£1	8½	The sum of £4 912 has been transferred to reserve.
" " 6½% Cum. Pref.	—	—	—	—	—	—	£1	—	
Electrical Apparatus	1 770	8 627	10 397	968	Pref.	—	£1	—	Controls Bray, Markham and Reiss, Ltd.
" " 10% "A" Cum. Pref.	—	—	—	—	only	—	£1	—	
" " 8% "B" Cum. Pref.	—	—	—	—	—	—	£1	—	
Ericsson Telephones	18 235	64 087	82 322	19 322	8	—	£1	—	Debentures redeemed in December, 1929.
" 7% Cum. Pref.	—	—	—	—	—	20/-	£1	7	
Hall Telephone Accessories (1928)	4 631	40 365	44 996	4 719	12	13/9	10/-	8 6/11	Share capital was increased to £175 000 in February, 1929.
Lancashire Dynamo and Motor	7 809	18 157	25 966	7 227	5	—	£1	—	Controls Crypto Elec. Co., Ltd. The company has reserved the right to pay off all or any of debenture issue at 103% at any time.
" " 6% 1st Mort. Deb.	—	—	—	—	—	—	£100	—	
" " 5½% Cum. Pref.	—	—	—	—	—	—	£1	—	
Mather and Platt	106 006	228 398	334 404	109 855	15	43/9	£1	6½	The preference shares have a priority as regards capital up to £10 10s. each.
" " 5% Cum. Pref.	—	—	—	—	—	8⅝	£10	5⅝	
Midland Elec. Mfg.	13 193	45 182	58 375	14 640	22½	75/-	£1	6	Share Capital was increased to £187 500 in March, 1929.
" " 7½% Cum. Pref.	—	—	—	—	—	—	£1	—	
Reyrolle (A.)	78 892	98 021	176 913	75 680	12½	—	£1	—	Same dividend for past ten years.
Telegraph Construction	114 123	77 801	191 924	102 284	10	23	£12	5 1/16	Trading account shows a debit balance, but a transfer was made from reserves.
Waste Heat and Gas Elec.	17 914	30 566	48 480	22 580	8	21/10½	£1	7 1/16	Year ended January 31st, 1930.
Westinghouse Brake and Saxby Signal	13 228	102 292	115 520	13 033	8	21/6	£1	7 1/16	8% registered debentures £316 950 were redeemed at par in 1927.

The activity created by the placing of large orders on the part of the Central Electricity Board during 1929, in conjunction with the many developments in domestic electrification, is reflected to some extent in the accounts of several electrical manufacturing and equipment companies. In spite of difficult international conditions and the general industrial depression, both the home and the export trade in electrical goods and apparatus has shown an improvement in relation to 1928, although in many instances the net profits of the companies have declined.

In the telephone world important arrangements for mutual help and collaboration have been made between telephone manufacturing and operating companies. As one of the results of this policy the International Automatic Telephone Co. now forms a prominent link in an important chain of companies covering the U.S.A., Great Britain, Germany, etc.

The results of the International Automatic Telephone Co., Ltd., for the last two financial years are compared below:—

INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Net Profit	£133 517	£130 816
7% Preference Dividend	11 924	11 924
12½% Ordinary Dividend (less tax)	53 750	53 750
12½% Deferred Dividend (less tax)	45 000	45 000
To Reserve, etc.	10 000	10 000
Patent Rights and Goodwill	360 000	360 000
Investments (at cost) and Loans	905 235	930 647
Debtors	101 545	123 627
Cash	4 509	3 629
Creditors (including provision for contingencies)	112 347	150 506
Ordinary Share Capital	430 000	430 000
Deferred Share Capital	360 000	360 000
7% Preference Share Capital	170 338	170 338
Carried forward	82 579	69 736
Dividend	12½%	12½%

The ordinary shares rank for 6% non-cumulative dividend and also for capital in priority to the deferred shares, and *pari-passu* with the deferred in the surplus profits after a dividend of 6% on the deferred. At the recent price of 21s. 3d., the preference yield £6 11s. 9d. per cent., and at 37s., the return on investments in the ordinary shares amounts to about 6¾.

AMERICAN TELEPHONE AND TELEGRAPH CO.

The expansion of the American Telephone and Telegraph Company during the past three years is indicated in the following table:—

	1927. $	1928. $	1929. $
Net Revenue	128 614 910	143 170 491	166 189 758
Dividends	97 379 934	103 821 440	116 378 771
Added to Surplus	79 173 841	19 349 051	49 810 987

In the London Stock Exchange Official List the common stock of this company is quoted at 250.

NEW YORK TELEPHONE CO.

The 1929 accounts show a net profit of $29 655 543, the dividend being maintained at 8%, and $5 582 543 added to the surplus.

BELL TELEPHONE OF CANADA.

The net income of this undertaking is shown at $5 528 069 in the 1929 accounts, the dividend of $8 per share being maintained, and the sum of $668 126 added to the surplus.

When comparing the principal features of the Accounts of Enfield Cable Works, Ltd., for the two last accounting periods, it should be remembered that the 1928 profit figure relates to the 18 months ended Dec. 31, 1928:—

ENFIELD CABLE WORKS, LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Net profit	£129 408	£143 067
7½% Preference Dividend	15 000	22 500
Ordinary Dividend	87 500	72 500
To Reserve	25 000	40 000
Share Premium Account	155 035	160 690
Creditors	60 804	33 179
Cash	148 685	44 594
Debtors	352 096	210 218
Stock	113 357	160 837
Reserve	160 000	140 000
7½% Preference Share Capital	200 000	200 000
Ordinary Share Capital	350 000	350 000
Carried forward	33 559	31 650
Dividend	25%	30%

At 26s., the preference shares yield 5¾%, and at 92 the ordinary return about 5 1/16%.

Some of the principal items shown in the final Accounts of the British Aluminium Co., Ltd., covering the last two accounting periods are compared below:—

BRITISH ALUMINIUM CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Net Profit	£279 793	£284 063
Preference Dividend	17 974	17 974
Ordinary Dividend	100 103	100 103
To General Reserve	100 000	100 000
To Depreciation Reserve	50 000	50 000
Property	2 871 423	2 737 079
Debenture Redemption Funds	482 911	445 056
5% Prior Lien Debenture (£100)	745 600	768 100
6% Non-Cum. Pref. Capital	299 570	299 570
Debenture Stock, 5½%	507 215	521 770
Ordinary Capital (£1)	1 001 034	1 001 034
Carried forward	35 559	33 843
Dividend	10%	10%

At 47s., the ordinary shares yield 4¼%, and at 22s. the preference give a return of about 5½%. The 5% debentures at 97 yield 5⅛%, and the 5½% debenture stock was recently quoted at par.

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COMPANY NEWS.

Rise of American Telephone and Telegraph Stock—Anglo-Portuguese Telephone Co.'s Capital Programme—Clyde Valley Co.'s Increased Profit—Directors' Reports.

AMERICAN Telephone and Telegraph stock is approaching the 300 mark, a further rise of 10 points during the past week bringing the quotation up to 280. Radio Corporation of America shares are over 60, a 5-point rise in the week, on talk of a deal with the General Electric and Westinghouse companies. General Electric shares have, for the same reason, jumped up a matter of 7s. 6d., to 55s. Hydro Electrics are 3 points higher at 54¼, the present quotation being 10 points above that ruling in the middle of last month. Since then, of course, the corporation's report has been made known, showing a net income of nearly £1 380 000 in 1929, compared with not quite £1 150 000 in 1928. International Telephone and Telegraph Stock has advanced to above $70 a share. Cables and Wireless stocks are much about the same as a week ago. Marconi International Marine shares at 45s. are down 1s. 3d.

In the manufacturing department, the feature has been the rise in General Electrics, already referred to. Associated Electrics have jumped from 28s. to 31s. 6d., and Ever Ready ordinary, with a rise of 1s., are once more over par, while the participating preference shares are 6d. better at 29s. 6d. Henley's ordinary shares are 3s. 9d. higher at 131s. 3d.; Enfield Cable Works shares are quoted at 90s. ex dividend and bonus. International Automatic Telephone shares are also ex dividend and bonus, the price being 35s. Automatic Telephone Manufacturing ordinary shares at 37s. 6d. are 1s. 3d. down.

A number of electricity supply companies' shares are at a slightly higher level. Charing Cross shares are 1s. 6d. up at 27s., and Brompton and Kensington, Chelsea, St. James' and Pall Mall, and Westminster are all 6d. to the good. Electric Supply Corporation shares are 1s. 3d. higher, at nearly 47s. South Metropolitan 7% preference have moved up from 25s. to 26s. 9d., but South Londons at 26s. 9d. are down 9d., and City of London 1s. 3d. lower at just over 33s. Calcutta Supply shares have given way 1s. 3d., to below 49s. 6d.

Metropolitan and District Railway shares are slightly firmer. London and Suburban Traction debentures are 2 points down

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref.	20/6	20/6	22/6	19/9
6½	,, ,, "C" Cum. Pref. ..	21/–	21/–	23/6	19/9
15	B'mouth & Poole El. S. Ord. ..	62/6	62/6	78/–	29/9
6	,, ,, ,, 6% Cm. Pf.	22/–	22/–	24/–	21/–
(*d*)	Brompton & Kensington Ord. ..	26/–	25/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	49/4½	50/7½	60/–	32/6
5	,, ,, 5% Cum. Pref.	20/–	20/–	23/3	19/10
4	Central Electricity Board 4% Stock	82½*	82½	81	77½
4	Central Elec. Sup. 4% Deb. ..	95½	95½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	27/–	25/6	51/–	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/–	17/–	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/–	25/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	34/4½	52/10½	26/–
6	,, ,, ,, ,, 6% C.P.	22/6*	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	36/10½*	38/9	44/6	26/6
8	,, ,, ,, ,, 8% Pref.	28/–	28/–	29/6	26/–
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/–
11	County Lon. Elec. Sup. Ord. ..	47/6	47/6	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/–	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/–	24/–	27/–	21/6
(*g*)	Electric Supp. Corp. Ord. ..	46/10½	45/7½	59/6	29/6
6	,, ,, ,, 6% Cum. Pref.	21/6	21/6	23/–	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/–	35/–	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/–
6	,, ,, 6% C.P. ..	17/6	17/6	20/6	16/–
5	Folkestone E.S. 5% C.P... ..	17/6*	17/6	19/6	17/6
4½	,, ,, 4½% 1st Mt.Deb.Stk.	90	88	92	80½
—	Hydro Electric Securities.. ..	54¼	51½	87	20
—	International Holdings	8⅛	6⅝	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/–	27/–	32/9	22/10
6	,, ,, ,, 6% C. 1st Pref.	27/–	27/–	28/6	24/9
7	,, ,, ,, 7% Part. Cum. Pf.	28/–	28/–	31/3	24/6
1/9⅛	Lon. Elec. Sup. Ord. (£1)	28/6	28/6	37/6	23/–
5	London Power Co. 5% Deb. Stk.	101	100	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/–	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	29/–	29/–	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/3*	32/6	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	26/9*	27/6	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord..	25/–*	25/–	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/–
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	27/6	27/–	28/6	23/6
8	Scottish Power Ord.	29/–*	31/–	35/9	22/–
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/–	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/–	25/–	26/–	21/9
8½	S. London E.S. Ord.	26/9	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	26/9	25/–	27/–	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/–	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	95	95	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/–
5	Victoria Falls Power Ord. ..	61/3	60/7½	69/–	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	92½	92½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	125½	125½	152	116
7·67	,, ,, ,, ,, 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/–	14/–
5	,, ,, ,, 5% Cum. Pf.	12/6	12/6	15/9	13/–
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	76	76	74½	54
4½	,, ,, ,, 4½ Pf.	79½	79½	85½	78
4	,, ,, ,, 4% Deb.	81	81	83	75
5	City & S. London, Cons. Ord. .	69	69	65½	52
4	,, ,, 4% Perp. Deb. ..	80	80	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	79	42½
4	,, ,, ,, ,, 4% Pf. Stk.	73	73	77	68
4	,, ,, ,, ,, 4% Deb. ..	81	81	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	94*	96	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	,, ,, ,, 5% Deb. ..	73	73	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	65	64½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	64½	63	76	60½
3½	,, ,, ,, 3½% Deb. ..	71½	71½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77½	77	81½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	81½	80½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	87½	87½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9	Torquay Trams Ord.	25/–*	25/–	30/3	20/3
8	Underground Electric Rlys. Ord.	23/–	23/6	28/6	11/–
5	Winnipeg Elec. Refg. Mt. Stk. ..	86*	86½	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	4/3	4/3	16/–	3/–
4½	,, ,, ,, 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	31/6	28/–	58/6	26/3
8	,, ,, ,, 8% C.P.	51/10½	51/10½	56/9	49/6
4	,, ,, ,, 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	38/9	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	10/–	10/–	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	99/4½	56/–
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	23/6	23/6	24/9	19/7
7	,, ,, ,, 7% Deb.	105½	105½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	75/–	75/–	91/3	63/9
6½	,, ,, 6½% C.P. ..	23/9	23/9	25/9	22/–
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/–
12	Consolidated Signal Ord.	35/–	35/–	52/–	6/6
5	,, ,, 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	24/4½	24/7½	27/–	14/–
6	,, ,, ,, 6% Cum. 2nd Pf.	19/–	19/–	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/–	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	,, ,, 7% C.P. ..	18/9	18/9	22/9	20/–
4	,, ,, 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	90/–†	92/6	112/6	60/–
7½	,, ,, ,, 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/–
—	,, ,, 6% C.P.	7/6	7/6	18/9	5/–
5½	,, ,, 1st Mt. Deb. ..	89	89	103½	86
6	,, ,, Conv. Deb... ..	65½	65½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	20/6	19/6	92/3	17/10½
10	,, ,, 7% Partic. Pref. ..	29/6	29/–	34/2	23/9
6	Ferranti 6% Pref...	18/–	18/–	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	55/–	47/6	81/3	26/6
6½	,, ,, "A" C.P.	23/–	23/–	26/–	22/–
7½	,, ,, "B" C.P.	25/6	25/6	27/9	22/9
7	,, ,, 1st Mt. Deb. ..	103	103	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	131/3	127/6	136/10½	69/3
12½	International Auto. Telephone Ord	35/–†	37/6	50/6	35/–
10	Johnson & Phillips Ord.	23/9	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	25/–	23/9	25/6	22/3
10	Nat. Elec. Construction (10/–) ..	22/6	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/–	25/–	36/6	23/6
10	,, ,, ,, Cum. Pref.	31/3	31/3	34/3	28/9
4½	,, ,, ,, Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	22½*	23	30½	20
8	Waste Heat & Gas Elec.	21/10½*	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	280	270	314½	144½
4½	,, ,, ,, Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	,, ,, 6% Prefd. Stk.	102½	102½	105½	91
1½	,, ,, Deferred Stk.	24½	24½	27	22
8	Anglo Portuguese Tele. Ord. ..	23/1½*	23/1½	26/–	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	60½	61½	90½	73½
—	"B" Ord. Stk.	31½	31½	104	33
—	5½% Cum. Pref. Stk. ..	98	98	99	90
3½	Eastern 3½% Pref. Stk.	64½*	65½	70½	58½
4	,, 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	32	32	43½	26
—	International Teleph. & Teleg. ..	$70½	$66½	161½	48½
15	Marconi Int. Mar.	43/9*	45/–	90/–	16/6
4½	New York Telep. 4½% Mt. Bds.	100½	100½	102½	96
12	Oriental Telephone Ord.	55/7½	56/3	65/–	41/–
—	Radio Corporation of America ..	60½	55½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/–	81/3
4	Western Tel. 4% Deb. Stk. ..	78	78	82	73

(*a*) 19$\frac{8}{11}$d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2$\frac{3}{4}$d. per share. (*h*) 88s. 2·136d. * Ex dividend. † Ex dividend and bonus.

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Directors' Reports, etc.

NEWMARKET ELECTRIC LIGHT CO., LTD.—Fin. div. at rate of 8 %, less tax, is announced.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Div. of ½% on common stk. is announced.

BELL TELEPHONE CO. OF CANADA.—Qrtrly. divs. of 2% (same as last year) will be payable on Apl. 15.

CANADIAN GENERAL ELECTRIC CO., LTD.—Div. on common stk. of 75 cents p. sh. for qrtr. ended March 31 is announced.

MADRAS ELECTRIC TRAMWAYS (1904), LTD.—Fin. div. at rate of 6% p.a., less tax on pref. shs., in respect of pfts. for 1929, is payable.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—Fin. div. of 10%, being 2s. p. sh., less tax, is now payable.

INDIAN RADIO TELEGRAPH CO.—Gross pft. for 1929, R.1 025 000. Divs. of 12½% on ord. and 8¼% on defd. shs. are recommended.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—Div. of R.1.4 annas p. sh., Indian tax free (same as last year) will be payable on Apl. 29.

J. STONE AND CO., LTD.—Pft. for 1929, £263 964, agst. £243 459. Ord. div. 20%, plus bonus 15%. To res., £50 000 (same as last year). Fwd. £127 592.

PARKER, WINDER AND ACHURCH, LTD.—Pft. for 1929, £9 054, agst. £4 012. Fin. div. at rate of 10 %, makg. 7½ % less tax, for year. Fwd., £11 701, agst. £8 563.

EASTERN TELEGRAPH CO., LTD.—Int. for half-year endg. Apl. 30, on 4% mtge. deb. stk. will be payable on May 1. Transfer bks. will be closed from Apl. 25 to 30, inclusive.

PROVINCIAL TRAMWAYS, LTD.—Blce., £15 479, agst. £16 749. After paymt. of div. on 6% cum. pref. shs. for year to Dec., 1927, leaving two years' div. in arrears, carry fwd. is £3 649, against £3 679.

VENNER TIME SWITCHES, LTD.—An issue of 30 000 8% cum. pref. shs. of £1 each was offered for subscription last week. The proceeds are to be devoted to the provision of additional factory accommodation.

RIVER PLATE ELECTRICITY CO., LTD.—Net pft. for 1929, £55 745, agst. £53 401. Div. of 10½% (agst. 11%) is proposed, plus bonus issue of 5% in fully paid ord shs. To res., £12 500, agst. £6 795 ; fwd., £5 648, agst. £7 403.

EDISON SWAN ELECTRIC CO., LTD.—Net pft. for 1929, £50 964, agst. £76 991. After provisn. for pref. div., ord div. is maintained at 10% p.a. To res. £30 000, agst. £50 000, makg. total res. £280 000. Fwd. £13 250, agst. £18 929.

CANADA POWER AND PAPER CORPORATION.—Pft. and income from investmts. for 1929, $8 604 000. Bond and deb. int. $4 186 937. Cap. and surplus available for no par value common shs. $46 851 000, givg. such shs. a book value of over $35 p. sh.

HEAD, WRIGHTSON AND CO., LTD.—It is announced that, owing to abnormal and uncertn. times through which iron, steel and engineering trades are passing, it is advisable to postpone paymt. of 6 months' pref. div. due March 31 until after completn. of blce. sheet for year endg. Apl. 30, 1930.

AMERICAN COMMONWEALTH POWER CORPORATION.—Gross earngs. of corporatn. and affiliated companies for year ended Feb. 28, 1930, $26 144 396, agst. $11 964 248. Net income for corporatn. $5 591 633, agst. $2 493 673. After pfd. div. chges., fin. blce. available for reserves, Federal taxes and surplus was $4 174 792, increase $2 827 092.

RADIO CORPORATION OF AMERICA.—Net operatg. income for 1929, $182 137 000, agst. $99 626 000 ; surplus for divs., $15 892 000, equal to $1·58 p. sh., agst. $19 834 000, or $15·98 p. sh. Company borrowed $32 000 000 from General Electric Co. of New York and Westinghouse Electric Co., and loaned it to subsidiaries.

LYMINGTON ELECTRIC LIGHT AND POWER CO., LTD.—Rev. for 1929, £8 807 ; net rev. blce., after provisn. for deb. int., pref. sh. div., income tax and exes. on increase of cap. and adding £228 brt. fwd., £2 287. Intm. div. of 3%, tax free, on ord. shs. has been paid. Fin. div. of 5%, tax free, recommended. To gen. res., £200 ; fwd., £247.

KESWICK ELECTRIC LIGHT CO., LTD.—Rev. for 1929, £6 531 ; expend., £3 448. After privisn. for bank int. and commissn. and int. on deb. stk., writing off £50 on free wiring account, and placg. £750 to depreciatn. res., £1 000 to res. fund and £150 to income tax res., blce. was £674. Divs. of 6% p.a. on pref. shs., and 10% p.a. on ord. shs. recommended. Fwd. £92.

LLANELLY AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Pft. for 1929, £53 029, agst. £52 426, before mtg. int. charges, which amt. to £16 771, agst. £14 729. To 5% deb. stk. redemptn. acct., £4 863, agst. £4 648 ; to res. and renewals accts., £15 000, agst. £19 000 ; pref. sh. div., £12 600. It is proposed to resume divs. on ord. shs., after lapse of three years, with a paymt. of 2½%. Fwd., £3 122, agst. £3 327.

NOTTING HILL ELECTRIC LIGHTING CO., LTD.—Pft. for 1929, includg. £28 977 brt. fwd., £91 873, agst. £91 734, includg. £27 744 brt. in, deb. and other int., £2 794, agst. £2 911, sinkg. fund "A" and int., £11 288, agst. £7 420, sinkg. fund "B" and int., £7 226, agst. £5 646 ; to contingency fund, £1 019 (same), joint undertakg. int., £2 172, agst. £2 334, and income tax, £11 526, agst. £12 887. Div. on 6% pref., £9 600. Fin. div. on def. at 11s. 7·817d. p. sh., less tax, makes 16s. 7·817d. (agst. 14s. 0·006d. ; fwd. £28 229, agst. £28.977.

A. REYROLLE AND CO., LTD.—Pft. for 1929, £98 021, agst. £90 615, plus £77 892 brt. in, after deductg. £1 000 for distribution among charitable and other funds. Divs. of 7% p.a. on pref. shs., and 12½% p.a. on ord. shs. are recommended. To res. for gen. purposes, includg. equalisatn. of divs., £100 233. Fwd. £75 681, agst. £78 892. Attentn. has been given to reorganisatn. and developmt. of J. H. Holmes and Co., Ltd., a subsidiary in which the company holds a controlling int. There was a loss in the first year's tradg. of that company, which was charged to res. in that company's accts., and has not been taken into acct. in arriving at the pfts. of A. Reyrolle and Co.

WINDERMERE AND DISTRICT ELECTRICITY SUPPLY CO., LTD.—Rev. for 1929 £15 016, decrease £174 ; workg. exes., £6 461, agst. £6 449. Blce. of rev. acct., £8 555, plus £803 brt. in ; deb. int. and divs., Keswick Elect. Light Co., £924 ; loan and bank int., £134, and redemptn. of debs., £493, making total of £10 909, less deb. int. and bank commissn., £849. Deducting amts. placed to depreciatn. res., £2 000 ; res. fund, £1 250 ; income tax acct., £500 ; cap. acct., free wiring, £250, and to writing off investmts., £493, left £5 567, out of which intm. divs. of 5% on 6% cum. pref. and 2½% on 7½% pref. shs. have been paid. Divs of 6% on 6% cum. pref. shs., making 11% for year, 5% on 7½% pref. shs., making 7½% for year and 4% for year on ord. shs. are recommended.

CONSTANTINOPLE TELEPHONE CO.—The International Telephone and Telegraph Corporation has purchased a controllg. int. in the stk. of the Constantinople Telephone Co. It is announced that the transactn. has been approved by the Turkish Govt. and that a new rotary automatic equipt. will be installed in Turkey. The International Corporation already operates in Spain, Cuba, Mexico, Porto Rica, Peru, Chile, Argentine, Uruguay and Brazil. The rept. of the Constantinople Telephone Co. for 1929 shows, after debiting int. on obligatns and debt certificates and usual allocatn. to res. for amortisatn., balce. of £T10 187 (agst. £T9 934, plus amt. brt. fwd. £T14 412, less distributn. made in April last on sh. cap. £T10 621, making £T13 978. Directors again recommend div. of 3½%.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Rev. for 1929, £1 874 049, agst. £1 859 159 ; blce. to net rev. acct., £1 180 944, agst. £1 207 130. Blce. from last acct. was £681 089, agst. £441 388. Int. in deb. stk. and tempy. loans absorbed £288 342 ; 7 % deb. stk. sinkg. fund instalmt., £5 000 ; and provision for diffce. between issue and redemptn. price of deb. stk., £4 600. Placed to contingency fund, £28 975 ; to res. for taxatn., £10 000 ; to res. for depreciatn. £284 953 ; to investmt. res. acct., £15 000. Fin. div. on 6 % pref. shs. at 3 % required £99 646. Fin. div. on ord. shs. at rate of 8 % (makg. 11 % for year) recommended. Electy. sold, 374 910 784 kWh, agst. 323 462 637. Consumers increased by over 40 000, makg. a total of over 162 000. Applicatn. has been made to the Commissioners for consent to extend Barking power house.

Company Meetings.

PINCHIN, JOHNSON AND CO., LTD.—At the recent general meeting, Mr. Edward Robson, chairman, moved the adoption of the directors' report and the declaration of a final dividend on the ordinary shares for the year 1929 of 20%, less tax, making 30%, less tax, for the year. He said while the company's total assets amounted to some £3 520 000, no less than £2 700 000 was represented by liquid, or easily realisable assets. Reserves and carry forward at January 1st amounted to £1 002 859. The report and accounts were adopted, and a resolution was passed authorising the capitalisation of £143 953 from the reserve and its application in paying up in full 287 906 ordinary shares, to be allotted to the ordinary shareholders in proportion to the number of such shares held by them.

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PARA ELECTRIC RAILWAYS AND LIGHTING CO., LTD.—Sir Francis M. Voules, presiding at the meeting on Monday, said the gross earnings of the tramways department had increased from 4 827 contos in 1928 to 4 940 in 1929, and those of the light and power department from 2 341 to 2 417 contos. If the recommendation to pay a final six months' dividend at the rate of 6% per annum on the preference shares was approved, there would remain £3 604 to be carried forward. The Board had decided that additions to the generating plant be provided. By the installation of two turbo-generators of 1 500 kW each they hoped to be in a position, in about a year, to satisfy any demand for some time to come, and to realise substantial economies. To provide for the expenditure, which would amount to about £30 000, the directors proposed setting aside from month to month sufficient portions of the ordinary revenue to meet payments for this power plant extension as and when due. The report was adopted, and the appointment of a committee of shareholders to co-operate with the Board in a scheme of capital reorganisation was approved.

BAIRD TELEVISION DEVELOPMENT AND BAIRD INTERNATIONAL TELEPHONE COMPANIES.—A scheme of amalgamation of interests was considered at a series of meetings of shareholders of these companies on Monday. Sir Edward Manville, chairman, said since the last annual meeting the energies of the companies had been chiefly concentrated on the perfection of television. They started regular vision transmission on September 30th last. The chairman explained the capitalisation proposed for the new company and the contemplated allocation of the shares respectively to the shareholders of the combining companies. The fusion of interests, he said, automatically gave the shareholders of the Development company a proportional use of the cash resources of the International company, and the "B" shareholders were to relinquish their rights of control. It was stated that the result of the voting would be announced later. At an extraordinary meeting of Baird International Television, Ltd. (presided over by Lord Ampthill), and also at a meeting of the holders of "A" shares, the scheme was approved. The adjourned annual general meeting followed, at which the report and accounts were adopted.

CLYDE VALLEY ELECTRICAL POWER CO., LTD.—At the meeting on April 2nd, Mr. Charles Ker (who presided in the absence of Sir Frederick C. Gardiner, chairman) said receipts from the sale of current had increased by approximately £43 000. Rates and taxes were equivalent to over 11% of the receipts. The net result was a profit of £355 000, an increase of £50 000. The output for the year, 258 000 000 kWh, was 18 000 000 kWh higher than for 1928, and additional connections to mains were 25 110 H.P., 9·38% increase. So far this year the output showed an increase of 8% over the corresponding period of 1929. The average rate per kWh sold last year was 0·736d., and the combined average received by the company and its subsidiaries 0·811d. The 20 000 kW, 50 cycle turbo alternator had been installed at Yoker power station, and had delivered power to the Central Scotland "grid" lines and to consumers since September. It was hoped to complete the standardisation of frequency in the whole of the company's area by the autumn of 1932. The estimated total cost was about £2 500 000. Another 20 000 kW turbo-alternator was due to be put in commission for the coming winter. The report and accounts were adopted.

LLANELLY AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Mr. M. A. Edwards, presiding at the meeting last week, said the conditions during the past year had not been inducive to industrial activity. In spite of this, 608 new consumers were added and 23 675 600 kWh sold, compared with 21 843 400. This increase was due largely to the growth of domestic consumption. A new super station for South Wales was contemplated in connection with the South West England and South Wales scheme, but its locality was not yet indicated. Their company had the rights to the best site available for the purpose. Negotiations of considerable importance had been conducted for several months which might result in considerably changing the scope and ramifications of the business. The company's Bill in Parliament under which it sought authority to run trolley vehicles and omnibuses in the place of, and in extension of, the light railways was proceeding normally. The first two months' trading this year showed a satisfactory increase over the corresponding period of last year. In the course of discussion it was suggested that a larger dividend than 2½% might be paid on the ordinary shares. The board's proposal to pay 2½% was, however, unanimously adopted.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Sir Alexander Roger, addressing the meeting on March 31st, said the gross operating revenue, £189 437, showed an increase of £19 418. Expenses, including £30 000 for plant depreciation, increased by £6 749, giving a gross profit of £71 287, compared with £58 618. Net profit was £50 941, an increase of £8 054. A final dividend of 5%, less tax, on the ordinary shares was recommended, making 8% for the year. To provide for the further expansion of the systems in Lisbon and Oporto, the company had expended additional large sums on capital account. The tariff rates which came into force on September 1st, 1928, had been a stimulus to new business. The basis of the tariff for all new subscribers consisted of an annuity which included a number of free calls, all calls above the number of free calls being paid extra for by the user. During the year 3 665 stations were added, approximately 16% above the total at the end of 1928. The rate of progress in England was less than 10%. The number of stations at the end of 1919 was approximately 13 000, whereas at the close of 1929 it was 26 681. The company had embarked upon a particularly heavy capital programme for 1930, involving over £200 000. It would be necessary soon to raise fresh capital. Summing up the past year, he thought there was every reason to be gratified at the results, and that the company might look forward to the future with equanimity. The report and accounts were adopted and the dividends approved.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—Mr. F. G. Kellaway, presiding at the meeting last week, said from the 1928 accounts, the amount brought forward was £36 689, from which was to be deducted the £1 500 additional remuneration voted to the directors at the last annual general meeting, leaving a net carry forward of £35 189. Adding to this the net profit for 1929, they arrived at a total of £238 300, of which £59 636 was distributed as an interim dividend on October 29th last. The directors recommended that there should be appropriated an amount sufficient to raise the general reserve account from £158,014 to £200 000, and that a final dividend for 1929 of 10% be paid, leaving a carry-forward of £17 405. There was a fair increase in the volume of business offering in 1929, and they had to face efficient competition. As a result of regulations passed at the Washington Convention of 1927, December 31st, 1929, saw the beginning of the end on board ship of spark transmitters of more than ¼ kW power. By the end of 1929 the company held maintenance and rental contracts in respect of 2 758 British ships, a large proportion of which carried direction-finders and auto-alarm apparatus in addition to the main installations. During 1929 the company created a new department, carrying the title "Marine Electrical Equipments," to deal with such matters as band repeaters, automatic telephones, broadcast reception on board ship, and sounding devices. They believed that the principles of Beam radiation which they were employing could give the shipowner the most satisfactory and economical form of sounding device. They had already rental and sales contracts in respect of over 70 marine wireless telephone equipments. Taking everything into account, the directors inclined to a feeling of restrained optimism for 1930.

New Companies.

ARROW ELECTRIC SWITCHES, LTD.—Cap., £2 000. Designers and manufacturers of and dealers in electrical wiring devices, switches, plugs, sockets, lampholders, etc. Solicitors: Ranger, Burton and Frost, 179, Queen Victoria Street, London, E.C.

HARLIE (EQUIPMENTS), LTD.—Cap., £100. Manufacturers and repairers of wireless apparatus, telegraphic and telephonic apparatus, electrical, magnetic and radioatic instruments, etc. Reg. Office: 5, Chiswick Road, Lower Edmonton, London, N.9.

RELIABLE BATTERY CO., LTD.—Cap., £1 000. Electricians, accumulator manufacturers, chargers, repairers and assemblers, manufacturers of wireless, telephone and telegraph apparatus and appliances, etc. Solicitors: Kerly, Sons and Karuth, 10 and 11, Austin Friars, London, E.C.2.

A. F. BULGIN AND CO., LTD.—Cap., £2 000. To acquire business of a merchant of radio wireless instruments, etc., carried on by A. F. Bulgin at 9, 10 and 11, Cursitor Street, Chancery Lane, London, W.C., as A. F. Bulgin and Co., and to carry on same and business of wireless engineers, manufacturers of telephones, X-ray and sound amplifying and reproducing instruments, etc. Solicitors: Rexworthy, Barnard and Bonser, 83, Cannon Street, London, E.C.4.

SENTINEL INSTRUMENTS, LTD.—Cap., £100. To acquire business of engineer and scientific instrument maker carried on by R. L. Granville-Johnston at Newcastle-upon-Tyne, and to carry on business of telephone, engineers, makers and repairers of and dealers in electrical and other fittings, telephones, indicators, fire alarms, lightning conductors, etc. Solicitors:—Hannay and Hannay, South Shields.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BIGGS, GEORGE AND SON, 5, Clayponds Lane, Brentford, wireless dealers. £27 6s. 1d. February 5th.

BRADFORD, Oliver Hubert, 2A, Hill Street, Griffithstown, wireless dealer. £11 14s. 6d. January 23rd.

BRADLEY, Mr. P. (trading as GRANTHAM ELECTRICAL CO.), 14, Grantham Avenue, Manchester Road, Warrington, electrical engineer. £24 10s. 11d. March 4th.

GRAY, H. C., AND SON, 6, Sutherland Avenue, Maida Hill, W., wireless dealers. £13 11s. 4d. January 21st.

JONES, Mr. A. S., 9, Newborough Street, Carnarvon, wireless dealer. £11 17s. 4d. February 20th.

ORMSKIRK WIRELESS CO., 44, Burscough Street, Ormskirk, dealers. £16 2s. 6d. February 25th.

Deed of Arrangement.

BULLOCK, Harold Alfred, Premier Buildings, Barbourne Road, Worcester, electrician. Dated March 26th, filed April 1st. Trustee, F. E. Bendall, 3, Warwick Passage, Birmingham. Secured creditors, £114; liabilities unsecured £3 139; assets, less secured claims, £1 111.

Receivership.

ELECTRICAL NAME AND NUMERICAL SIGN CO., LTD.—E. G. F. Cartwright, C.A., of 4, Heathcote Street, W.C.1, was appointed Receiver and Manager on March 19th, 1930, under powers contained in debenture dated January 22nd, 1913.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

ELECTRAMONIC CO., LTD., 1, Budge Row, E.C.4. The creditors were called together on April 2nd at the above address, when one of the directors, Mr. Gerrald-Nathan, stated that he was chairman of the committee of investigation which was elected at the last meeting of the shareholders. The present position was that there was a liability to the bank of £536, preferential creditors claimed £315, and there were creditors under £10 amounting to £397. The creditors over that amount were for £4 750, and in addition there were directors' fees of £957. The solicitors' costs were scheduled at £2 000, and there was money advanced to the company by Mr. Sayers of £3 985. The total assets were in the neighbourhood of £24 000 and it was proposed that a scheme of arrangement should be entered into with the creditors. The company proposed that all the creditors under £10 should be paid in full, and that creditors over that amount should receive 10s. in the £ in cash, and should take notes for the balance to be spread over a period of 24 months with an option to redeem at earlier dates if necessary. The Chairman added that all claims against the Celestion Company had been wiped out and there was a great hope of the company doing big business in the future. The creditors decided to accept the theme of arrangement, and it was intimated that the company would go into voluntary liquidation and a new company would be formed.

"M. P. A." WIRELESS, LTD., 62, Conduit Street, London, W.1. A largely attended meeting of the creditors of the above was held on April 4th at the Holborn Restaurant, London, W.C., when a statement of affairs was submitted as at January 8th last, which disclosed unsecured liabilities of £20 357, in addition to first mortgage debentures of £29 060, and £71 653 issued share capital. The assets, after allowing £1 041 for preferential claims, amounted to £8 002 10s. 6d., showing a deficiency of £21 058, as regards the debentures, and consequently there are no assets available for distribution amongst the creditors or shareholders. The assets include book debts £4 427, estimated to realise £3 000, and stock in trade £10 295, valued at £5 000. Mr. Hodgson, the chairman, said that the shareholders held a meeting the previous day, when resolutions were passed for voluntary liquidation. The Brookmans Park station had "hung fire," for quite a long time, and after the manufacturers had got ready for the season, there was a great dislocation not only for their company but for many other firms in the trade. It affected them very severely. They had also been planning to resell the company to a larger concern. The outside capital which had been brought into the company was less than £30,000. The rest of the capital had been provided by Mr. Hodgson and a few friends. The creditors might ask what the directors had got out of the business, but he could assure them that they had received no benefits whatever, with the exception of three of the creditors who were working their whole time and their salaries had been small. For himself, he had received nothing in any shape or form, but, on the other hand, he had backed the company with thousands of pounds of his own money. After some discussion it was decided to appoint Mr. James Ure, the receiver for the debenture holders, as liquidator of the company.

London Gazette, etc.

Companies Winding-up Voluntarily.

KNIGHTON ELECTRIC SUPPLY CO., LTD. By special resolutions, March 31st. W. Lloyd, A.S.A.A., of Priory Street, Dudley, incorporated accountant, and P. Parker, of Council Offices, Knighton, solicitor, appointed as liquidators.

STRATFORD AUTO AND WIRELESS CO., LTD. By resolution, March 18th. E. H. Hawkins, incorporated accountant, 4, Charterhouse Square, London, E.C.1, nominated as liquidator.

Bankruptcy Information.

LAYTON, H. B., 35-39, Maddox Street, London. Receiving order, April 2nd. Creditor's petition. First meeting, April 16th, 11 a.m., and public examination, May 30th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

MELVILLE, Ernest James, lately trading as JAMES MELVILLE AND CO., Dudley Chambers, Angel Row, Nottingham, electrical contractor. First meeting, April 15, 11 a.m., Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. Public examination, May 1st, 10 a.m., County Court House, St. Peter's Gate, Nottingham.

Notice of Intended Dividend.

AUSTIN, Clifford, 97, Domestic Street, Leeds, trading as C. AUSTIN AND SON and AUSTINS ACCUMULATOR AND RADIO SERVICE, wireless accessories dealer. Last day for receiving proofs, April 26th. Trustee, H. C. Bowling, 24, Lower Bond Street, Leeds, Official Receiver.

Partnerships Dissolved.

DRIVER AND PETERSON (Thomas Lashlie PETERSON and Shiavux Cawasji DRIVER), plumbers, heating, sanitary and electrical contractors, 398, Stanhope Road, Back Westoe Parade and Albany Street, South Shields, Durham, by mutual consent, as from June 21st, 1929.

TAYLOR AND EDMONDS (John Robert TAYLOR and Frank EDMONDS), wireless dealers, 17, Abbey Street, Accrington, as from March 8th, 1930, by mutual consent. Debts received and paid by F. Edmonds, who will continue the business.

TURNER AND BOOTH (Ernest TURNER and William BOOTH, electrical engineers, 51, Church Street, Radcliffe, Lancashire, as from March 31st, 1930, so far as concerns W. Booth, who retires from the firm. Debts received and paid by E. Turner.

METAL AND CHEMICAL PRICES.

		Price.	Tuesday, April 8th Inc.	Dec.
Copper—				
Best Selected	per ton	£74 15 0	—	15s. 0d.
Electro Wirebars	,,	£83 15 0	—	10s. 0d.
H.C. Wire, basis	per lb.	11 1/16d.	—	1/32d.
Sheet	,,	11 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2 5/16d.	—	1/32d.
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10 3/8d.	—	—
Wire ,,	,,	10 5/16d.	—	1/16d.
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 15 0	—	15s. 0d.
Foreign or Colonial	,,	£18 5 0	—	12s. 6d.
Tin—				
Ingot	per ton	£162 7 6	—	£8 7s. 6d.
Wire, basis	per lb.	2s. 2 1/4d.	—	1 1/4d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£18 5 0	—	5s. 0d.
Mercury	per bottle	£22 15 0	—	—

Sulphur—Flowers, Ton £12 0 0; Roll, ,, £10 10 0. *Copper Sulphate* .. Ton £25 to £25 10s. *Boric Acid* (Crystals) ,, £32 0 0. *Sulphuric Acid* (168° Tw.) Ton £6 15 0. *Sodium Chlorate*—per lb., 2 1/2d. *Sodium Bichromate*—Per lb., 3 1/2d.

Rubber—Para fine, 8 1/4d.; plantation, 1st latex, 7 7/8d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

A quiet tone was seen last week, and according to James Forster and Co. prices had a sagging tendency and closed at the lowest. The American price is unchanged at 5·75 cents. per lb. Closing prices on April 4th were £18 11s. 3d. for April, £18 12s. 6d. for May and June, and £18 13s. 9d. for July, 5s. to 2s. 6d. per ton lower on the week.

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EXPIRING PATENTS.

BELOW is a further list of patents of interest to electrical engineers and which, unless extended, expire during 1930 :—

No.	Date (1914).	Name of Patentee.	Subject of Patent.
14 817	June 20 ..	British Insulated and Helsby Cables, Bayles and Higham.	Electrical condensers.
15 194	June 24 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electric meters.
15 329	June 26 ..	Siemens Bros. and Co., and Marechal.	Metal filament lamps.
15 585	June 29 ..	Parsons	Dynamo-electric machinery.
15 788	July 1 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electrical vacuum discharge devices.
15 868	July 2 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electric meters.
16 619	July 11 ..	Betulander and Palmoren	Selectors for automatic telephone systems.
16 869	July 15 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electric meters.
16 986	July 17 ..	Parsons	Dynamo-electric machinery.
17 317	July 21 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electrical measuring instruments.
17 426	July 22 ..	Evans (Elektrochemische Werke G.m.b.H., Germany).	Producing flows in molten masses of electrical furnaces.
18 443	Aug. 8 ..	Thompson	Actuating signals on and communicating with trains.
18 497	Aug. 10 ..	British Thomson-Houston Co., Young and Watson.	Relays for voltage regulators.
18 758	Aug. 17 ..	Peckham, Thomas and Andrews.	Suspension of trucks of tramway vehicles, etc.
18 761	Aug. 17 ..	Woodhouse, and Callender's Cable and Construction Co.	Cable terminal boxes.
18 809	Aug. 18 ..	Mellersh-Jackson (S. I. Posen, U.S.).	Pocket flash lights.
19 057	Aug. 25 ..	British Thomson-Houston Co. (General Electric Co., New York).	Speed controlling device for motors.
19 237	Aug. 29 ..	Marks (Morkrum Co., U.S.)	Mechanism for printing telegraph systems.
19 882	Sept. 17 .	Beaver and Claremont ..	Electric cable.
20 176	Sept. 25 ..	Knipe and Read	Electric welding, and article produced thereby.
20 196	Sept. 25 ..	Railway Signal Co., and Roberts.	Locking mechanism for use with railway signals, etc.
20 549	Oct. 5 ..	Beaver and Claremont ..	High voltage insulated cable.
20 557	Oct. 5 ..	British Thomson-Houston Co. (General Electric Co., New York).	Electric transmission systems.
20 805	Oct. 10 ..	Clarke, and Chadburns (Ship) Telegraph Co.	Ship's telegraphic apparatus.
20 908	Oct. 13 ..	Thompson (Soc. Anon. des Telegraphes Ed. Belin, France).	Arrangements for synchronising apparatus having similar periodic movements.
21 388	Oct. 22 ..	British Thomson-Houston Co. (General Electric Co., New York).	Wireless signalling systems.
21 794	Oct. 30 ..	Siemens Bros. and Co. (Siemens and Halske A.G., Germany).	Circuit arrangements for telephone installations.
21 825	Oct. 31 ..	British Thomson-Houston Co. (General Electric Co., New York).	Dynamo-electric machines.
21 906	Nov. 3 ..	W. A. S. Benson and Co., and Ellwood.	Reversible connector for electrical apparatus.
22 062	Nov. 5 ..	Smyth	Electric generators for lighting mechanically propelled vehicles.
22 383	Nov. 11 ..	Kuyser	Dynamo-electric machines.
22 437	Nov. 12 ..	Gimingham	Arc incandescent lamps.
22 897	Nov. 23 ..	Anderson and Atchley (F. G. Warburton, Canada).	System of control for maintaining relative speeds of a number of electric motors.
22 940	Nov. 23 ..	Fessenden	Measurement by the use of sound waves.
23 122	Nov. 26 ..	British Thomson-Houston Co. (General Electric Co., New York).	Vapour electric devices.

GOVERNMENT PUBLICATIONS.

The following publications have been issued and can be obtained at H.M Stationery Office, London, etc. (The titles of the publications are given in the order in which they were issued) :—

Mines Department.—New edition of Handbook of Explanatory Notes by H.M. Electrical Inspector of Mines on the General Regulations Governing the Installation and Use of Electricity at Mines. 6d.

Ministry of Transport.—Electricity Commission : Rural Electrification. Description of Bedford Demonstration Scheme. 6d.

Ministry of Transport.—Electricity (Supply) Acts, 1882 to 1928 :—Draft Special Orders, 1930. West Lancashire Rural, 9d. Haverfordwest Rural, 9d. Ipswich (Extension), 1s. Swindon (Extension), 6d. Hythe, 6d. Exmouth, 4d.

War Office.—Government Department Electrical Specifications. No. 1, 1929, Electric Cables, J, K and L. Classes (Rubber Covered for Electric Power and Light.) 6d.

Statutory Rules and Orders, 1930 : Tramway. Increase of Charges, Bristol Tramways (Temporary Increase of Charges) Order. 1d.

General Post Office : Engineering Department : Technical Instructions : XXV. Automatic Telephone Exchange Systems : Part 8. P.B.X. Final Selectors—Diagrams, January, 1930. 1s.

Statutory Rules and Orders, 1930 : Electricity, Applications for Special Orders, etc. Electricity Commissioners Special Orders, etc. ; Rules, dated Feb. 19, 1930, 4d.

Ministry of Transport : Certified Electricity Supply Special Orders, 1929 : Hornsea and Skirlaugh District, 9d. Pontardawe Rural District, 1s. Torquay (Extension, etc.), 6d. Great Yarmouth (Extension), 6d.

General Post Office—Engineering Department : Technical Instructions : XXV. Automatic Telephone Exchange Systems : Part 4, the Non-Director System (Letterpress), 6s. Diagrams, 6d.

Ministry of Transport.—Light Railways Acts, 1896 and 1912. Railways Act, 1921 : Report of Proceedings of Ministry of Transport up to December 31, 1929. 6d.

Mines Department : Daily Log Book required to be kept at mines where electricity is used ; alternative edition ; with double space for reporting (M. and Q. Form 10A). 2s. 6d.

Wireless Telephony Committee. Copy of Correspondence between the Secretary, Cabinet Committee on Overseas Wireless Telephony, and Dr. F. E. Smith, Prof. G. W. O. Howe. 3d.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

322 882 Albion Clay Co., Ltd., and R. Lawton. Electrical conduits and means of manufacture of same. (29/11/28.)
322 884 D. S. Burleigh. Electric drives for gramophones. (30/11/28.)
322 888 G. A. Betulander. Arrangement in cross-bar switches. (6/12/28.)
322 891 Pirelli General Cable Works, Ltd., and J. R. Harding. Means for supporting overhead electric lines or conductors. (10/12/28.)
322 892 W. Row. Electric dimmer switches. (10/12/28.)
322 897 C. G. M. Bennett and C. A. Ely. Electric incandescent lamp holders. (13/12/28.)
302 294 Sprague Specialities Co. Electrical condensers. (13/12/27.)
302 589 Telefonaktiebolaget L. M. Ericsson. Circuit arrangements for the generation of simple harmonic oscillations. (17/12/27.)
322 907 E. J. Lever (Trix), Ltd., and D. A. Lyons. Portable wireless receiving sets. (19/12/28.)
322 920 A. W. G. Tucker and Ferranti, Ltd. Oil-filled electric transformers. (3/1/29.)
322 933 F. Mousley. Methods of constructing and carrying antiseptic or perfumed appliances for use in telephones or speaking apparatus. (18/1/29.)
305 102 British Thomson-Houston Co., Ltd. Electromagnetic separation of complex ores. (30/1/28.)
322 944 Switchgear and Cowans, Ltd., and G. H. Neep. Electric switchgear. (2/1/29.)
322 946 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Transformers. (4/2/29.)
306 944 General Railway Signal Co. Train dispatching systems. (28/2/28.)
306 538 Telefunken Ges. fur Drahtlose Telegraphie. Aerial systems for wireless signalling. (24/2/28.)
322 966 G. Ellison and J. Anderson. Alternating electric current interrupters. (4/3/29.)
307 424 C. J. R. H. Von Wedel. Electric discharge tubes. (7/3/28.)
322 975 L. W. Wild and Wild-Barfield Electric Furnaces, Ltd. Electric furnaces. (20/3/29.)
309 138 Associated Electrical Industries, Ltd. Deoxidising apparatus for use with oil-immersed electrical apparatus. (5/4/28.)
309 550 British Thomson-Houston Co., Ltd. Electrically wound clocks. (12/4/28.)
322 822 J. L. Baird and Television, Ltd. Television apparatus and the like. (11/7/28.)
322 823 J. L. Baird and Television, Ltd. Television apparatus and the like. (11/7/28.)
314 759 J. Dieux. Electromagnetic pick-ups for disc gramophone or like records. (10/5/28.)
322 775 J. E. Pollak (Ganz-Fele Villamossagi Reszvenytarsasag). Apparatus for regulating voltage in alternating current distribution systems. (1/6/28.)
322 825 S. O. Bowker. Electric junction boxes. (12/9/28.)
323,032 A. Rosenberg. Lamps and therapeutical buildings and structures for use in ultra-violet ray therapy. (17/8/28.)
306 521 M. I. Pupin. Artificial lines for telegraphy and like purposes. (24/2/28.)
323 022 C. E. Foster and H. C. Oughton. Sensitive electrical regulating, indicating, or recording devices. (7/9/28.)
323 034 S. O. Bowker. Electric junction boxes. (12/9/28.)
323 037 Standard Telephones and Cables, Ltd., and A. D. Blumlein. Alternating-current bridge circuits. (13/9/28.)
323 038 Standard Telephones and Cables, Ltd., and M. C. Field. Dielectric material for submarine cables. (14/9/28.)
298 630 Eisenwerk Weserhutte Akt.-Ges. Method and machine for laying cable. (14/10/27.)
323 014 W. E. Beatty (Bell Telephone Laboratories, Inc.). Volume control for sound recording and reproducing. (17/9/28.)
322 995 S. Z. de Ferranti and Ferranti, Ltd. Magnetic suspension devices. (15/6/28.)
322 996 S. Z. de Ferranti and Ferranti, Ltd. Electromagneto. (15/6/28.)
292 979 Ganz-Fele Villamossage Reszvenytarsasag. Alternating current supply systems. (28/6/27.)
297 328 Suddeutsche Telefonapparate-Kabel-Und Drahtwerke Akt.-Ges. and K. Kohl. Generation of electric oscillations. (17/9/27.)
297 427 Associated Telephone and Telegraph Co. Telephone systems. (21/9/27.)
323 017 B. B. Fenn. Incandescent electric lamps. (18/9/28.) (Cognate Applications, 29461/28 and 34789/28.)
297 462 British Thomson-Houston Co., Ltd. Electromagnetic compasses of the earth-inductor type. (22/9/27.)
323 041 F. A. Lindemann. Apparatus for producing electric current corresponding to light incident thereon. (19/9/28.)
323 027 A. Graham and Co., Ltd., W. J. Rickets, and W. Stott. Telephonic systems. (19/9/28.) (Cognate Application, 14342/29.)
323 043 W. E. Beatty. (Bell Telephone Laboratories, Inc.) Sound recording or reproducing devices. (20/9/28.)
323 044 A. Egger. Apparatus for connecting instruments, meters, and the like to alternating-current systems carrying heavy currents. (20/9/28.)
297 682 Electrical Research Products, Inc. Manufacture of loaded conductors. (24/9/27.)
323 049 L. Burn. Ovens and hoods of electric, gas, and oil cookers. (24/9/28.)
322 999 C. J. Owen and Automatic Coil Winder and Electrical Equipment Co., Ltd. Coil winding machines, etc. (12/7/28.)
294 114 Telefunken Ges. fur Drahtlose Telegraphie. Apparatus for denoting and ascertaining position, type, etc., of ships. (15/7/27.)
311 755 Soc. Des Ateliers De Montage et D'Ebenisterie. Thermionic valve amplifiers. (16/5/28.)
289 157 A. Soulier. Means or systems permitting of the transformation of a distribution at variable electric tension into a distribution at constant tension. (4/10/27.)
323 071 D. Danielsson, and Allmannasvenska Elektriska Aktiebolaget. High-tension switch-fuses. (23/10/28.)
323 077 Holophane, Ltd., and H. S. Allpress. Spot-light projectors. (27/10/27).
323 079 J. B. Meiklejohn, and J. B. Meiklejohn, Ltd. Insulating switches. (31/10/28.)
323 090 Burovox, Ltd., and J. K. Haynes. Telephone systems. (15/11/28.)
301 431 British Thomson-Houston Co., Ltd. Furnaces. (29/11/27.)
323 098 F. Warburton. Telegraph printers. (30/11/28.)
301 914 Westinghouse Brake and Saxby Signal Co., Ltd. Railway traffic controlling apparatus. (8/12/27.)
307 008 Luth and Rosens Elektriska Aktiebolag. Electric driving arrangements. (1/3/28.)
323 108 Wilkins and Wright, Ltd., and J. H. Hewitt. Mechanism for rotating the spindles of electric condensers or other instruments. (19/12/28.)
323 109 J. W. Record and Record Electrical Co., Ltd. Means for retarding the action of electrical apparatus. (19/12/28.)
323 119 H. H. Berry. Electric imitation fires. (1/1/29.)
323 123 A. W. G. Tucker and Ferranti, Ltd. Alternating-current load-transferring switches. (3/1/29.)
323 124 S. G. S. Dicker (N. V. Philips' Gloeilampenfabriken.) Transformers. (7/1/29.)
304 287 O. Ekman (trading as Nordisk Elektricitets Selskab, J. P. Jakobsen, O. Ekman.) Lamp shades. (18/1/28.)
323 131 Baron Marks (A.C. Spark Plug Co.). Magnetic speedometer. (21/1/29.)
323 136 M. H. Goldstone. Insulated electric lamp-holders. (26/1/29.)

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305 538 A. Daniker. Quick-acting thermal electric switches. (6/2/28.)
306 091 C. Lorenz Akt.-Ges. Apparatus for picture telegraphy. (15/2/28).
307 059 Telefunken Ges fur Drahtlose Telegraphie. Aerials. (3/3/28.)
323 158 L. T. Dixon and W. J. Silvester. Electric lamp-holders for vehicles. (1/3/29.)
309 079 International General Electric Co., Inc. Process for the manufacture of electrical condensers. (4/4/28.)
323 168 F. A. Schroeder. Electrostatic telephones. (8/4/29.)
309 494 Osnabrucker Kupfer-und Drahtwerk. Apparatus for the crossing of quadruple-core cables during stranding. (11/4/28.)
309 506 International General Electric Co., Inc. Manufacture of electrically insulating materials. (11/4/28.)
309 917 K. Lenzkes. Device for stopping electrically-driven looms by a weft-guard. (17/4/28.)
310 806 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Cathode-ray sterilisation. (30/4/28.)
315 351 Akt.-Ges der Maschinenfabriken Escher, Wyss, et Cie. Steam or gas turbines. (12/7/28.)
315 864 Electrolux, Ltd. Nozzles for suction cleaners. (21/7/28.)
315 725 International General Electric Co., Inc. Multiple-stage rotary compressors. (16/7/28.)

Applications for Patents.

November 27th.

36 315 Akt.-Ges. Brown, Boveri et Cie. Trolley wire support for electric railways. (27/5/29, Germany.)
36 283 British Electrical and Allied Industries Research Association and P. D. Morgan. Fusible cut-outs.
36 305 S. Darby, W. B. Lancaster, T. E. Riddle and M. H. Weston. Devices for protecting ends of electric cables.
36 394 W. H. Dearden, G. Lawton, and Standard Telephones and Cables, Ltd. Manufacture of loading material for cells.
36 395 W. H. Dearden, G. Lawton, and Standard Telephones and Cables, Ltd Magnetic materials and loading.
36 405 Dubilier Condenser Co. (1925), Ltd. Radio receiver, etc. (27/11/28 Germany.)
36 365 Electrical Research Products, Inc. Transmission systems. (27/11/28 U.S.)
36 331 E. A. Forceville, and Siemens Bros. and Co., Ltd. Electromagnetic systems.
36 310 C. C. Garrard, General Electric Co., Ltd., and F. J. Keeley. Oil-immersed electrical apparatus.
36 312 C. C. Garrard, General Electric Co., Ltd., and F. B. Willis. Electrical apparatus responsive to synchronisation of alternating voltages.
36 309 General Electric Co., Ltd. Manufacture of incandescent lamps. (30/11/28, Germany.)
36 398 L. B. Haigh, Standard Telephones and Cables, Ltd., and E. P. G. Wright. Semi-automatic telephone exchange systems.
36 323 W. T. Henley's Telegraph Works Co., Ltd., E. Moor, and H. S. Wheeler. Electric switch mechanisms.
36 322 Igranic Electric Co., Ltd., and H. S. Payman. Variable resistance devices.
36 385 B. Krol, and Mullard Radio Valve Co., Ltd. Thermionic valves, etc.
36 291 H. G. Nicholson. Static transformers.
36 329, 36 330 C. L. Peters, and Siemens Bros. and Co., Ltd. Automatic telephone systems.
36 396 E. K. Sandeman and Standard Telephones and Cables, Ltd. Distributor for use in telegraphy, etc.
36 386 L. Silberstein. Manufacture of electric resistances. (18/12/28, Germany.)
36 397 Standard Telephones and Cables, Ltd. (L. J. J. Schreiber and K. M. Sano). Step-by-step selectors for telephone systems, etc.
36 356 Westinghouse Brake and Saxby Signal Co., Ltd. Operating railway signals. (15/2/29, India.)

November 28th.

36 485 Associated Electrical Industries, Ltd. Ventilation of electrical machines. (7/12/28, U.S.)
36 479 British Thomson-Houston Co., Ltd. Transformers. (28/11/28, U.S.)
36 480 British Thomson-Houston Co., Ltd. Synchronous motor drives. (28/11/28, U.S.)
36 481 British Thomson-Houston Co., Ltd. Leads for incandescent lamps, etc. (30/11/28, U.S.)
36 541 A. W. Coker and R. H. Wadeson. Electric fires, etc.
36 425 S. O. Cowper-Coles. Electrodeposition of metals.
36 426 S. O. Cowper-Coles. Electroplating.
36 543, 36 544 C. R. Cook. Electric couplings, etc.
36 521 W. S. Eaton. Electrical commutators. (28/11[28, U.S.)
36 433 A. J. Fyfe. Fixing flat electric cables into junction boxes, etc.
36 565 Gramophone Co., Ltd., and A. G. D. West. Adjusting means for rotatably mounted electrical components.
36 564 E. V. Mackintosh. Electromagnetic vibratory devices.
36 503 J. M. Ortega. Devices for use with thermionic valves.
36 536, 36 537 J. Robinson. Wireless receiving systems.
36 538 J. Robinson. High frequency electrical apparatus.
36 539 J. Robinson. Wireless receiving apparatus.
36 469 Standard Telephones and Cables, Ltd. (Bell Telephone Manufacturing Co., Inc.) Telephone switchboards.
36 462 W. W. Triggs (National Carbon Co.). Galvanic cells.
36 546 W. W. Triggs (Weston Electrical Instrument Corporation). Electric cell.
36 418 A. E. Watson. Plugs for electric switches, etc.
36 460 Western Union Telegraph Co. Synchronous telegraph system. (5/11/29. U.S.)

November 29th.

36 680 Benjamin Electric, Ltd. Holders for thermionic valves. (30/11/28, U.S.)
36 675 W. Binder. Television, etc. (29/11/29, Hungary.)
36 590 G. G. Blake. Electrotherapeutic electrodes.
36 619 British Power Railway Signal Co., Ltd., Park Royal Engineering Co., Ltd., and C. W. Somersgale. Electric lighting systems for vehicles, etc.
36 656 British Thomson-Houston Co., Ltd., C. J. Morton and L. Griffith. Ignition devices for engines.
36 657 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Electric arc rectifiers.
36 673 M. W. Clarke and Spencer (Melksham), Ltd. Magnetic separators.
36 635 C. Contal and E. Davidson. Rheostats, etc. (3/12/28, France.)
36 720 A. F. Cornock and General Electric Co., Ltd. Holders for thermionic valves, etc.
36 585 J. A. Crabtree. Manufacture of covers for electric switches, etc.
36 692 R. E. Ellis (Adams Sibley Development Corporation). Electric motors.
36 718 General Electric Co., Ltd., and N. F. T. Saunders. Alternating current motors.
36 579 R. M. Hamilton. Totalisators, etc.
36 703 W. O. Hayne and Plessey Co., Ltd. Variable condensers.
36 648 Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). Circuit controllers for lifting magnets, etc.
36 626, 36 627 Lodge-Cottrell, Ltd., and L. Lodge. Apparatus for electrical precipitation of solid, etc., particles from gases.
36 674 A. W. Roschdestwin. Electric signal transmitter.
36 649 Soc. des Etablissements Pericaud. Devices for supplying radio apparatus from mains. (30/11/28, France.)
36 618 C. P. Stanworth. Electrically controlled apparatus.
36 643 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Machines for pre-shaping tapes for application of cores.
36 644 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Annealing continuously loaded submarine cables.
36 645 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Manufacture of magnetic materials.

November 30th.

36 803 Associated Electrical Industries, Ltd., and I. N. Whitesmith Manufacture of electrical coils.
36 772 Automatic Telephone Manufacturing Co., Ltd., and P. N. Roseby. Magnetic cores for loading coils, etc.
36 758 D. F. Cautley. Light sensitive cells.
36 747 A. O. Hinchliff, Watliff Co., and S. J. Watson. Electrical commutators.
36 507 International General Electric Co., Inc. Transformers. (30/11/28, Germany.)
36 762 G. E. Marr. Electric switches.
36 782 J. N. Morris and M. D. Scott. Electric pumps.
36 779 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Apparatus for generating Röntgen rays. (4/1/29, Germany.)

December 2nd.

36 923 J. L. Baird and Television, Ltd. Television, etc., apparatus.
36 835 A. S. Bean, J. Brown and Technico Electrical Co. Illuminating apparatus fittings.
36 836 A. S. Bean, J. Brown and Technico Electrical Co. Electric shades, etc.
36 840 R. W. Biles and A. Reyrolle and Co., Ltd. Electric fuses.
36 819 G. G. Blake. Electric switches.
36 865 T. E. Bradford. Cut-outs.
36 860 British Electrical and Allied Industries Research Association and E. B. Wedmore. Circuit breakers.
36 867 British Thomson Houston Co., Ltd. Current transformers. (1/12/28, U.S.)
36 869 British Thomson-Houston Co., Ltd. Electron discharge devices. (15/12/28, U.S.)
36 870 British Thomson-Houston Co., Ltd., and H. C. Wheat. Electric lighting fixtures.
36 918 W. J. Brown and Gramophone Co., Ltd. Wireless receivers.
36 837 A. Campbell. Alternating current potentiometers.
36 852 F. D. Carrington and Carrington Mfg. Co., Ltd. Cabinets for wireless sets.
36 907 Electric Scaling Hammers, Ltd., and A. E. Hernandez. Scaling tools.
36 908 Electric Scaling Hammers, Ltd., and A. E. Hernandez. Scraping tools.
36 909 Electric Scaling Hammers, Ltd., and A. E. Hernandez. Shaft couplings.
36 910 Electric Scaling Hammers, Ltd., and A. E. Hernandez. Electric motors.
36 919 Gramophone Co., Ltd. Electrical connecting devices.
36 901 Hecla Electrics Pty., Ltd. Vessels equipped with electric immersion heaters.
36 887 W. Kaatzer. Telephone transmission.
36 896 C. D. Lightfoot. Electric heating or cooking apparatus.
36 897 C. D. Lightfoot. Wireless receivers, etc.
36 898 C. D. Lightfoot. Electric switches.
36 832 L. M. McLeod. Electric water heaters.
36 931 Marconi's Wireless Telegraph Co., Ltd. Synchronising systems for television, etc. (30/11/28, U.S.)
36 927 Siemens and Halske Akt.-Ges. High vacuum discharge vessels. (3/12/28, Germany.)
36 932 Telefunken Ges. für Drahtlose Telegraphie. Aerial arrangements. (19/2/29, Germany).
36 893 Westinghouse Brake and Saxby Signal Co., Ltd. Multiple control apparatus. (3/12/28, U.S.)

COMING EVENTS.

Friday, April 11th (To-day).

Physical Society.—Imperial College of Science and Technology, Imperial Institute Road, London, W. Fifteenth Guthrie Lecture, by Prof. P. Debye, on "The Scattering of X-rays in Gases in Relation to Molecular Structure." 5 *p.m.*
Institution of Electrical Engineers (London Students' Section).—Savoy Place, Victoria Embankment, London. Address by Col. Sir T. F. Purves. 6.15 *p.m.*
Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-upon-Tyne. Annual general meeting. 7.15 *p.m.*

Saturday, April 12th.

Institution of Electrical Engineers (London Students' Section).—Visit to the Deptford Power Station of the London Power Co. 2.30 *p.m.*
Association of Mining Electrical Engineers.—South Wales Institute of Engineers. Paper by Mr. S. T. Richards on "Some Considerations Governing Power Costs at Collieries." 6 *p.m.*

Monday, April 14th.

Institution of Electrical Engineers (Western Centre).—Town Hall, Cheltenham. Paper by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by Means of Thermal Storage." 6 *p.m.*
Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting.
Electrical Contractors' Association (Hastings Branch).—Lewcock's Restaurant. Ordinary meeting.
Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Telephone Exchange Practice in Germany and Scandinavia." (Opened by Mr. A. B. Eason.) 7 *p.m.*
Institution of Electrical Engineers (Mersey and North Wales Branch).—The University, Liverpool. Annual general meeting. 7 *p.m.*
Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Annual general meeting. 7 *p.m.*
Institution of Electrical Engineers (South Midland Centre).—The University, Birmingham. Paper by Messrs. H. A. Humphrey, D. M. Buist and J. W. Bansall on "The Imperial Chemical Industries Limited's Steam and Electric Power Plant at Billingham." Illustrated by a Cinematograph Film. 7 *p.m.*
Electrical Association for Women (Bristol and District Branch).—Rotary House, Colston Street. Lecture demonstration on stage lighting. 8 *p.m.*

Tuesday, April 15th.

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, King Street, Leeds. Annual general meeting. 7 *p.m.*
Association of Supervising Electrical Engineers.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. J. R. Harding on "Present-Day Practice in Overhead Line Construction." 7.15 *p.m.*

Wednesday, April 16th.

Electrical Contractors' Association (Sussex Branch).—Ordinary meeting.
Institution of Electrical Engineers (Sheffield Sub-Centre).—Royal Victoria Hotel. Paper by Mr. H. S. Carnegie on "The Selection of Electric Drive for Heavy Industrial Use." 7.30 *p.m.*

Thursday, April 17th.

Institution of Electrical Engineers (Hampshire Sub-Centre).—Municipal College, Portsmouth. Paper by Dr. C. V. Drysdale on "Alternating-Current Potentiometers and Their Applications." 7.30 *p.m.*

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THE ELECTRICIAN

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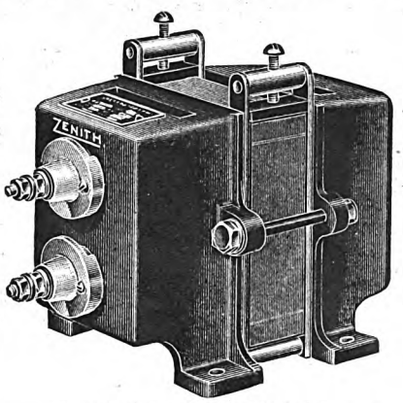

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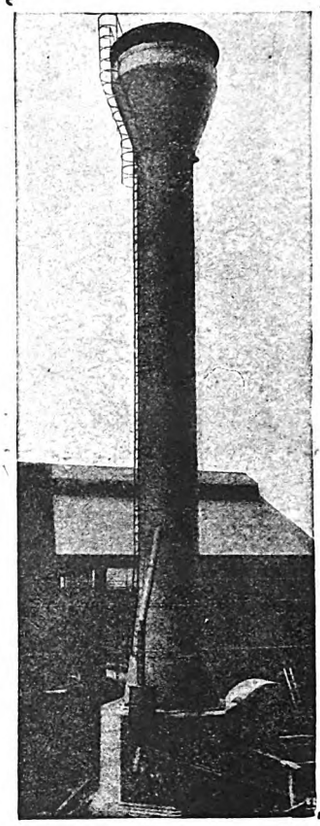

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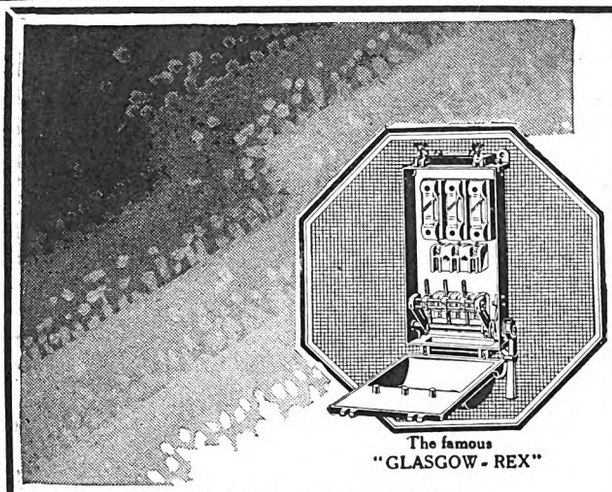

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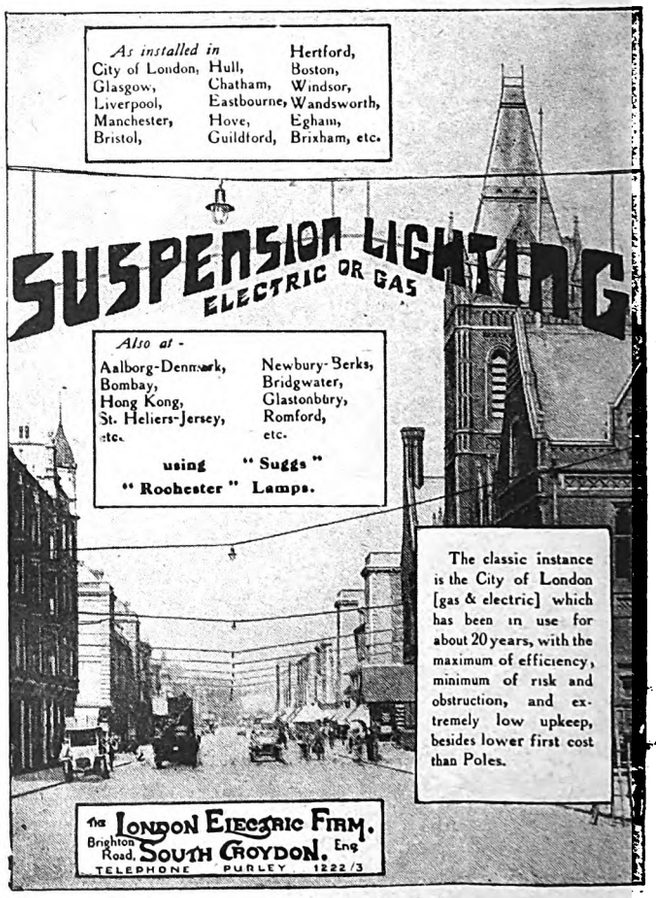

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THE ELECTRICIAN

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The Budget.

THERE may be sound Socialist strategy in the Budget, but if that be so, it is quite beyond my comprehension." These are the words of Mr. JAMES MAXTON, in an interview with the "Daily Herald," and they give the key to the Budget as a whole. The fact is that Mr. SNOWDEN has done no more and no less than any Chancellor in circumstances as they are to-day would have found it necessary to do. Those who see some hope in the national financial position, and think they know the way out of the present mass of difficulty, will, therefore, find little to worry about in Mr. SNOWDEN'S speech on Monday. Those, on the other hand, who regard an annual public expenditure of £1 400 000 000 of rates and taxes as a slow and steady process of national suicide, will be more despondent than ever at this, the twelfth post-war Budget, which takes us further than ever from sane ideas of economy. Such minor alterations in taxation as are actually made are, as might be expected, mostly in the wrong direction. Another £48 000 000 is to be extracted from estate duty, income tax and surtax, while at the same time three-quarters of the bearers of these imposts are to be charged rather less than before. This is the easy road. It is straightforward vote-catching. The bulk of the unthinking mass will applaud. Students of industry know all too well that the extra money will come straight out of the fund on which prosperity and employment depend. Mr. SNOWDEN'S clever bid for the support of the middle classes, his recognition of the growth of sentimental Socialism among them, is, perhaps, the most serious feature of the Budget as a whole. There are far too many people under the delusion that they are free from personal responsibility for public expenditure. Now, as the "Daily Herald" most significantly points out on its front page, the man earning £700 a year, with two children, will actually pay less in 1931-32 than he pays to-day. The demand note which he has just satisfied was for £30 2s. Next January he will be asked for £27 18s. 6d., and, it is to be assumed, will accordingly bless the Socialist Government. All of which helps to hide the fact that the huge burden of local and national public expense, now amounting to £4 10s. per week per family, is in itself the chief cause of the price level in this country, which enhances the cost of everything we buy and make, and ruins our position in the markets of the world.

The Budget wipes out the last remnants of the pretence at helping industry from the derating proposals of a year ago. The sum of £30 000 000 has been added to the Whitehall account on the supposition that there is some corresponding relief of local rates. Ratepayers do not share the enthusiasm of politicians in this matter. There has been in some cases a welcome readjustment by derating. In most cases, however, the benefits have been more than balanced by new assessments. These new assessments were put upon us accompanied by the most specific of political pledges that they were for purposes of rating, and had no connection with Schedule A. Mr. SNOWDEN now announces a new assessment for Schedule A which will, of course, be followed in a year or two by a corresponding levelling up of rating figures. Water companies here and there and certain electricity supply undertakings, in the respect of domestic two part tariff service charges, will profit by these devices, but in the end the rating burden will be heavier, notwithstanding the £30 000 000 addition to the national Budget. All these charges go straight into the costs of manufacture. The motor industry and the trades that are subject to the operation of Safeguarding Acts are granted some respite from disturbance of the present arrangements, though in the case of several of these trades the blow will fall this year. The building trade, however, just beginning to see signs of hope after years of political handicap, will despair at the thought that land taxes, which, when first introduced by Mr. LLOYD GEORGE, began all the trouble and developed the housing shortage, are, notwithstanding

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their author's recantation and everybody else's protest, to be tried again.

Still, Mr. SNOWDEN, so far as he has refrained from spectacular schemes and the temptation to satisfy his own backbenchers, has justified to the full the widespread confidence in him as a financier. Our position as a trading nation is probably safer in his hands than in those of any of the practical alternatives which present themselves. The pity is that he will be subject to no criticism that sound economists will be able to regard as effective or useful. He has to meet the onslaughts, such as they are, of the inventor and author of most of our present expenditure, Mr. LLOYD GEORGE, and from the Opposition proper of Mr. WINSTON CHURCHILL, who, as a Conservative Chancellor actually added to the expenses of the nation.

Current Topics.

Contraction of External Trade.

MR. SNOWDEN has imposed fresh burdens on British industry and trade at a time when the external commerce of the country is shrinking at a disquieting rate. For the first quarter of this year there was a contraction of £45 million in our overseas trade as compared with the first three months of 1929, divided evenly between imports on the one hand and exports and re-exports on the other, the only satisfactory feature being that there was no increase in the visible adverse balance of trade. For March the position was still worse, with a decline of £7 million in exports and re-exports, and £5·2 million in imports; March, 1929, was a shorter working month as it included the first part of the Easter holiday. In contrast with the general trade figures, it is pleasing to find that exports of electrical goods are still increasing, the total for the first quarter of this year being £554 071 greater than in the corresponding period of last year, and last month £230 302 above March, 1929. But imports are also continuing to rise, the total for the quarter just ended being £2 501 335, a rise of £822 400 over the first quarter of 1929, and the fall in purchasing power all over the world caused by declining commodity prices is not a happy augury for the immediate future of our export trade, even in electrical goods.

Fortunate France.

IN strong contrast with the unpleasant gift of Easter eggs from the Chancellor of the Exchequer to the British nation is the position of our neighbours across the Channel. The French Budget, which was read a second time a few days ago, shows a surplus of £30 000 000. This week a Bill will be passed giving further taxation relief of £12 000 000—a total of £42 000 000 in a year. In these painful circumstances, we must content ourselves for the moment with the hope that the Clerk of the Weather will be kind and give us of his best during the holiday period, so that we may return to work next week braced for the stern task of fighting our way back to prosperity against the tide of adverse world conditions and the additional obstacles which our Governments place in the way.

British Industries Fair.

THE Electrical Advisory Committee of the Birmingham Section has submitted a memorandum to Lord CHELMSFORD'S Committee on the future of the British Industries Fair. It is considered that the present date is altogether unsuitable for Dominion, Indian and American visitors, who have attended the fair in negligible numbers hitherto; an important section of the electrical industry and many individual electrical exhibitors have ceased their participation on this account. The end of May and/or early June would, it is considered, be the most desirable period in which to hold the fair. The present duration is regarded as satisfactory, and the Birmingham Committee sees no advantage in or necessity for a second fair. It does not favour the holding of a similar fair abroad or regard a travelling exhibition of British goods as a practical proposition. In the matter of improving the present utility of the fair it is suggested that trade associations might be invited to undertake the organisation of sections dealing with their own industries, and the great importance attaching to classification and grouping of exhibits is emphasised. We believe that these views are fairly generally held in the electrical industry, but the difficult problem of the date will certainly give Lord CHELMSFORD'S Committee a lot of trouble.

Another Council!

WE have no great love for committees and advisory councils so that we do not feel any surge of enthusiasm at the announcement that yet another of these bodies has been set up under the chairmanship of Mr. G. M. GILLETT, M.P., Secretary of the Department of Overseas Trade, to study problems connected with export trade. Most aggregations of the kind, however able their members may be individually, are apt to display collective folly or timidity. This is almost inevitable and the abler the members the more likely is it that they will stultify one another when they combine as a council. Committees, Commissions, Councils and Boards breed like rabbits in these days, and we do not seem to gain anything worth having from their labours. The country might indeed make better progresss toward setting its house in order if it were not deluded into looking to bodies, such as that which Mr. GILLETT has just set up, to find a road which can only be discovered by the individual exertions of its business men.

Rural Amenities.

IN the circular which has been issued by the Electricity Commissioners at the request of the Minister of Transport regarding the preservation of the beauty and character of the countryside three points are mentioned upon which it is suggested that particular stress should be raised. These points relate to careful consideration of alternative routes for overhead lines in areas of notable beauty, and the erection of such lines in depressions instead of on sky lines, the replanting of glades cut through afforested land with indigenous shrubs or coppice, and the colour of insulators. The design of stations and sub-stations is also mentioned, and it is recommended that the services of a professional architect should be utilised in a consultative capacity from the outset to ensure the harmonising of such buildings with their surroundings. No exception can be taken to these suggestions, which are based on consultations with the Councils for the Preservation of Rural England and Rural Wales and other interested bodies which have displayed a reasonable and conciliatory attitude towards electrification. With due respect on both sides for the spirit of these recommendations there should be little to fear from responsible bodies in the way of obstruction of electrical distribution in rural areas and individual fanatics will find it less easy to stir up difficulties.

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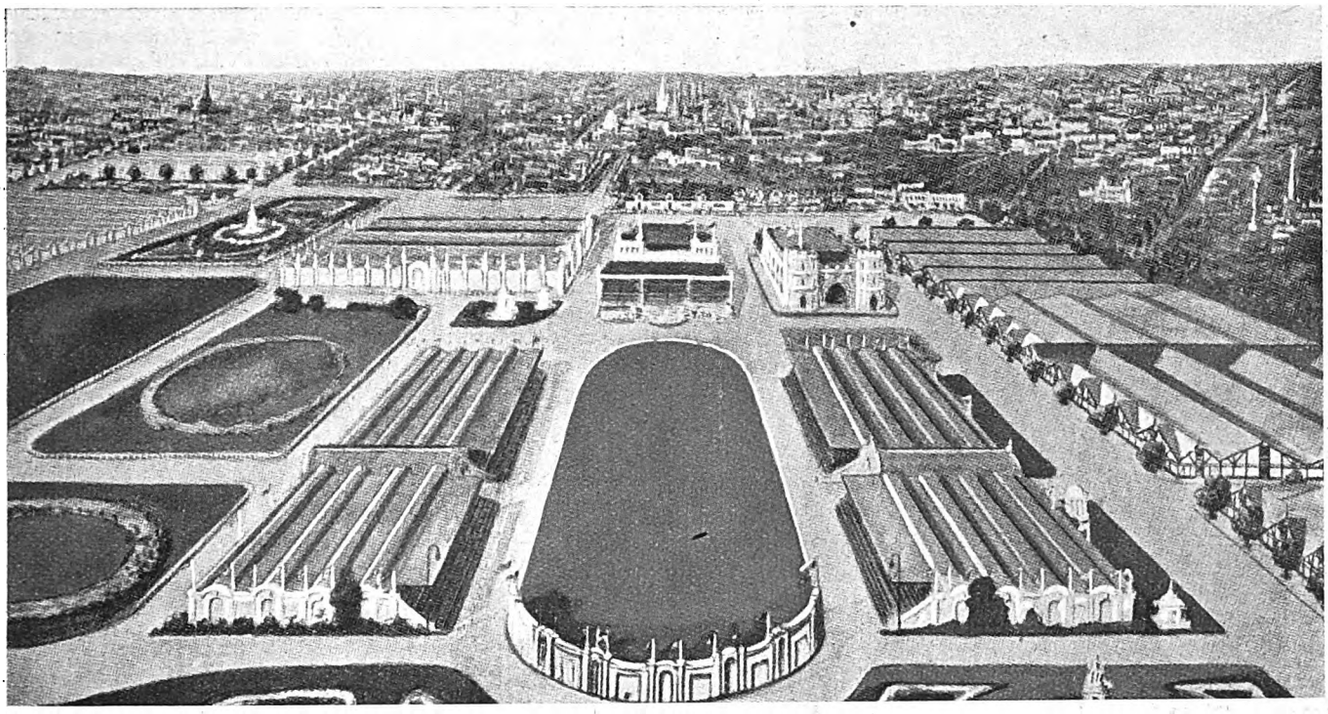
BUENOS AYRES EXHIBITION.

Organisation of British Electrical Section well in Hand—B.E.A.M.A. Working Out Plans for a Co-operative Exhibit—Importance of the Argentine Market.

NOW that the opening and closing dates of the British Empire Trade Exhibition to be held in the Palermo grounds of the Argentine Rural Society, at Buenos Ayres next year, have been definitely fixed it has become possible for intending exhibitors to go forward with their arrangements for this important effort to increase the demand for British goods in Argentina and neighbouring South American States.

It was originally intended that the exhibition should open on February 18th and close on April 2nd, but the dates finally arranged are March 14th to April 27th, and the alteration is generally regarded as an improvement. Already some 85 per cent. of the space available in the exhibition buildings has been booked, and plans are being prepared for additional buildings which it is expected will be required to provide accommodation for intending exhibitors. Major A. L. Abbott has been appointed architect to the exhibition, and Mr. Alfred Burr and Mr. Vincent Burr are working with him as consulting architects. We give on this page a reproduction of the architects' drawing of the exhibition grounds as they will appear when the work of adaptation has been completed.



Reproduction of the architect's sketch of the layout of grounds and buildings, British Empire Trade Exhibition, Buenos Ayres, 1931. The electrical section will be housed in one of the buildings on the right of the picture.

The exhibition is intended to be thoroughly representative of the British Empire, and only articles of Empire manufacture will be admitted. The British Chamber of Commerce in Argentina, which is organising the exhibition, is not seeking any financial profit, but any surplus will be handed to the Chamber to be used in the furtherance of Anglo-Argentine interests. Although no steps have been taken to that end, it may be suggested that while the exhibits are in South America the possibility should be explored of arranging for their subsequent display at Rio de Janeiro and/or Valparaiso.

Electrical exhibits will be housed in part of the Mechanical Engineering and Engineering Accessories Buildings (which includes pavilions 3, 4, 4*b*, 5 and 6). About a dozen electrical firms in Great Britain have already booked space. The British Electrical and Allied Manufacturers' Association is working out plans to ensure that there shall be a representative collective exhibit worthy of the British electrical manufacturing industry. It is recognised that Argentina, after India and the Dominions, ought to be the most valuable market in the world for British manufactures, owing to the strength and variety of our financial interests in that country. The extent of British investments in Argentina is estimated at £450 000 000 to £500 000 000. The uneasiness of the Argentine Government and people regarding American financial penetration is also a valuable psychological factor in operating in our favour. In 1928, out of total imports of electrical goods amounting to £4 366 000, Great Britain supplied £1 453 000, the United States £1 432 000 and Germany £1 329 000. In that year we supplied nearly half the imports of electrical machinery. It should be possible for us to secure as much electrical business in Argentina as the United States and Germany combined, and the exhibition of 1931, following on the activities of Lord d'Abernon's mission last year, should, if properly used, go far towards raising our exports to Argentina towards the attainable level.

In view of the aim of the Argentine Government to stimulate industrialisation there are prospects of important railway extensions, power schemes on a large scale, and a wider and more effective distribution of agricultural activity, which should provide excellent openings for British electrical manufacturers.

Coming to the details of the electrical pavilion it is suggested that this should include models, illustrated drawings and diagrams and special decorative schemes showing the productive capacity of the British electrical manufacturing industry, its achievements and its participation in world trade, photographs of complete schemes connected with the generation, transmission and distribution of electricity, use of water power resources, industrial equipment, electrification of transport services, interior and exterior illumination and commercial and domestic applications of electricity. The ordinary type of manufacturers' catalogue will be quite inadequate for this occasion, and each participating firm should aim at producing, in English and Spanish, something similar to the publication which was issued with the balance sheet by the A.E.G. this year. B.E.A.M.A. will doubtless produce a special publication dealing with the industry and its achievements as a whole, suitable for circulation in all Spanish-speaking countries, which will serve as a nexus for the publicity matter issued by individual firms and might be usefully reinforced by a special issue of "World Power," containing an account of the relation of the British electrical industry to the economic development of Argentina and a buyers' guide, which could be distributed throughout the Republic and neighbouring States.

G. H. L.

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ELECTRICAL EQUIPMENT OF CINEMA THEATRES—II.

Generator Sets—Projector and Spot Lantern Switchboard—Auditorium and Stage Dimmers—Balanced Auditorium Lighting.

By CLEMENT D. BOND.

[*Mr. C. D. Bond is the amusement engineering specialist for Messrs. W. J. Furse and Co., Ltd., Nottingham, the well-known firm of electrical engineers and lift manufacturers, who specialise in electrical equipment and lifts for theatres, cinemas, race tracks, skating rinks and dance halls. The first article of this series appeared in our issue dated March 21st.*]

THE general distribution having been decided the next thing to arrange was the various electrical apparatus. Referring back to the single line diagrams (Figs. 2 and 3 in the first article) it will be seen that mains are being run to four motor generators—two for projectors, one for battery charging and one for sound reproduction—as the latter generally forms part of a contract separate to the electrical work I shall not discuss it, the other three, however, will be built to the following specification :—

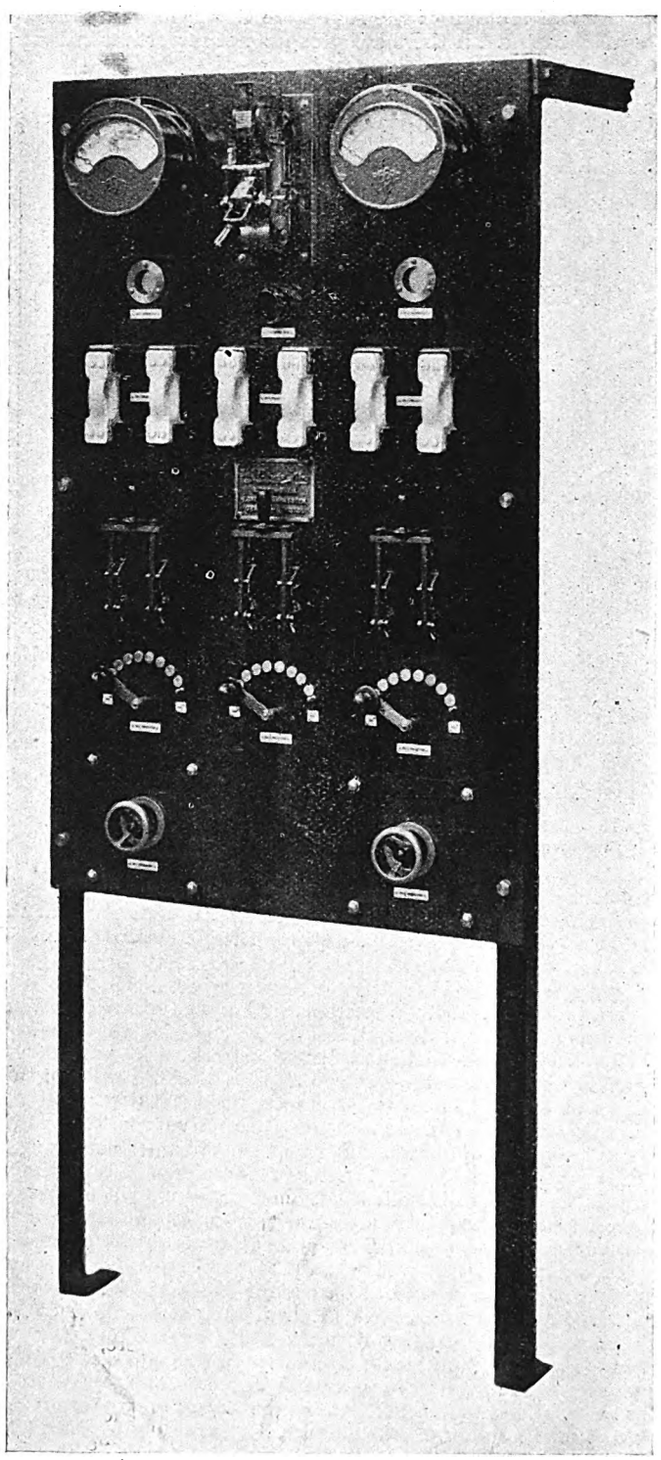

Fig. 4.—Projector room switchboard, W. J. Furse and Co.

Each set will consist of a motor and a generator coupled together with flexible coupling, both machines being mounted on one common cast iron bedplate, complete with sound proof packing. They will be totally enclosed, ball bearing type with terminal boxes suitable for screwed conduit connections. They will comply with B.E.S.A. specification, be compound wound, run at a speed of 800 r.p.m. and suitable for incoming supply of 460 V.

In the case of the sets for projectors they will be built suitable for cinema arcs and capable of a continuous output of 150 A at 80 V with voltage regulation of 20 V.

The battery set, however, will be built for battery charging having an output of 60 A at 100/145 V. This machine will be shunt wound.

When designing the electrical equipment of a new cinema the exact output of the generators should not be decided until their definite requirements are known.

It has been arranged to instal three projectors and one spot lantern. To control these the projector room switchboard will consist of sindanyo panel built on angle iron frame (Fig. 4), having mounted on it the following :—

(*a*) 4—ammeters, one for each projector and one for spot.
(*b*) 1—voltmeter with voltmeter switch.
(*c*) 3—pilot lights showing which of the two projector generators is working and also if talkie generator is functioning properly.
(*d*) 1—double pole circuit breaker with time lag. The purpose of this is that if at any time during the performance an overload is put on the generator over and above the load of two arcs at once, it will trip. This will save pulling out the overload starter coil in motor generator room. This breaker also acts as a main switch for the board.
(*e*) 8—single pole Home Office fuses.
(*f*) 4—double pole dead hinge back of board type switches, one for each projector and one for spot.
(*g*) 4—resistance controls, one for each projector and one for spot, the resistances being separately mounted in dimmer room.
(*h*) 2—shunt regulators, for projector motor generators.

The operating box board above referred to will be situated in the operating box, the generators being erected in a separate room. In the motor generator room there will be an angle iron frame on which will be mounted all the necessary control gear for the four machines with their main switches and fuses. In this room will also be situated the battery charging board which will consist of a sindanyo panel built on angle iron frame, having mounted on it the following :—

1—charge ammeter.
1—discharge ammeter.
1—voltmeter.
1—voltmeter switch and fuse.
1—5-way charge and discharge switch.
4—single pole fuses.
2—double pole dead hinge switches.
Shunt regulators.
1—battery cut-out switch.

Adjoining the motor generator room will be the battery room, which will not only house the secondary lighting battery but also the sound reproduction battery.

Again referring to the single line diagrams it will be seen that four mains are being run from the main 230 V lighting boards, two to auditorium section of dimmers and two to stage section of dimmers, terminating in each case in an iron-clad switch. This bank of dimmers, which will be fixed in

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the dimmer and resistance room adjoining the operating box, will be built to the following specification :—

The dimmer bank will be built up in one combined dead front bank with switchboard arranged in two sections, one for stage and one for auditorium. The dimmers will be arranged for individual and master control by self-releasing clutches, which will lock on to the master shafts as required. The master shafts will be arranged for slow motion, grand master and cross control. With this arrangement it will be possible to raise any combination of dimmers on one shaft and at the same time lower any combination of dimmers on the other shaft or shafts, that is, it will be possible to raise all the stage dimmers and at the same time lower all the auditorium dimmers. Each master shaft will be fitted with a selector lever coupling it to the grand master control and each selector lever will have three positions—" raise," " lower " and " off." The switches and fuses will be mounted on black enamel slate panels 1 in. thick and the panels will be insulated from the framework. Each dimmer will be controlled by a single pole twin break back of board type knife switch with dead front operating handle. The switches will be bussed on one side for the main incoming leads as required (Figs. 5 and 6).

The fuses will be Home Office pattern, the outgoing fuses being mounted immediately above the switches and the return fuses immediately below the dimmers. The outgoing fuses will be provided with cable sockets for outgoing load leads and the return fuses will be bussed on one side for the main return lead. A pilot light will be provided in each dimmer circuit and connected so as to show the state of dim of its circuit.

The dimmers will be open coil radial lever type, each having 100 contacts; they will be graded for dimming gasfilled lamps. Quick break off positions will not be provided as they are not necessary.

The wattages of the dimmers will be as follows :—

	W each.
Auditorium wings, red, blue, green, white ..	10 000
Auditorium ceiling under balcony, red, blue, green, white	3 000
Auditorium proscenium, red, blue, green, white ..	5 000
Footlight, red, blue, amber, white	2 500
No. 1 batten, red, blue, amber, white	2 900
No. 2 batten, red, blue, amber, white	2 500

The dimmer switchboard will be complete with necessary back connections, busbars, cable sockets, labels and insulating

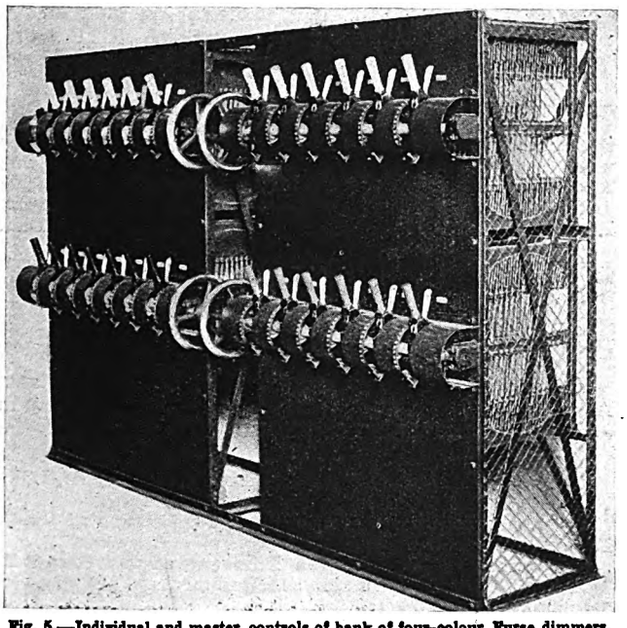

Fig. 5.—Individual and master controls of bank of four-colour Furse dimmers. (Front view.)

fillets and suitable for 230/460 V, 3-wire d.c. supply. The auditorium lighting will be split up to form an equal balance but it will not be possible to do this with the stage equipment owing to the regulation which does not permit of a higher voltage than 250 in the battens. The footlight and No. 2 batten will be balanced against No. 1 batten.

Between the operating box and dimmer room a signalling device is being arranged. This will consist of a 5-way colour indicator with five switches in the dimmer room connected to 5-way colour indicator and buzzer in the operating box. By this means it will be possible for the dimmer operator to notify the spot lantern operator what colour spot he requires. There will also be a two-colour indicator and buzzer in the dimmer room operated by two switches in the operating room. By this it will be possible for the projector operator to give warning to the dimmer operator of end and start of picture.

An efficient automatic telephone system will be installed connecting up the following positions in the house :—

General office (P.O. telephone), manager, assistant manager, all female staff rooms, all male staff rooms, all payboxes, advance booking office, all café managers, all

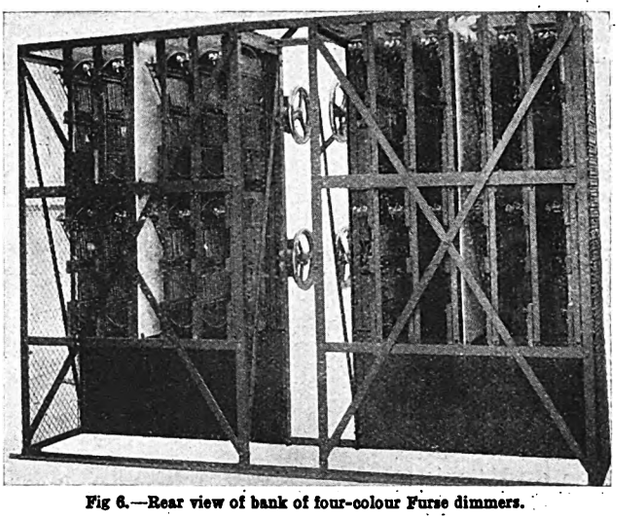

Fig 6.—Rear view of bank of four-colour Furse dimmers.

kitchens, stage, orchestra, organ console, garage, operating room, dimmer room, generator room, battery room, non-synchronous room, intake room, engineers' room, rewind room, boiler house, plenum room, vacuum room.

In addition there will be three spare lines for further extensions if required.

(*To be concluded in our issue of May 16th.*)

SUPPLY IN RURAL AREAS.

Injustice of Charging on Unit Basis—Advantages of Block System.

Lecturing to members of the Western Centre of the Institution of Electrical Engineers on the subject of " Economics of Rural Electricity Supply for Domestic Purposes," at the University College of the South-West, Exeter, recently Miss Margaret M. Partridge, B.Sc., A.M.I.E.E., said that under the Central Board's South-Western Area scheme she thought that purchasing costs would in the future average ½d. a unit. On this basis they would have to charge more than ½d. to the consumer to pay for the cost of distribution. It was a fallacy and injustice to charge for electricity on the unit basis because actual costs per unit varied.

She would say to the engineer : " When in doubt, keep prices low in order to get a large demand and a fair return on capital ; " to the consumer : " Use electricity for all purposes to obtain it cheaply."

Mr. W. C. Bache (Cheltenham), in moving a vote of thanks, said that although perhaps five years ago it might have been correct to say that municipalities were loth to extend their electricity undertakings to rural areas, he did not think that was the case to-day. Dealing with the question of the point of saturation for the purely domestic load, he thought it would be difficult for the majority of consumers to-day to use more than 2 000 units per head per annum, but this might probably not be the case in the near future. Until they got rid of the method of charging solely by the unit he did not think they would get the consumer greatly interested in his own consumption.

Mr. Howard (Taunton), asked whether the lecturer recommended selling current at just over ½d. per unit (if it was bought cheaply from the grid) to disrticts where, for every 1 000 supplied, 500 units were taken up in iron losses in the transformers.

Miss Partridge, in reply, said she thought the American block system was quite the fairest way of charging for electricity. She thought it unfair to charge the same tariff to people who used electricity for all purposes as to those who only used it for lighting.

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MODERN "ATMOSPHERIC" LIGHTING.

Installation at the "Apollo" Picture Playhouse, Birmingham—Sunrise and Sunset Effects—Curtain and Screen Colour Lighting.

THE "Apollo" Playhouse, Tyburn Road, Birmingham, which was opened on March 31st, provides a good example of modern lighting methods applied to an atmospheric decorative scheme. The lighting effects depend very largely on the use of daylight colour-sprayed lamps controlled by dimmers.

A distinguishing feature of the front is the very wide entrance portico and the large two-storied window above which, when illuminated at night, can be seen from a great distance.

The interior lighting has been designed not only to give the decorative and atmospheric effects desired, but also to ensure a restful diffusion of light. The auditorium lighting is carried out by means of two rows, each consisting of ten large indirect fittings with burnished aluminium reflectors. Each fitting measures 8 ft. long by 2 ft. 8 in. wide, and is fitted above a panel opening in the ceiling, thus forming part of the ceiling decoration.

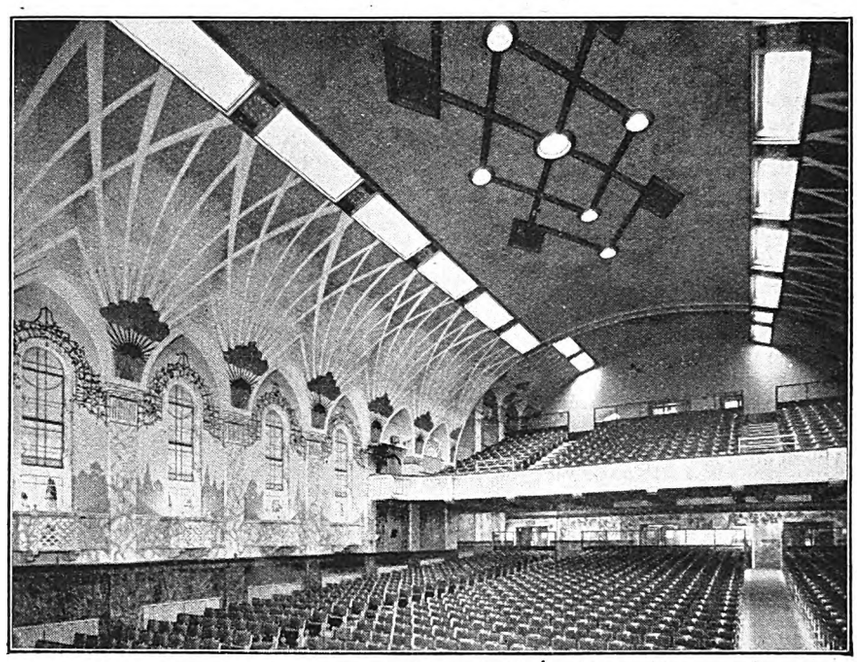

Fig. 1.—Auditorium lighting, "Apollo" Picture Playhouse, Birmingham.

On either side of the auditorium are five painted windows, each with a plaster balcony in the foot. The auditorium decorations are designed to give an outdoor impression with fields and trees in the distance, and the amber lamps in the balconies, by means of the dimmer control, are made to give a very charming sunrise or sunset effect, according as they are switched up or down. During the intervals the ceiling lighting, in combination with the mural decorations, gives an impression of a shady wood on a hot summer's day, while during the performances the daylight lamps in the ceiling panels produce an effect of twilight, which is extremely attractive.

Stage lighting is carried out by means of 32 X-ray reflectors fitted with 32 200 watt lamps, the reflectors being equipped with Geligniite colour screens. Four different colours are employed and each colour consisting of eight lamps is controlled through a separate motor driven dimmer, the reflectors being fitted over the proscenium arch.

The sound equipment is of B.T.H. manufacture and was specially designed to suit the acoustics of the theatre. This equipment, which employs Mazda exciter lamps, can be used either for sound on film, or sound on disc. The sound equipment is used in conjunction with Ross projectors. The whole of the electrical installation work was carried out by Mr. B. French, A.M.I.E.E., of Mill Street Electrical Works, Kidderminster.

I.E.E. SUMMER MEETING.

Arrangements for Irish Visit—Inspection of Shannon Works.

THE Council of the I.E.E. have accepted the invitation of the Committee of the Irish Centre to hold the 1930 summer meeting in Ireland, and the following tentative programme has been arranged :—

MONDAY, JUNE 2ND.

Assemble in the evening at the Gresham Hotel. Light refreshments. Music.

TUESDAY, JUNE 3RD.

Motor trip in Co. Wicklow, including inspection of overhead transmission lines. Lunch and tea at Glendalough. Dance at the Gresham Hotel, Dublin.

WEDNESDAY, JUNE 4TH.

Proceed by special train to Limerick for visit to the Shannon Scheme. (Lunch and tea there.) Return to Dublin, arriving about 10 p.m. Dinner on train.

THURSDAY, JUNE 5TH.

Visit the brewery of Messrs. A. Guinness, Sons and Co. Lunch by invitation of the Company. Leave Dublin by special train for Belfast (arrive about tea-time). Reception by the Lord Mayor of Belfast, the Rt. Hon. Sir William Coates, at the City Hall. Dancing.

FRIDAY, JUNE 6TH.

Morning—Assemble at Queen's Bridge. After a tour of the Harbour on s.s. "Musgrave," the party will split into two groups for alternative visits as follows : Group 1 will land and visit the harbour power station and then leave for a visit to Messrs. Harland and Wolff's shipyard. Group 2 will remain on board the steamer, and, after a trip down Belfast Lough, will proceed to Harland and Wolff's wharf to pick up Group 1. The whole party will then return to the City. Afternoon—Assemble at York Street Mills and visit the power house, spinning, weaving, finishing, and manufacturing departments of the mills. Tea will be provided at the mills. For those who do not wish to visit the mills a motor-coach excursion will be provided. The route for this excursion will be through Antrim and Ballymena to Glenariffe and home by the Coast Road. Tea will be provided at the Olderfleet Hotel, Larne. Evening—Reunion and Dinner at the Grand Central Hotel, Belfast. Dancing.

E.C.A. CONVENTION.

Provisional Programme for the Llandudno Meeting.

The provisional programme for the Electrical Contractors' Association's fifth annual conference, to be held at Llandudno on June 25th, 26th and 27th, is as follows :—

WEDNESDAY, JUNE 25TH.

10 a.m. Meeting of the Council of E.C.A., N.E.C.T.A., Ltd., and N.F.E.A. at the Town Hall.

2—10 p.m. Arrival of delegates and Registration at the Grand Hotel.

7.30 p.m. Reception by the President at the Grand Hotel. Dancing in the ballroom and light refreshments.

THURSDAY, JUNE 26TH.

9.30 a.m. Annual General Meeting at Town Hall.

11.30 a.m. to 1 p.m. Opening of conference at the Town Hall. Civic welcome and reply by the President. Presidential address by Mr. H. Willoughby-Ellis. (12.30 p.m. Official photograph.)

2.30 p.m. to 5.30 p.m. First conference paper and discussion.

8 p.m. Smoking concert in the Grand Hotel.

FRIDAY, JUNE 27th.

9.30 a.m. Second conference paper and discussion.

12 noon to 1 p.m.—Votes of thanks ; installation of new President ; short address by new President.

2.30 p.m. Garden party.

9 p.m. Ball and supper at the Grand Hotel.

Arrangements for golf, drives and so on, will be made for those desiring to stay in Llandudno over the week-end.

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THE ENGINEERING PROFESSION.

Scientific Spirit Essential to National Efficiency.

WE give below the inspiring introductory portion of the presidential address delivered by Colonel Sir Thomas F. Purves to the Students and Graduates of the Institution of Electrical Engineers on April 11th.

The Institution realises very fully that its future is essentially bound up with the health and the vitality of the Students' Section. It is to you, who are students and graduates to-day, that it must look to carry on its work throughout the next generation and to hand it on to your successors.

We who are in charge of its destinies for the moment are doing our best to maintain its actions and its policy in harmony with the rapidly developing conditions and needs of the electrical industry. We are striving to make it, and to keep it, a real asset and a power for good in the nation, by helping and encouraging those engaged in all branches of research and industrial activity based upon applications of electrical science.

So far as I am able to judge, the policy of maintaining a comprehensive electrical engineering institution, and of extending its fields of action to take in all the new aspects of the subject as they arise, is being justified by results. It will be for you to judge how long and how far this process can be continued.

We may take it for granted that the scope of electrical engineering, in the broad sense of the term, will increase indefinitely, and that the importance of its contribution to the welfare of mankind will be more and more widely realised.

It may be that it will ultimately become impossible for a single institution to cover the whole field of the practical utilisation of electrical forces, but I confess that I cannot in my own mind see why it should ever fail to do so; nor can I at present imagine any future conditions that would make it undesirable to maintain the common co-operation of all electrical engineers in the nation-wide professional institution such as ours.

Wise sectionalisation, both territorial and functional; the utmost possible executive freedom for each constituent part; a properly representative governing authority; and a constitution sufficiently flexible to conform without strain to great changes in the groupings of personnel and of subject matter; are, I think, the conditions essential to success; and I venture to recommend you to keep these points in the forefront of your minds after you become corporate members and are called upon to help in settling the many difficult problems which arise in the life and progress of our great Institution.

To those younger men amongst you who have recently joined our ranks, and made up their minds to become electrical engineers, I should like to extend a hearty welcome. I congratulate them upon having entered a profession which, whatever its drawbacks may be, is at least a real live profession and one with limitless possibilities of progress in front of it. You need never doubt that it will be fully capable of absorbing all the initiative and all the energy you can bring to bear upon it.

Intellectual Honesty.

It should comfort you to feel that the engineering profession is a profession conducive to intellectual honesty and to the preservation of self-respect. The engineer, like the scientist, must found his conclusions and his actions upon reality if he is to achieve results. It has its pitfalls no doubt—you may have to give expert evidence in the witness box some day—but it is in its very essence a profession which discourages dishonesty. I hope you will have plenty of occasion to realise the *confidence* which honest men extend to those who are honest, and to appreciate in your own experience the convincing power and success of honesty and singleness of purpose, and of thought for others, in a man's career.

I daresay you already know from experience that the monetary rewards of engineering are not great. I think they are likely to improve, and that the prospects of engineering in connection with the higher directing positions in industry are likely to improve. The extraordinary idea that the study of engineering tends to incapacitate a man for a directing position has been hard to kill, but it is now giving place to recognition of the fact that the spirit of science and engineering in the highest quarters of industry is essential to national efficiency. In any case the advantage of possessing surplus money is much over-rated. It is far better to have interesting work than to be rich. What, in the last resort, can money buy that is worth having except *mental states?* The man who has a real interest in his work is rich already.

E.D.A. CONFERENCE.

Discussions on Aspects of Publicity and Propaganda Work.

AN important Conference of Electricity Supply Undertaking Sales and Publicity Managers, organised by E.D.A., was held on April 9th and 10th. The following subjects were discussed:—

NATIONAL NEWSPAPER AND MAGAZINE ADVERTISING, introduced by Mr. S. E. Gullick and Mr. A. W. Hulbert, who pointed out that the combined circulation of the newspapers used in the E.D.A. scheme was approximately 4 000 000, and that the cost of one 4 in. single-column advertisement in all these papers worked out at roughly £180 or $\frac{1}{1000}$d. per reader.

LOCAL ADVERTISING, introduced by Mr. V. W. Dale, who stressed the importance of obtaining expert guidance from a competent agency or from E.D.A.

POSTER SERVICE, introduced by Lieut.-Colonel W. A. Vignoles. It was mentioned that the cost of a poster scheme embracing 121 towns containing 52½ per cent. of the population of Great Britain and Northern Ireland, for 13 weeks would be £10 038.

CINEMATOGRAPH FILMS, introduced by Mr. J. I. Bernard, who gave an estimate of £3 500 as the cost of a film publicity campaign covering 500 bookings of six days each over a period of six months, and showing a film to 5 000 000 people—less than ¼d. per person. He believed that the time had come when much greater use could be made of E.D.A. films.

LECTURE WORK, introduced by Mr. G. S. Francis. Mr. Francis pointed out the importance of careful selection of the points to be included, and of treating the subject in an objective rather than a subjective manner.

E.D.A. LITERATURE FOR LOCAL DISTRIBUTION, introduced by Mr. V. W. Dale, who deplored the exploitation of the industry for the benefit of spurious advertising adventurers. He recommended the preparation of efficient mailing lists of logical prospects as much more economical than general advertising for certain lines.

FINDING NEW MARKETS, introduced by Lieut.-Colonel W. A. Vignoles, who dealt with the work of the Industrial Heating, Rural and Agricultural Electrification, Refrigeration, Water Heating, Exhibition, and Electric Vehicle Committees.

LINKING LOCAL ADVERTISING AND PUBLICITY SCHEMES WITH E.D.A. CAMPAIGNS, introduced by Mr. V. W. Dale, who said that aloofness from the policy of a central organisation was of no use to anybody. Whole-hearted co-operation in arriving at the right policy was required.

HOW TO APPROACH THE PUBLIC WITH TARIFFS, introduced by Lieut.-Colonel Vignoles, who urged the advantages of uniformity of tariffs and an endeavour to get the whole country to adopt a two-part tariff with the same running charge throughout the country This would greatly facilitate the work of the Association.

In his introductory address to the Conference Lieut.-Colonel Vignoles said that they owed to Mr. W. Williamson, of the Clyde Valley Company the first definite suggestion that this Conference should be held. They had in the last twelve months noted an increase of some 50% in the sales of E.D.A. literature and posters, and he thought this was an indication of the greater interest being taken in the efforts made at headquarters to assist undertakings. He trusted that the Conference would help them to produce more nearly what the bulk of undertakings required, and to make undertakings appreciate more what E.D.A. had to offer.

Considering the general question of publicity by supply undertakings, he would like to say how important it was that every undertaking should prepare definite schemes of publicity work on the basis of an annual, or other periodical, allocation of money for the purpose; this money should be allocated to definite items, and the effect of the scheme visualised as a whole.

The Conference was attended by representatives of more than forty municipal undertakings and supply companies, in addition to E.D.A. area officers and members of the headquarters staff.

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BOOK-KEEPING FOR ELECTRICAL CONTRACTORS—VI.

Recording Orders for Stock—Electrical Goods Received and Issued—Materials Rejected and Returned—The Stock Ledger.

By S. HOWARD WITHEY, F.C.I.

TO find that the stock of wire, lamps, batteries, or table fires, etc. needs replenishing, and then to set down one's requirements on a memo. tablet or in a diary is no system at all. It is true that the electrical contractor is often compelled to stock only those particular goods or products which he knows can be readily sold, and is forced by insufficient working capital to limit his sphere of activity, but this only serves to emphasise the need for the discriminate placing of orders, and the need for a systematic control over the stock from the time of its arrival on the premises.

Directly the stock under any heading threatens to reach the minimum known to be essential, the person in charge of the stores should make an entry in a stock order book, sometimes referred to as the requisition book. To give the best results, this book should be provided with separate columns or sections for the insertion of the date; the department, shop, or person requiring the stock; a description of the goods, materials, or stores needed, including the number, quantity, or weight; the existing stock on hand under that particular heading; and the signature or initials of the person authorising the placing of the order. A separate section for office use, to be filled in by the contractor or the order clerk, will be found very useful, this section being ruled to show the date on which each order was placed; the name and address of the suppliers; particulars of the goods, etc., ordered; the date on which they arrived on the contractor's premises, including their general condition upon arrival; and the page on which the necessary entry has been made in the inwards book kept in the shop, stores, or receiving department.

Until such time as an order has been actually authorised by the contractor or his departmental manager, the official order form should not be forwarded to the suppliers or agents. A good method of making out orders consists of using a duplicate book on the pen or the pencil carbon-copy principle whereby two copies are produced, the original form being forwarded or handed to the suppliers, in every instance, and the copy retained in the book to facilitate all future references to details. If more than two copies are needed, it will be better to use a manifold order book consisting of thin tissue leaves, and one of the copies should be passed on to the office for use when checking the accuracy of the details stated on the invoice or other debiting document when it comes to hand.

Before the stock is transferred to its allotted place, the storekeeper should examine the delivery or advice note which accompanies the goods, and should carefully check the quantity and the quality with the copy of the official order which has been retained. When this has been done, and providing the stock is not rejected for any reason, an entry can be made on the left-hand or receipts side of a stock book, giving the date of receipt; the official order number; the name and address of the senders; a description of the goods or articles supplied and any special observations or remarks. The right-hand side of the stock book should be reserved for particulars of all goods, articles, materials, and stores issued from stock, each entry showing the date of issue; the requisition number; the number or quantity issued; and such a description of the goods, etc., as will enable them to be identified.

Treatment of Rejected Goods.

It sometimes happens that after taking certain accessories or components into stock, they are discovered to be inferior to those actually specified in the order, or are found unacceptable for another good reason. If such rejected stock is returned by the contractor to the suppliers or agents, details should be recorded in an outwards book ruled on similar lines to the stock book, the various columns being used for the insertion of the date of return; the original order number; and the quantity and description of the goods, articles, or materials, etc., rejected. This book should also be used for recording particulars of empty boxes, cases, crates, etc., returned by the contractor from time to time.

To make room for electrical products for which there is an obvious demand, certain goods will often be disposed of, and as it is usually much easier to buy goods than to sell, cash is exchanged for goods more readily than goods are exchanged for cash. Broadly speaking, a large turnover takes less capital to finance than does a relatively small turnover, and the same amount of capital will bring back more in the form of net profit when it is utilised intelligently in the direction of turnover expansion.

The amount of capital locked up in the form of stock must necessarily be considerable, and if only for this reason the contractor should be able to reconcile the stocks on hand from time to time. To be in a position to readily ascertain the quantity and the value of the stock on hand under any heading at any time, a stock ledger should be kept. This ledger may consist of cards kept in a drawer, or loose leaves, or a bound book of the ordinary type, and providing the ledger can be indexed; the outstanding advantages of the card or the loose leaf system are that the constant opening of new accounts for the same electrical products and accessories is avoided; each account will maintain its position in the ledger, and there will be no blank cards or leaves to turn over. Moreover, the utilisation of a division for "closed accounts" will ensure that only current stock accounts are handled by the staff.

Personal Care of Stock Ledger.

Each stock ledger account will have its debit and its credit side, each of which will be provided with a cash column. To avoid errors, irregularities and fraud, this ledger should not be kept by the person in charge of the stores, but should be entered up either by the contractor himself or a responsible assistant. Each item recorded on the debit side of the stock book should be transferred to the debit side of its respective account opened in the ledger, showing the date, the name of the suppliers, the stock book folio, the quantity received, and the rate or price; the cost being extended into the cash column. As soon as a stock book item has been recorded in the ledger, the ledger folio should be inserted against it. Each item recorded on the credit side of the stock book should be transferred to the credit side of its proper ledger accouut, giving the date, the name of the department or shop to which the goods, etc. were issued; the stock book folio; the quantity issued; and the rate or price; the cost price of the goods issued being extended into the cash column. Some care will have to be exercised to guarantee that all items entered on the credit side of the ledger are priced out at invoiced cost. In like manner, each item recorded in the outwards book will be transferred to the credit side of its particular account kept in the ledger, and by keeping this work up to date the value of the stock under any heading may be ascertained by balancing the cash columns of that account. The following is a good general ruling for the stock ledger:—

STOCK LEDGER.

(Left-hand or Debit Side).

Date.	Received from	Folio.	Quantity.	Rate or Price.	£	s.	d.

(Right-hand or Credit Side).

Date.	Issued to	Folio.	Quantity.	Rate or Price.	£	s.	d.

The next instalment of this series will show the correct method of keeping and classifying the purchases transactions.

(*To be continued.*)

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"ELECTROCUTION."

An Electric Iron Fatality—Responsibilities of Supply Authorities or Contractors—Attitude of the Coroner—What is the Legal Position?

By "CRITIQUE."

THE writer has been greatly interested in reading the newspaper reports of a most regrettable fatality, caused by a man being electrocuted in a North of England city a few weeks ago, whilst handling an electric iron, and of the coroner's enquiries into the matter.

It appears, from the evidence, that this unfortunate man detached the connector from an electric iron, which, by the way, was fitted with a three-core flex and duly earthed, and, without withdrawing the plug from the three-pin socket, commenced to carry out some operation on the flexible cord with a pair of scissors. The iron connector, being fitted with an earthing strip, was apparently held in one hand, thus forming a good "earth," the scissors came in contact with the live flexible wire, and the shock, with 230 V alternating current, caused death.

Whether the switch, single pole, controlling the iron plug, was switched off or not, does not appear to matter for the moment, as one gathers that the switch was in circuit on the neutral wire, so that whether the switch was on or off the flexible cord would still be "alive," and by tampering with this "live" wire, at the same time being well "earthed" through the medium of the iron connector earthing strip, anyone could get a severe shock. I think it must be admitted, although one is bound to feel extremely sorry for the victim and his relatives, that it was a very foolish thing to do. Had the plug been withdrawn from the three-pin socket, and completely isolated and disconnected from the supply, no harm could have come to him, and for anyone, either amateur, ordinary householder, or even a skilled man, to start dabbling about with live wires as this man unfortunately did, is asking for trouble. What are plugs and sockets made for? To connect and disconnect apparatus easily and conveniently; and yet this very simple and elementary precaution is not taken.

From the evidence given at the inquest, one gathers that when the installation was first put in, the switch was in circuit with the live wire, but owing to a main switch being replaced with a new one, the wires apparently got crossed, with the result that the single-pole switch controlling the ironing plug was then on the neutral wire. Is any responsibility for such happening to be attached to anyone? as, by the number of adjournments of the inquest and the number of fresh witnesses called, one was almost inclined to think that an endeavour was being made to place legal responsibility either on the supply authority or on the man who changed the faulty main switch.

The supply authority's representatives who were called as witnesses appeared to be handled severely by the coroner, especially for visiting the house without obtaining authority from him. Personally, I consider they were perfectly justified in doing so, in spite of having no authority from the coroner; because it was very necessary, on learning that someone had been electrocuted, to go at once to find out the reason why. Otherwise something might have happened that would be a danger to other people. It was, therefore, very essential that the supply authority's representatives should go at once to see that matters were safe as far as other people in the house were concerned.

Case of Street Explosions.

Would the coroner, in the case of the London streets which were blown up some months ago, have insisted that the gas authority's men should not go on to the job without his authority because a man had been killed? If an accident occurs, electrical or otherwise, surely it is very important that safety be assured at the earliest possible moment, whether the coroner authorises it or not. A case might arise in which it was necessary to withdraw the supply authorities' main fuses to make the place safe. Must electric supply people await the coroner's pleasure before they act?

If a legal contributor to this journal can state whether any liability rests either on the supply authorities or contractors in reference to accidents occurring where switches are still in circuit with the neutral wire instead of the "live" wire, it would be of great interest to the trade. A single-pole switch is used to break a circuit, and whilst we are fully aware that it is distinctly advisable to insert the switch in the "live" wire section of the circuit, I do not know of any law which does or can demand that this be done, except in so far as various specifications call for it. Even if it is not done, the electric supply can be quite satisfactory from a working point of view, and I do not see where any legal liability rests, either on a supply authority or a contractor, should an accident occur in circumstances such as are detailed. There must be hundreds of thousands of switches in use at the present time that are on the neutral side of the circuit, and have been so for 10, 15 or 20 years or more, but no accidents have arisen as a result.

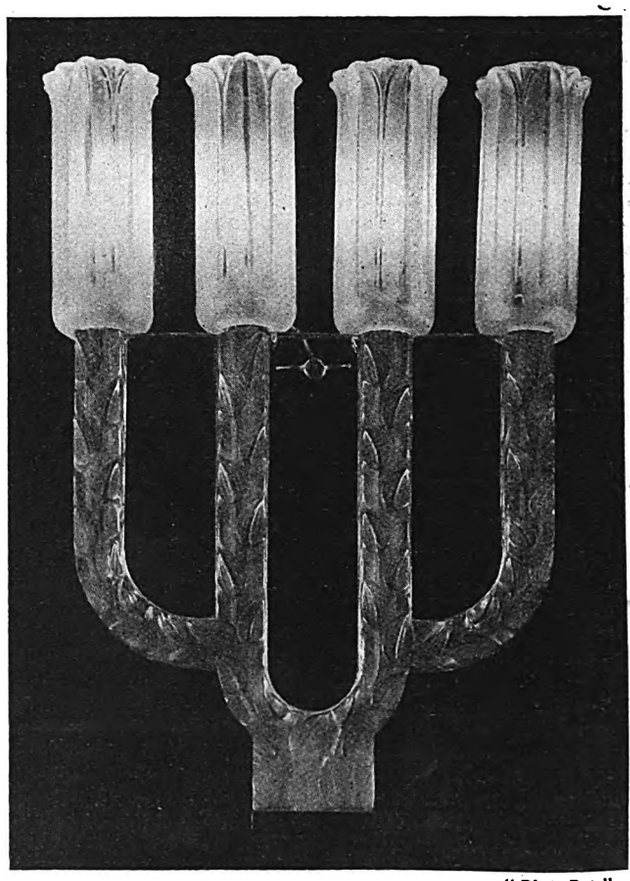
Generally speaking, if a man puts his hand in a fire, he will get burnt, or if he puts his hand in or among moving machinery, he will get seriously hurt. The same thing applies if a man deliberately dabbles about with live electric wires; he is liable to get a severe shock.

In the case previously mentioned, provision was made for disconnection by means of the plug in the socket, and also at the main switch, but neither precaution was taken. I therefore ask, what is the legal position? Is it likely that any claim for damages would succeed in the case of accident or death brought about by circumstances that might arise through a single-pole switch being inserted on the neutral side instead of the "live" side of the circuit? Could a contractor be held responsible, or, alternatively, could a supply authority be held responsible for connecting up an installation where such a condition existed?

This appears to have been a case in which an "unearthed" iron would have been safer than an "earthed" one, but I will not dwell on this part of the subject.

[*A legal view of the points raised in the foregoing article is to the effect that the position as regards liability must depend to a very large extent on the particular circumstances of each individual case. In such special cases as interference with a live wire by anyone with a pair of scissors, the person doing so would probably be defeated in any claim that he or his representatives might make by a defence of contributory negligence.*—ED.]

MODERN DECORATIVE LIGHTING.



"Photo Rep."

"Oxford" wall light, Lalique Galleries.

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TRANSPORT FOR CONTRACTORS.

The One-ton Lorry—Running Costs—Comparison with the 7 h.p. Van—Types of Body for Electrical Dealers—Need for Periodical Inspection.

By W. A. GIBSON MARTIN.

IN a previous article* it was shown how the 7 H.P. vehicle could be used as a service van, or as a tender to a fleet of larger vehicles, and detailed running costs were given to prove that the small delivery van would cost a fraction over 3½d. per mile if the annual mileage was 20 000. The electrical contractor who requires an all-round general service vehicle, however, may decide that a vehicle with a larger capacity, and capable of accommodating a heavier and more bulky load, may be of more utility, in which case the one-ton van will demand consideration. A table of running costs for the one-ton vehicle, compiled in exactly the same way as the previous table for the 7 H.P. van, is given below :—

RUNNING COSTS FOR THE ONE-TON VEHICLE.

Petrol : 12 m.p.g., 1s. 5d. per gallon.
Oil : 700 m.p.g., 5s. per gallon.
Tyres : 15 000 miles per set for five :
Replacement cost, £21 per set, 32 × 4½

Original Cost .. £245
Painting 15
Total cost .. £260
20% depreciation per annum .. £52

	Number of Miles per Annum.								
	5 000			10 000			20 000		
	Actual Cost		Cost per Mile	Actual Cost		Cost per Mile	Actual Cost		Cost per Mile
Running Expenses :	£ s. d.		d.	£ s. d.		d.	£ s. d.		d.
Petrol	28 8 8		1·36	56 17 7		1·36	113 15 2		1·36
Oil	1 15 0		·08	3 10 0		·08	7 0 0		·08
Tyres	7 0 0		·33	14 0 0		·33	28 0 0		·33
	37 3 8		1·77	74 7 7		1·77	148 15 2		1·77
Standing Charges :	£ s. d.		d.	£ s. d.		d.	£ s. d.		d.
Government Tax ..	15 0 0		·72	15 0 0		·36	15 0 0		·18
Insurance	15 2 6		·72	15 2 6		·36	15 2 6		·18
Garage	26 0 0		1·24	26 0 0		·62	26 0 0		·31
Depreciation ..	52 0 0		2·49	52 0 0		1·24	52 0 0		·62
	108 2 6		5·17	108 2 6		2·58	108 2 6		1·29
Totals :	£ s. d.		d.	£ s. d.		d.	£ s. d.		d.
Running Expenses	37 3 8		1·77	74 7 7		1·77	148 15 2		1·77
Standing Charges ..	108 2 6		5·17	108 2 6		2·58	108 2 6		1·29
Driver's Wages ..	156 0 0		7·48	156 0 0		3·74	156 0 0		1·87
Allow for Repairs ..	10 0 0		·48	15 0 0		·36	20 0 0		·14
Total	311 6 2		14·91	353 10 1		8·45	432 17 8		5·07

Reference to the table will show that on a 20 000 mile basis, the one-ton van will cost practically 5d. per mile as against the 3½d. of the smaller vehicle, while on the minimum mileage of 5 000 per annum, the figures are 1s. 3d. (14·91d.) and 11½d. (11·68d.) respectively. It is obvious that if the electrician has heavy enough loads, and has a large enough area to cover, the one-ton vehicle is, on the whole, the more useful type of transport, as the running costs are only approximately a third more, while the larger vehicle will convey more than twice the load.

First Cost.

The one-ton chassis, on which the figures are based, is a British production that has proved a reliable and economical unit, well up to its work and capable of giving long periods of service without extensive overhaul. It has been adopted in large numbers for Post Office transport, as well as by other large concerns with a fleet running into the hundreds. The engine is a four-cylinder water-cooled unit developing 31.5 B.H.P. A 6 V lighting set supplies current for three lamps, or if long journeys are anticipated after dark, a 12 V circuit with five lamps (and an electric starter) can be fitted at an extra cost of £15. The price appearing in the table of running costs is inclusive of a spare wheel and tyre, an engine-driven tyre pump, speedometer, full kit of tools and driving mirror. The chassis price is £170, but several types of body are standardised at £205, £210 and £220, plus the cost of adding the electrical dealer's name and address to the body panels.

For the purpose of giving a fair estimation of running costs, the price of the vehicle in priming grey has been taken at £245, in order to allow a margin for any alterations or additions to body work that may be desired in connection with the electrical trade, and the sum of £15 has been allowed for painting, making the total cost £260. Depreciation, at the rate of 20% per annum, has been calculated, thus writing off the vehicle in the books at the end of five years. This is the simplest method of arriving at depreciation, and is on the generous side. The income tax authorities will only pass depreciation at 20% per annum on the diminishing value, but in the event of the electrical dealer being able to prove a greater amount of depreciation than has been allowed for income tax purposes, the authorities will pass a further amount on the vehicle being sold for scrap, or on exchange in part payment for a new model.

The efficiency of the one-ton van can be greatly improved if the electrical contractor will give some thought to the body-work. First of all, the general outline has to be considered. Is a completely enclosed body the most suitable? or will the open type be more useful in conveying material to the job? The box-van body can be an exceptionally useful type of vehicle, giving perfect protection from the weather, and allowing fragile goods to be packed securely. On the other hand, the flat-platform body allows the load to project to a certain extent at the sides, and lengths of pipe, ladders, and scaffolding can be allowed to project over the tailboard. The drop-side lorry may be useful for some purposes, while there is always the van with fabric sides that roll up, a compromise between the open body and the box van.

Spare Wheel and Tools.

Having decided upon the most useful, all-round body, arrangements must be made to accommodate the spare wheel, tools and any packing materials in frequent use. On the chassis described, the spare wheel is placed between the frame members at the rear, and is exposed to all the mud and dust thrown up by the rear wheels. In this position, the spare wheel is out of sight and is therefore overlooked when the vehicle is being washed down. The result is that the spare tyre is constantly wet, the canvas soon rots through, and even although the tyres may be changed over every 5 000 miles—as they should be if they are to give the maximum service—every cover deteriorates sooner than it should, and the tyre bill is higher than it ought to be. Any body builder, or even the local joiner, will be able to enclose the spare wheel in a stout wooden cupboard lined with waterproof material, thus protecting the spare wheel, and lowering operating costs.

The modern engine is very reliable, and if properly looked after there will be few roadside adjustments required. But such adjustments as are necessary, always seem to occur when time is pressing ; and so the electrical contractor should adopt some means of housing tools and spares conveniently so that when a halt is compulsory, delay may be minimised.

The essential equipment for the road may be divided into three sections, and they should be housed separately if possible. These sections are : (*a*) small, fragile parts, easily damaged, such as carburetter jets, magneto file, spare lamp bulbs, fuse wire, insulating tape and spare sparking plugs ; (*b*) the heavier tools supplied as standard kit, such as adjustable and box spanners, hammer, screwdriver and hub-cap spanner ; and (*c*) tools for wheels changing, i.e., wheel brace, jack and jack handle. Group (*a*) may be accommodated in a cupboard placed under the instrument board, or in a stout leather bag, well protected from the jolts and jars of the road, below the driver's seat. Group (*b*) may be housed in a tool box, placed on the running board and fitted with lock and key. Group (*c*) must be instantly accessible without interfering with the load, or with any other tools, and may be stored in another toolbox on the opposite running board, or in a wooden box lined with felt below the driver's seat, or in a separate division of the cupboard suggested for the accommodation of the spare wheel. All three groups should be inspected at irregular intervals by some responsible member of the firm or departmental head, and all drivers should be instructed that no journey must be started unless tools are in their places and in good order.

The secret of good service lies to a large extent in regular inspection. When the electrical staff are working at high pressure all the week, it is difficult to find time when the vehicle and the inspector are both free. The difficulty may be overcome in many cases by arranging the transport schedule so that there is little work to be done on Saturday forenoon. The driver can then make any adjustments that are necessary, thoroughly wash down the body and clean up the engine, while the inspector can find time in which to check over details and ensure trouble-free service during the following week.

* In THE ELECTRICIAN of March 28th.

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ELECTRIC COOKING IN THE HOME.

Varying Types of Hotplates—Slow Boiling Problem—Advantages of Electric Kettles and Saucepans—Thermal Storage Cooking.

By HILDA L. DOVER, B.Sc.(London).

TO-DAY there are so many good and reliable electric cookers on the market that the deciding factor in the choice of a cooker is just a matter of individual taste as to design and finish. Of course, the cost has to be borne in mind, and until a more reasonably priced cooker with all the necessary additions included is put on the market, the electric cooker industry will not progress as rapidly as is desired. Such a cooker should be advertised in the daily newspapers on the women's page and in women's magazines, not once, but time after time with varying slogans such as :—Electric Cooking means Coolness, Cleanliness and Comfort in the Kitchen—Electri ccooking, means Joints more Juicy—Electric Cooking means Reliability of Results.

In spite of the attractive appearance of many electric cookers. there are some which are more practical in use than others, and it is advisable to keep these merits in mind when selecting a cooker. Every cooker manufacturer has his own particular method of construction of hotplate. Their efficiencies appear to be very good under ideal conditions but vary from

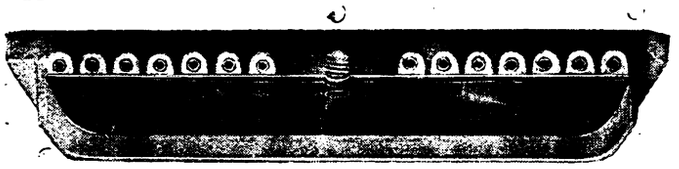

Fig. 1.— Section of Sadia hotplate.

time to time chiefly due to moisture. To ensure drying out any moisture the Hotpoint Company keep their hotplates at a temperature of 120° F. for several months before fitting them on their cookers. The most extensively used hotplate is the Sadia type, in which nichrome wire is imbedded in cement and fixed under a cast iron plate. The heat is transferred to the plate by conduction, and loss of heat downwards is reduced by a mica sheet held in place by a clamping plate. In this type of hotplate 35 watts per sq. inch can be dissipated with safety. Hotplates so constructed have an average life of at least two years. It was when the open type of hotplate was much more widely used that breakdowns were so frequent, and unfortunately the general public learned these facts and have not yet been educated up to the use of the enclosed type, or realised their reliability without any maintenance costs. Sadia plates can be obtained from 4½ to 11¾ in. in diameter as well as in square and rectangular shapes. These plates have three-heat regulation.

Many important cooker manufacturers use a similarly constructed type of hotplate. The Revo Company's latest enclosed hotplate simply plugs in and can easily be removed if defective. The Universal type merely requires a screwing motion and fits flush, thus no liquid can get between the element and the cooker. The Berry-McClary hotplate is clamped in, whilst the Magnet hotplate is fixed by a central bolt and wing nut. The average time for heating half a pint of water from 158° F. to boiling point on an enclosed cement filled plate of 1 600 watts loading was 6 minutes 50 seconds, and for one pint 8 minutes 45 seconds. This is rather loo long for the rush of civilisation of to-day so the cooker manufacturers are trying hard to reduce this time. The Revo Company with the Superspeed boiling plate of 2 000 watts loading can heat a half a pint of water from 156° F. to boiling point in 2 minutes 48 seconds, and one pint in 4 minutes 5 seconds. But this has only been effected by an additional cost of £5 per cooker. A transformer is fitted under the cooker and a very low pressure is used. Besides the cumbersomeness of the transformer there is an annoying buzz. In spite of these objections many hundreds of these plates are in use in various parts of the country—the Shropshire, Worcestershire and Staffordshire Electric Power Company hire out this plate in connection with the Revo cookers that they purchase.

To overcome the slow boiling problem an electric kettle should always be supplied with the electric cooker. At the Ideal Home Exhibition at Olympia the Hotpoint Company have been showing a new Calrod kettle with an automatic device for disconnecting the current when the water boils away. In addition to the electric kettle, a small saucepan with self-contained elements for boiling small quantities of milk, eggs, etc., is a valuable time-saving appliance. It is almost a necessity where no permanent help is kept.

However efficient the hotplate may be, good results will not be obtained unless suitable cooking utensils are used. When adopting electricity for cooking it is advisable to buy a new complement of saucepans. It will save much time and money in the long run. Supply companies should urge this when connecting an electric cooker for a new consumer and try to meet them with hire, hire-purchase or discount rates. The correct size of the utensil is the size of the hotplate ; heavy aluminium or cast iron is preferable, machine turned with perfectly flat bottoms, as 75% efficiency can be obtained from utensils with flat bottoms against 30% if the bottom is warped. In fact, a 20% saving in time and current can be made by using good saucepans of correct size. There is an urgent necessity for education in the actual method of cooking by electricity. This is apparent from the large variations which are obtained from consumers' meter readings. Cases are on record where the average energy consumption varies as much as 3 : 1 for similar households and apparatus.

It is generally accepted that heating by the enclosed or open hotplate is too slow—improvements in efficiency have been made since the war, but the expense has been enormous. An efficient hotplate is in use in Sweden by means of which two pints of water at ordinary temperature can be boiled in less than three minutes.

A little money spent by the manufacturers in educating women in the more scientific method of cooking, as with the Thermal Storage Cooker, would be more profitably spent than in gaining a small increase in hotplate efficiency.

The grill in most British made cookers is of the open type of element nichrome wire twisted in spirals is wound on porcelain. These elements are placed on the top of the cooker with the hotplates and in some case can be used for boiling as well as grilling. After about five minutes preheating the grill is ready for use. When the grill is on the top part of the cooker a door should be provided with a safety catch to prevent the door falling straight down and thus causing breakages. This cupboard can be very effectively used for warming plates and dishes. When grilling has to be done by means of the top element of the oven —as in the Universal and the Berry-McClary cooker—a plate rack or warm cupboard should be included in the equipment for the warming of plates when the oven is not being used or when it is being used for a roast. The disadvantage of the grill in the oven is that cakes and pastry cannot be cooked at the same time as the grill is being used. Breakfast cookers, as they are sometimes called, consist only of hotplates and grill. The Universal Portable Electric Cooker is an ideal cooker for a small flat or where the kitchen space is limited. It will cook perfectly a complete meal for four persons, only using 1½ units per hour full on.

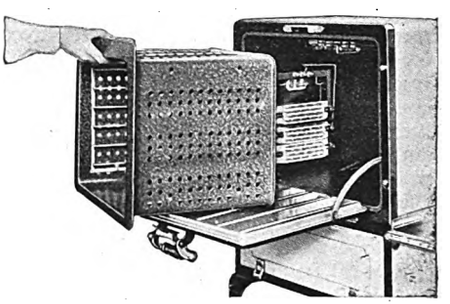

Fig. 2.—Interior of "Magnet" oven withdrawn, showing elements.

There are two schools of thought on the position of the elements in the oven, side and bottom heating, and top and bottom heating. The oven should be efficiently lagged. The facility with which the whole of the interior of the Magnet cooker oven is removed for cleaning is a great asset : the rounded corners and enamelled finish all add to its labour-saving properties. Most ovens are now fitted with a thermometer or temperature gauge. For small cookers a thermometer is far from essential, in fact, the automatic controlling device on the Universal Cooker is of much more use. It is essential that fuses be supplied for separate elements. The main switch should be put in a convenient place so that tall saucepans or steamers can be used or a plate rack can easily be removed for cleaning.

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SAVINGS AND PENSION SCHEMES.

The National Savings Committee's New Model Schemes.

SINCE the new model schemes 9 and 10 were introduced about a year ago by the National Savings Committee more than two hundred associations have adopted scheme 9 or a combination of 9 and 10. In the gas industry alone there are now over 80 such associations. In the belief that a number of firms and undertakings in the electrical industry will be interested in this method of providing for the old age of their staffs we give some particulars of these schemes.

The schemes have been designed so that the cost to the employer can be extremely low, so that even the smaller firms can participate. A feature of the schemes is that employees are left in complete control of their savings and of the interest earned; they can withdraw their certificates from the association at any time at their full value, and it is left entirely to them whether or not they join the scheme.

Scheme 9 includes a measure of group insurance. The weekly contribution of the employee can be fixed at any agreed amount not exceeding 4s. a week. On the basis of a weekly subscription of 1s. with an employers' guarantee to make up the member's savings to £200 in the event of death before his savings amount to that sum the employer's liability would diminish from £49 at the end of the first year to zero at the end of 15 years. This liability can be covered by a "Group Insurance" policy. The premium per individual on the above basis would range in the first year from 5s. 2d. for those aged 20 at entry to 11s. 1d. for those aged 45. These amounts would dwindle yearly to 2d. and 9d. respectively for the fifteenth year. Against these payments to the insurance company the income tax rebate allowable to the employer must be set. Assuming normal age distribution the average net cost to the employer over the 15 years would be about 4s. per annum for each employee or less than 1d. per week.

At the meeting of the executive of the Home Counties Alliance of the Federation of Master Printers—the printing trade has taken a particularly strong interest in these schemes—on April 1st it was unanimously decided to go forward with a scheme of group insurance for members of the Alliance, and that the Alliance would arrange insurance cover for firms which so desired.

Scheme 10 does not incorporate the insurance benefits guaranteed under scheme 9, the employers' contribution being applied to give one savings certificate for every agreed number of certificates purchased through the association by its members with their own money. The scheme has advantages where a large number of women or young people are concerned, and can be used as a means of accumulating a long service fund. This scheme was originally limited to employees whose pay does not exceed £300 a year or £6 a week, but this regulation has recently been amended so that the higher paid employees can, under certain conditions, now be included. Combinations of schemes 9 and 10 can be arranged to suit the needs of firms.

Several engineering firms, including some of the electrical manufacturing companies, have adopted savings and insurance schemes in conjunction with the National Savings Committee; the Isle of Thanet Electric Supply Co. is another instance.

A postcard, which need not be stamped, addressed to the National Savings Committee, Sanctuary Buildings, Westminster, S.W.1, will bring full particulars, or, if desired, a call from a representative competent to give full explanations.

BOOK REVIEWS.

The Electric Wiring of Buildings. By F. CHARLES RAPHAEL. (London: Sir Isaac Pitman and Sons.) Pp. 258. 10s. 6d. net.

After a period during which text-books on the subject of electric wiring were very few and far between, we seem to be entering now upon a period of a large number of such publications. There is, however, room for them all. This book by Mr. Raphael contains a preface in which the author refers to "patient reviewers of the technical Press who, failing some guidance from the author, would feel compelled with noble self-sacrifice to read the volume through from cover to cover before passing their opinion upon it." I, for one, have read this volume through from cover to cover, and feel grateful to one who, writing with very considerable authority upon a very important subject, has been the means of adding a valuable reference book to my shelves. This book embraces, all the details which the electrical contractor comes across in his everyday work, including a chapter on weak-current work, such as bells, telephones, fire alarms and radio—subjects which are too often omitted altogether from books which pretend to cater for the electrical contractor.

D. W. T.

Electrical Wiring and Contracting. Edited by H. MARRYAT. Vols. I, II and III. (London: Sir Isaac Pitman and Son.) Issued in weekly parts, price 1s. each part, and in volumes at 6s. each,

This is a work which should fill a long-felt want in the electrical contracting industry. It is, in particular, a happy idea to publish it in monthly parts at a shilling each.

The subjects to be dealt with will cover not only the practice of electrical wiring itself, but practically all the subjects which are in any way associated with this trade: Workshop science, drawing, electricity and magnetism, and alternating current work are dealt with in Vol. I, while Vol. II is concerned with d.c. generators and motors, mathematics, a.c. generators and motors, wires and cables, Further sections will combine to make what will ultimately be a most useful work of reference. Each section is written by an author especially competent in the subject under consideration.

The work is adequately illustrated by line blocks and half-tone blocks, while the sub-titles and page headings facilitate quick reference to any particular point. I have tested the book with several of the many problems with which the electrical contractor is apt to be confronted, and in every case I have found a reference to the matter. If the finished work is well-indexed—and, if the name of the publishers counts for anything, it will be—then eight very useful volumes will, I hope, be on the bookshelves of every contractor and consulting engineer and of many architects.

I think the most important aspect of the work, however, is one to which I have already made reference. The small and compact size of the monthly parts—crown 8vo.—coupled with the moderate price of one shilling, ought to make all apprentices, who are keen on their job, subscribe to this. In fact, contractors may go so far as to suggest to their apprentices that these books will help them on in their craft. Incidentally, the work has been arranged to follow as closely as possible the course of training drawn up by the Apprenticeship Committee of the City and Guilds of London Institute in conjunction with the Electrical Contractors' Association.

Finally, it is to be hoped that the existence of such a work of reference which is within everyone's means will materially assist in spreading the knowledge of electrical installation work to all those who should have some knowledge of the subject, and yet, owing to the absence of any satisfactory book, are left in ignorance.

Volume III opens with a section on Practical Wiring Work; is divided into two parts; it occupies just half of the volume and is in itself a very complete treatise on the subject. Section XII is on the subject of fittings and the last section in this volume, is on Primary and Secondary Cells.

D. W. T.

A First Electrical Theory. By H. W. HECKSTALL-SMITH. (London: J. M. Dent and Sons.) Pp. 372. 4s. net.

I believe that all schoolboys will like this book, and it is for schoolboys that it is written by a man who thoroughly understands their psychology. I myself should very much like to be in Mr. Heckstall-Smith's class at Stowe School. The author describes it as a text-book covering the school certificate, Matriculation and first M.B. examinations. It is, in fact, purely elementary, though even the elements of a subject like electricity can be very baffling to the student unless they are set forth in a particularly lucid way. The book is certainly lucid and it is full of humour. Perhaps the most striking thing about it is that the author tears himself away from the conventional water analogy for all things electrical, though he makes full use of analogies, some serious, some whimsical and some definitely comic. Beginning as he should with a highly readable chapter on molecules, atoms, electrons, protons etc., he follows the natural sequence of events until he bids good-bye to his reader—I sincerely trust it is only *au revoir*—on the platform of dynamos and motors and modern physics. The author treats us to what is really a sort of epilogue which he describes as a very short history of electrical science. The book is well illustrated and is handy in size. D. W. T.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Brilliancy Control of Electric Gramophones

[To the Editor.]

Sir,—In your editorial columns on April 4th, dealing with De Luxe Electric Gramophones, reference is made to "brilliancy control—for emphasising either high or low notes as desired." It may be of interest to state the reasons for such control. The upper musical register is sometimes defective due to a reduction in output from loud speakers and pick-ups, whilst the register below the middle of the pianoforte is represented at gradually decreasing strength on the record.

To secure equal response over the range 5 000 to 50 cycles, the lateral motion of the pick-up needle should increase inversely as the frequency. In practice, this occurs from 5 000 to 250 cycles, but from 250 to 50 cycles the lateral motion is constant. Hence at 50 cycles the voltage from the pick-up is $\frac{1}{5}$ its proper value and therefore the sound output is reduced to $\frac{1}{25}$.

Limitation of the sideways motion is essential to avoid increasing the diameter of the record. Also with grooves of the correct width the majority of pick-ups jump like performing fleas below 100 cycles, owing to the large lateral excursion.

At the National Radio Exhibition in 1929 Gambrell Radio introduced an instrument which, used with pick-ups like the B.T.H., Celestion, etc., gives perfect compensation in the lower register. In this instrument—due to the writer and known as the Novotone—a brilliancy or scratch control is incorporated so that the upper register can be adjusted by a 50 ohm rheostat to suit any taste.

This apparatus—the first of its kind—is connected between the pick-up and the amplifier. It can be used with any radio gramophone, whatever its price, with results which can best be described as "Realism from Records."—I am, etc.,

N. W. McLachlan.

Coventry Street, W.1.
April 8th.

Safety in Domestic Electrification.

[To the Editor.]

Sir,—On page 394 of The Electrician of March 28th at the bottom of the second column, Mr. T. C. Gilbert quotes a remark I made in your issue of August 15th, 1929, alluding to the hazards of independent earthing of portable domestic appliances in particular. In this connection it is of interest to note that the wiring system discussed in the writer's book* (also quoted by Mr. Gilbert) purposes to do away with independent earth-connections.

As a general rule, new installations are not passed by the supply undertaking until they satisfy the required insulation test, which test-figure usually represents the best condition of the insulation. "Ideal" insulation, referred to by Mr. Gilbert of the system and installation (which must be taken together), is commercially beyond the engineer's expectations.

A "complete" *permanent* system—insulation for new or old systems and installations for normal and abnormal operating conditions is what we should like, but as we are unable to guarantee this desired state, engineers must seek to do the remaining best thing for the safety of the public—effectively earth the system and installation.

Making every exposed part of fixed or portable appliances, fittings or apparatus, of insulation in place of metal does not guarantee the public a permanently danger-proof installation. As there can very rarely (or ever) be any such thing as a permanent fool- and danger-proof "ideal" insulated system and installation, experience has forced engineers to adopt the best-safest practice—namely, effective earthing.

For safety in domestic electrification we have to contend with three main and distinct sources of danger; those coming from the outside conductive system, from the inductive system, and from the domestic installation. In discussing the problem of safety or danger, Mr. Gilbert would seem to be under the impression that all dangers start in the domestic installation. And he would appear to specially condemn the earthed system instead of the earthing methods used.

For d.c. generation with underground distribution we have the simplest and safest conditions with the origin of danger nearest to the domestic electrification. For th ea.c. generated, transformed, and overhead (combined primary and secondary) distribution lines, we get a varied distinct set of danger conditions originating far from the domestic electrification.

System, operation and safety cannot be allied with "riding the earthing idea to death." Earthing is a real practical necessity, not an "idea"—it leads to safety, not to "death." And earthing should never follow fads, fancies, parrot practice nor the practice of cranks.

As a general rule, it is found cheaper and easier to maintain a sound, efficient and permanently earthed-neutral system than to maintain a sound and permanent highly-insulated system. For a.c. step-down supply, earthing is the cheapest, most permanent safe method for general public use.

The installation of improved domestic-installation *insulation* does not definitely solve the danger problem—many of the possible and probable dangers to domestic installations come from without. Earthing does definitely solve the danger problem, and it is up to the engineer to mitigate the failure of earthing devices and adopt that system of wiring requiring a minimum of such devices for a complete domestic electrification.

Troubles and misunderstandings should more often centre around the defective installation and not the system to which it is connected. Instead of blaming the wiring, fittings, method of earthing, the high domestic voltage, etc., Mr. Gilbert apparently throws the blame on the earthed system. He admits that: "A large proportion of accidents are due to the failure of earthing devices." But he prefers scrapping the earthing system to correcting the defective installations. He would sooner centre attention on increasing domestic *insulation*. Of course, all engineers are in favour of increasing the insulation on the insulated part of a system or/and installation. Installing a 230 V (insulated) circuit with, say, 3 300 V insulation is in the direction of better protection, but such a precaution is unwarranted, and, where an overhead supply steps-down from 6 600 V or higher voltage, this unnecessary and commercially-impracticable insulation may not guarantee absolute safety for all time under prevailing portable-appliance conditions any more than the ordinary-insulated 230 V-to-earth system would do. In the book* referred to by Mr. Gilbert, many possible dangers are discussed and the writer hopes that every interested electricity supply engineer will find time to study the discussion on earthing of systems and installations given therein.

It certainly is the duty of the industry to study more of, and evolve, methods of protection. The writer has no hesitation in saying that proper wiring installation and earthing of the domestic services and the system will provide the best and surest method of protection. In the book quoted* the writer proposes a new method of domestic electrification for affording better protection with a cheaper installation.—I am, etc.,

William T. Taylor.

Worthing.
April 3rd, 1930.

[*Further letters on this subject have had to be held over until next week owing to exigencies of space.*—Ed.]

Zweigberk's Multiple Unit Train Control.

[To the Editor.]

Sir,—May I be permitted to add to your references to the greatly lamented T. Von. Zweigberk's contribution to electric traction?

Your own remarks omit reference to his multiple unit system of train control in which the main feature was the use of solenoid contactors with *series* as distinct from shunt magnets. These units were energised by the return current from the train motors, which was either passed through all the control magnets on the train to earth at the rear of the train or diverted to earth in front of the train.

The immense advantages of this system were that no current was broken in the controller, but only by the contactors with the metallic shield blow-outs, and that the control wires were at earth potential at all times.

When I inspected this system in 1907 and prepared a description for my old paper The Electrician, which was published on April 19th and 26th of that year, the opinion was expressed that this system would be universally adopted on d.c. trains. It seems strange that our prophecy has not been fulfilled.—I am, etc.,

W. E. Warrilow.

Oxhey,
April 12th.

* "Electricity Supply Transformer Systems, Etc." Published by Messrs. Charles Griffin and Co., Ltd., London, W.C.2.

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NEWS IN BRIEF.

Electrical Vote-Recording—Press Telephone Communication with Russia—Czechoslovakia's Electrical Imports—Road Traffic Signals for Bradford.

THE number of hired cookers connected to Manchester Corporation's mains in February, 1930, was 75, making a total of 6 019.

Telephone communication between Paris and Saigon (French Indo-China) was made available to the public last Saturday.

The annual general meeting and luncheon of the South Wales and Monmouthshire E.D.A Area will be held at the Royal Hotel, Cardiff, on May 1st.

The annual general meeting and luncheon of the South-West E.D.A. Area will be held at the Royal Hotel, Bristol, on April 24th. The principal guest will be Mr. H. Marryat.

The revised estimate of the surplus on the past year's operation of the London County Council's tramways department is £52 570, and it is estimated that the surplus for the current year (1930–1931) will be £89 411.

Eastbourne Electricity Committee has decided that inquiries be made into "wireless transmission of electrical energy."

A suggestion that electric vote recording apparatus should be used at London County Council meetings is to be considered.

Glamis Castle, the home of the Earl and Countess of Strathmore, is to be fitted for electric lighting. The work has been entrusted to Lowden Brothers and Co., Ltd.

At Maesteg Police Court last week, three defendants were find for obtaining electricity without payment, by attaching a wire on the mains' side of the meter.

The 15th Highland Light Infantry, which was mainly recruited from the Glasgow tramway employees, held a commemoration service at the Cenotaph, George Square, Glasgow, last Sunday.

The Post Office has compiled geographical statistics of wireless licence holders. There are 541 000 in London, 304 000 in Lancashire, 252 000 in Yorkshire, and only 195 000 in Scotland and 30 000 in Northern Ireland.

The Heriot Watt College, Edinburgh, provides full-time day diploma courses in mechanical, electrical and mining engineering. The entrance examination will take place on April 22nd and 23rd, and the courses commence in October.

Lt.-Col. A. A. Jayne, postmaster-surveyor for the Leeds and West Riding district, stated at a meeting of the Leeds Rotary Club, last Friday, that the Leeds office was to be equipped with the latest high-speed telegraph apparatus, at a cost of some thousands of pounds.

Mr. J. A. Crabtree will speak at the annual dinner of the Business Research and Management Association, to be held at Anderton's Hotel, London, on May 1st. His subject will be "Research the Foundation of Successful Business Building," and tickets can be obtained from Mr. H. A. Haylett, hon. sec., 50, Bushey Avenue, Snaresbrook, London, E.18.

At a meeting of Birmingham "Safety First" Council, on April 10th, Mr. O. C. Power said the only solution of the trouble of glaring headlights on vehicles was that all such vehicles should be fitted with dip and swivel lamps. Mr. J. Howell mentioned that Birmingham tramways department was experimenting with automatic signalling at the rear of tramcars and omnibuses.

Preliminary arrangements are in hand for a direct London-New York submarine cable, and it is stated, in the annual report on telephone and telegraph progress which was approved by Glasgow Chamber of Commerce Telephone Advisory Committee last week, that the new cable which it is proposed to lay between Glasgow, Ayr and Stranraer will form a link in this service.

The City telephone exchange, London, was closed down for six minutes on one day of last week, while the staff carried out fire drill.

Dundee Transport Committee has granted the tramwaymen two extra days' holiday with pay. This concession is to be made at once.

A tender amounting to £1 233 has been accepted for the supply of X-ray apparatus for the new out-patients' department of the Herefordshire General Hospital, Hereford.

It is stated that the Russian Government authorities have now rescinded the restrictions which were at first imposed regarding press communications through the newly-opened Berlin-Moscow telephone service.

Czechoslovakia's imports of electrical machinery and apparatus, in January and February of this year, were valued at 70 000 000 crowns, compared with 50 000 000 in January and February, 1929.

The electric lighting at London County Council's Plumstead and District Hospital is to be improved, at a cost of £815.

Bradford Watch Committee has authorised the provision of automatic road-traffic signals, and will invite tenders for their installation and maintenance.

Cheltenham Corporation has informed Mr. Shakespere Shenton, who requires a 60-cycle supply for the exhibition of sound films at the Winter Garden, that the Corporation is not yet in a position to complete the change over.

The Hull City Analyst has advised the City Engineer that he is of opinion that if a Ringrose electric lamp detector is employed, it will give valuable information as to the safety of air in sewers. The City Engineer has been authorised to purchase such a lamp.

It is stated that the overhead transmission of electricity in connection with Doncaster's railless trolley vehicle system is interfering with wireless reception in the district. The Borough Electrical Engineer has devised means which it is believed will remedy the trouble.

Recently published statistics show that machinery installed in industry in South Africa in 1921 amounted to about 700 000 H.P., of which 21% was electrically operated. In 1928, the total was 1 050 000 H.P., the electrical percentage being 27. Electricity generated in 1927 was approximately 1 900 000 000 kWh. Electrical apparatus and machinery imported in 1928 was valued at £2 493 365, compared with £984 369 in 1922.

Imports into the Irish Free State in February, 1930, included electrical goods valued at £41 402, compared with £30 886 in February, 1929. For the two months ended February 28th, 1930, the value of such imported goods was £91 497, against £71 690 in the corresponding months of last year. Exports from the I.F.S. in January and February last included machinery and electrical goods amounting to £119 596, against £14 287 in the same months of 1929.

At last week's meeting of the Society of Engineers, Mr. R. Borlase Matthews read a paper on "Rural Electrification and Electro-Farming in Great Britain." Electricity supply for farms, he said, would mean a considerable addition to the amenities of country life, and would induce many urban industries to migrate to the countryside. The mains of large towns should be extended until they met the mains of the neighbouring towns. There were many localities which had not supplies, although authority to supply had been given. Supplies had been given by 95 local authorities in 521 parishes, out of 1 397 authorised and by companies in 914, out of 3 085 authorised!

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of April 17th, 1880, contained a reference to possibly the first attempt in this country to use the telephone for summoning cabs. "We understand (the paragraph read) that the Sheffield Telephone Exchange Company intend applying to the Corporation for permission to fix in the immediate vicinity of one of the central cab stands a small signal box so that subscribers may be able to call a cab or a hansom at any moment."*

The application of the electrotyping process to the making of statues in bronze was recorded in the same issue.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of April 21st, 1905, it was recorded that a conference attended by over 100 delegates had decided to form a "Society of Post Office Engineers."*

The Governor of the Upper Senegal and Niger Territories, French West Africa, arrived in Paris, his visit being partly in connection with plans for constructing a telegraph line across the Sahara from Algiers to Timbuctu and Lake Chad.

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PERSONAL.

MR. R. A. Parsons has been elected President of the Gloucester Chamber of Trade.

Watford Town Council has fixed the maximum salary of Mr. A. W. Barham, chief electrical engineer, at £1 250 per annum, the sum he is at present receiving.

Estate of the gross value of £26 596, with net personalty £20 789, was left by the late Mr. Walter Fearnside, Irvine, consulting electrical engineer Cape Electric Tramways, Ltd.

Carnarvon Corporation, which recently took over the local electricity generating station from the National Electric Construction Co., has appointed Mr. A. C. Pike as resident manager.

Mr. Charles James Barker has retired from the firm of Barker Bros., electrical and general engineers, of 91 and 92, Westgate, Grantham, and the business will be continued by Mr. J. W. W. Barker.

Mr. John A. Sumner, assistant engineer to the Mid-Cheshire Electricity Supply Company, Northwich, has accepted the position of distribution engineer on the staff of the chief engineer and manager of the West Midlands Joint Electricity Authority.

The London County Council Highways Committee recommends that Mr. J. F. Sinclair be appointed rolling stock engineer in the tramways department, at an inclusive salary of £1 000 per annum, rising by annual increments of £50 to £1 200 a year.

Mr. Ben Turner, Secretary for Mines, has appointed Mr. R. W. Glass and Mr. Frank Lee to be members of the Safety in Mines Research Board to fill the vacancies caused by the retirement from the Board, under the rotational scheme of retirement, of Sir John Cadman and Mr. A. M. Henshaw.

Mr. Douglas Hays, general manager and director, the Scottish General Omnibus Co., Ltd., has resigned, following the acquisition of the concern by the Scottish Motor Traction Co., Ltd., and has been appointed manager of the transport undertakings owned by the Midland Counties Electric Supply Co., Ltd.

Application has been made by the Mersey Tunnel Joint Committee for the services of Mr. P. J. Robinson, city electrical engineer, Liverpool, in a consultative capacity in connection with the lighting and power supply of the new Mersey Tunnel. The Electricity Committee has adopted a resolution granting the request and authorising Mr. Robinson to retain any fees which might accrue.

Mr. J. K. Bruce, general manager of London County Council Tramways, who has been in ill-health for some time, has been certified by the Council's medical examiner as permanently unfit to carry out his duties. The General Purposes Committee recommends that Mr. Bruce's retirement shall take effect from June 30th, with a pension of approximately £805 per annum, plus a lump sum of £2 426.

Capt. H. G. Bell has been appointed by the Central Electricity Board to be technical assistant to Mr. Robert Blackmore, chief engineer for the North-Western England Electricity Scheme. Capt. Bell received his technical training at the Manchester College of Technology, including a post-graduate course of research work on commutator problems at heavy overloads. Since the war he has had a variety of interesting experiences with the Metropolitan-Vickers Electrical Company. For two years he was the company's liaison engineer with the Westinghouse Company in America, and on his return was made responsible under Mr. A. P. M. Fleming for the design and operation of the original 2ZY at Trafford Park. Subsequently Capt. Bell was chief assistant designer of the radio apparatus developed by the Metropolitan-Vickers Company. For the last four years he has been engaged on the design and application of protective equipment for power transmission systems, and is joint author, with Mr. T. W. Ross of a paper on this subject presented to the I.E.E. during the present session.

Obituary.

MR. JAMES M. INGLIS on April 6th, aged 67 years. He had for many years been in business as an electrician in Edinburgh.

MR. JOHN JAMES ARMSTRONG, on April 8th, aged 58 years. He was for many years connected with the Eastern Telegraph Co.

MR. SYDNEY LUKE SMITH who, 15 years ago, joined the Western Electric Co., now Standard Telephones and Cables, Ltd. Recently he spent several months in reorganising the telephone system in Madrid.

BUSINESS ITEMS.

THE Birmingham address of the FOSTER ENGINEERING CO., LTD., has been changed to 12, Newmarket Street.

The LONDON ELECTRIC FIRM, Brighton Road, South Croydon, is now in process of increasing the size of its works.

The Birmingham address of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., is "Wellington House," 39, Bennetts Hill, Birmingham.

The London office of DANIEL ADAMSON AND CO., LTD., turbine and boiler engineers, has been moved to Craven House, 16, Northumberland Avenue, W.C.2.

W. F. DENNIS AND CO., 70, Queen Victoria Street, London, E.C.4, have resumed the sale of solid and flexible copper rail bonds, "Neptune" brand, manufactured by Messrs. Felten und Guilleaume, Carlswerk, A.G.

The CURTIS MANUFACTURING CO., LTD., wish us to state that their only works and offices are at Conduit Place, Paddington, W.2, and 32, Spring Street, Paddington, W.2, respectively, and that they have no connection with any other firm of similar name.

The Aktiebolaget Separator, of Sweden, has concluded an agreement for co-operation with the General Electric Company of New York, whereby the Swedish company has taken over the agency for Sweden for the electrical refrigerating apparatus Santo.

Confidential reports on the market for secondary and primary batteries in Uruguay and Colombia have been prepared by the Department of Overseas Trade, and issued to firms whose names are entered on its special register. United Kingdom firms desirous of receiving a copy of the reports, with particulars of the special register service and form of application for registration should communicate with the Department of Overseas Trade, 35, Old Queen St., London.

The Greek Government has ordered from MARCONI'S WIRELESS TELEGRAPH CO., LTD., three of the latest type duplex telephony and high-speed telegraphy Marconi stations, to be erected, one in or near Athens, with duplicate plant, one on the island of Crete, and the other on Chios. A similar Marconi station, but working on telegraphy only, is also to be installed to exchange messages with ships. The equipment of this station will include a direction finder.

A report on the market for secondary and primary batteries in Australia has been prepared by the Department of Overseas Trade from information furnished by the Trade Commissioner in Australia and issued to firms whose names are entered on its Special Register. United Kingdom firms desirous of receiving a copy of the report, together with particulars of the Special Register service, should communicate with the Department at 35, Old Queen Street, London, S.W.1.

H.M. Senior Trade Commissioner in Canada and Newfoundland has forwarded to the Department of Overseas Trade copies of the Canadian Electrical Code, Part I, Second Edition, giving the essential requirements of minimum standards governing electrical installations for buildings, structures and premises in Canada at voltages up to 5 000. A copy of the code is available for inspection at the Department of Overseas Trade, London, or the Department will obtain further copies for firms at a cost of 1s. 3d.

"MOVIE" ENGINEERS.

First Annual Dinner—Electrical Development in the Film Industry.

THE London Section of the Society of Motion Picture Engineers held their first annual dinner on April 10th, at the May Fair Hotel, London, when Sir Oliver Lodge, F.R.S., was the guest of honour. Mr. S. Rowson, chairman of the Society, presided, and, following the dinner, an historical display of films was shown illustrating the progress made from 1896, when the first public exhibition is recorded, up to the present time, represented by "Mickey's Choo Choo." Included in this display was a lecture film explaining and illustrating the principles of sound recording and reproduction by the Western Electric Co., Ltd.

There was also included an exhibition of apparatus relative to the film industry, including an optical magnifier for the examination of records, a model of a photographer's sound recording system, a magnetically operated mercury-vapour clock, double turntable cinema musical equipment, a rapid visual method of measuring the reverberation in a hall, and high-power amplification equipment.

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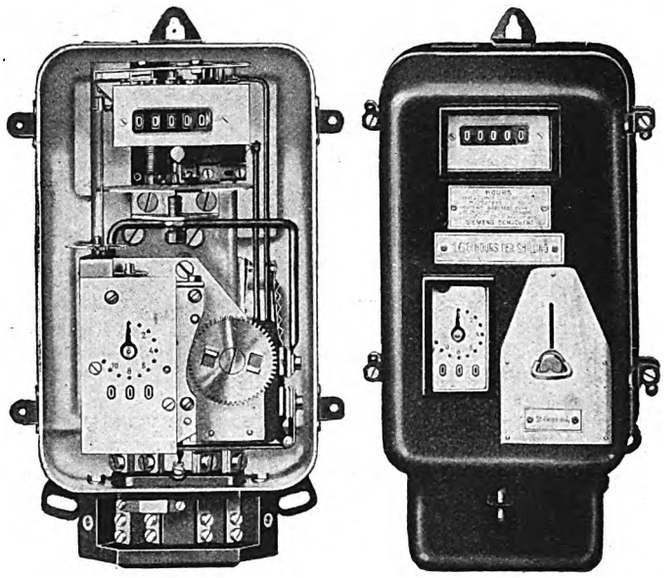
AUTOMATIC COLLECTION.

New Apparatus for Collection of Fixed Charge.

AN apparatus has been designed by Robert Hornby and Co., Ltd., 77, Dean Street, London, W.1, to permit of a house service being connected to the supply authority's



Internal and external views of the Hornby automatic collector.

mains for a definite period for each shilling inserted in the slot. If, for example, the agreed amount to be prepaid is 1s. per week, then on the insertion of one shilling into the automatic collector the house service is connected to the supply mains for a period of 168 hours, and at the end of this time the switch automatically opens and the house remains disconnected from the mains until the insertion of another shilling.

Should the charge be, for example, 1s. 6d. or 2s. per week, the automatic collector is so calibrated that for each 1s. at the 1s. 6d. per week rate 112 hours will be obtained, and for 2s. per week 84 hours per shilling, and so on, to perhaps 6s. per week. The automatic collector as at present is only suitable for a.c. supply up to 20 A connected load, although it is contemplated making the apparatus suitable for 50 A connected load.

One object of the apparatus is to enable supply authorities to have capital charges prepaid, and they can sell either through a slot meter, or an ordinary quarterly meter, the current consumed at a flat rate, irrespective of the purpose for which the current is used. The collector is also useful in connection with the hire purchase of expensive electrical apparatus, as for example:—A consumer buys some current consuming apparatus worth £15 or £20, and the hire purchase rate agreed to is 2s. 6d. per week, then this amount can be added to the capital charge, which is, say, 1s. per week, the collector being set to collect 3s. 6d. per week, or 48 hours use of the installation for each shilling inserted in slot.

It must be clearly understood that the automatic collector takes no account whatsoever of the amount of load. It merely connects the installation to the mains for a definite period from the time of the insertion of the shilling, and this fact must be borne in mind in fixing the capital charge per week. In the case of very small consumers, where the standing charges are out of all proportion to the possible consumption of units, the automatic collector could very well take the place of the house service meter if used in conjunction with either a current limiter or fuses designed to limit the maximum demand; then the consumer can be given a supply at a fixed sum per week, this sum covering the overhead or standing charges and its probable consumption within the limits of the fuses or other device for limiting the maximum demand. The collector as at present designed is uniform with the standard slot meter as regards dimensions and outward appearance, and is provided with one counter which integrates the hours, and a second counter indicating the total number of shillings passed through the slot, besides an indicator showing the number of shillings to the user's credit at any particular time.

TELEVISION EXHIBITION.

Number of Exhibits Nearly Four Times Greater than Last Year.

THE second annual exhibition of the Television Society was opened at University College, London, for one day, on April 9th, when over 20 Fellows, Members and Associates exhibited. A number of televisors were shown, constructed for the most part on the Baird principle of mechanical exploration. One of the exhibitors, Capt. R. Wilson, in collaboration with Mr. E. L. Gardiner and Mr. A. A. Wates, operated a transmitter of his own design and this by means of land lines enabled a number of televisors to be shown under working conditions. During the afternoon the Tuke trophy was awarded to the three exhibitors named in connection with the transmitter referred to.

Complete receivers were shown by Mr. H. J. Peachey (Associate), Mr. C. E. C. Roberts (Student), Mr. Colin P. Garside (Student), Mr. S. G. Foord (Student), and Mr. Ian Vaughan-Jones (Student). Mr. Peachey's exhibit was perhaps the most ambitious. It consisted of a 3-valve set for speech and a 4-valve set for vision signals, both loose-coupled to one aerial and earth. Mr. Garside's machine was fitted with a phonic-wheel synchroniser; Mr. Foord paid particular attention to motor speed control, using rheostats with coarse and fine adjustment; Mr. Vaughan-Jones used two driving motors, each being a four-volt machine, working in parallel.

Mr. C. E. C. Roberts also showed a new television system dispensing with mechanical parts, consisting of a model transmitter and a number of receiving valves. Mr. H. S. Ryland (Fellow) specialised in selenium and his exhibit consisted of a "Selenium Organ" together with a range of selenium cells which he had made. Mr. G. G. Cato (Associate) showed working a simplified form of transmitter and receiver, on the Baird principle, but with the difference that the receiving disc had one more hole than the transmitting disc and was run at a slightly slower speed. Mr. R. W. Corkling (Associate) exhibited an apparatus of his own invention named a "Televidascope"; it was a compact form of television receiver utilising drum exploring, which, when connected to the output of an ordinary vision receiver, enabled a number of people to see at once. A darkened room was not essential when using this form of receiver and it is suggested that it is also suitable for the cock-pit of an aeroplane. A colour televisor, worked on the Baird principle and movie picture apparatus for use with talking-pictures of the "Fox" movietone type were shown by Mr. Martin Woodroffe (Fellow). Among other exhibits were various models of synchronising apparatus by Mr. C. P. Garside (e.g. synchronising two d.c. motors by coupling small magneto alternators to each); a pendulum synchronised disc shown by Mr. John Woolley (Associate); wireless receivers specially designed for television signals by Mr. W. C. Fox (Fellow) and Mr. W. J. Richardson. Honourable mention in the competiton for the Tuke trophy was awarded to the Southend Circle, represented by Mr. R. I. Cowley, Mr. D. L. Plaistowe, and Mr. A. R. Knife, for a variety of exhibits, and to Mr. H. J. Peachey. The judges were Professor F. J. Cheshire, Dr. Clarence Tierney, and Dr. H. Monteagle Barlow. The president of the society, Professor Sir Ambrose Fleming, visited the exhibition in the course of the day and paid tribute to the progress of which it gave evidence. The attendance, we understand, was considerably greater than was the case at last year's exhibition.

THE SOCIAL SIDE.

ON Friday, April 4th, a large number of the staff and workpeople of the Liverpool Electric Cable Co., Ltd., met to see the final game of the company's Billiards Spring Handicap. After presenting the cup to the winner, and other prizes, Mr. T. H. Tweedle, the works manager, handed a gold watch to Mr. Charles Moloney, the honorary secretary of the Sports Club, which had been subscribed for by all departments, and congratulated him on his 21 years of hard work, cheerfully undertaken in the interests of sport. In acknowledging, Mr. Moloney, who was received with much enthusiasm, briefly reviewed the work which had started in pre-war days with a football team only, whereas now there were also strong cricket and bowling teams in the field, and what had been particularly gratifying to him was the fact that he had always been fortunate in getting the whole-hearted support of the members, and further, that it was a great satisfaction to record the successes attained and the high standing in the local league contests.

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IN PARLIAMENT.

L.C.C. Charing Cross Bridge Bill before a House of Commons Committee.

A HOUSE of Commons Select Committee has proceeded with the consideration of London County Council's Charing Cross Bridge Bill during the past fortnight. Mr. Frank Pick, managing director of the Underground railway companies and the London General Omnibus Co., said the District Railway station to be constructed at the Embankment would be in one of the arches of the new bridge. In 1929, 36 378 000 passengers used the Charing Cross District Railway station. Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., and formerly general manager of the Great Western Railway Co., said, from a purely passenger traffic point of view he did not think the Southern Railway Charing Cross station should be moved. The Lion Brewery site (at the Lambeth end of the present Charing Cross bridge) was better than any of the alternatives that had been discussed. He would like a Royal Commission to consider the whole question of the London railway termini. On Thursday of last week the Chairman announced that while the Committee were prepared to find the preamble of the Bill proved, they would accept the scheme on the north side of the river provided that Westminster City Council and the London County Council agreed to terms by which the necessary widening of St. Martin's Lane was accomplished before the bridge was opened. So far as the Southern Railway are concerned, they are in a sense the promoters of the Bill and yet not the actual promoters. The Committee fully accepted the position of the Southern Railway that they would rather remain where they were and not have to move. The Committee thought the best course was to adjourn for, say, a month—the London County Council to consider with the Southern Railway whether they could find some different site for the railway. The Committee will meet again on May 6th.

Scottish Central Power Company's Bill.

The Unopposed Bills Committee of the House of Lords considered last week the Bill promoted by the Scottish Central Electric Power Co. for an increase of capital and other purposes. The Bill, which was passed for third reading, seeks authority to increase the existing capital by £400 000 to £1 000 000 and the borrowing powers of the company from £200 000 to £500 000.

Replies to Questions in Parliament.

In reference to the inquiry held last July into the Dorking Electricity Order, the Minister of Transport says he is not satisfied that the proposals of the Order as it stands are in the best interests of the development of the electricity supply in Dorking and neighbouring areas, and at his request the position is being discussed by the Electricity Commissioners with the promoters and other parties concerned with a view to making further proposals.

In reference to an inquiry in the House of Lords whether the Government would give every possible facility to Imperial and International Communications for research and experimental work in connection with wireless telephony, Earl Russell said the Postmaster-General had certain obligations to see that experiments did not cause interference with other wireless stations. Subject to that, he was willing to do all he could to assist or permit research of that nature.

The total overall cost of providing public telephone services with Canada, South Africa, India and Australia, by means of the Post Office radio stations at Rugby and Baldock, is estimated at £43 000 a year. This cost includes £4 000 a year for existing costs at Rugby and Baldock, making a net additional cost for the Dominions services of £39 000 a year. With regard to the questions that were put to the two experts consulted on the subject of oversea wireless telephony—broadly, the questions were intended to elicit whether the high aerial system or the lower aerial system as used at Rugby was likely to prove the more effective—the experts reported that both systems were probably equally capable of providing satisfactory telephonic communication between two points for a given number of hours a day. As regarded future development, the adoption of the more elastic system—the Rugby system, with the lower masts—would be advantageous, since equally satisfactory results could be attained with a smaller expenditure of money, and the provision of alternative wave-lengths was likely to be more cheaply made with the relatively low mast system.

"E.T.B.I." HOUSE.

Further Novel Competition in Aid of Electrical Charity.

SO successful did last year's Cable Competition prove to be that the Electrical Trades Benevolent Institution has decided to launch another competition. This year the competition bears the title E.T.B.I. House and takes the form of "brick" buying. Each book of bricks contains forty sixpenny bricks, each brick representing a donation of 6d. to the funds of the Institution. Each purchaser of a brick is entitled to one free entry in the competition for which a number of valuable prizes have been given. To win a prize all that is necessary is to forecast the district in which the most bricks will have been sold by October 1st next, and also the total number of bricks which will be sold in all districts. Full particulars are given on the back of the bricks.

The closing date of the competition is October 1st and all particulars can be obtained from Capt. J. T. Keeping, secretary, E.T.B.I., 9, Southampton Street, London, W.C.1.

PRELIMINARY PRIZE LIST.

	Presented by
Terminals, Battery Cord, etc.	Belling and Lee, Ltd.
Brownie No. 2 Crystal Receiver; Wave Trap and Selectivity Unit	Brownie Wireless Co., of G.B., Ltd.
Magnum Wave Trap	Burne-Jones and Co., Ltd.
Celestion A2 Ebony Loud Speaker	Celestion, Ltd.
Cryselco Goods value £3 3s.	Cryselco, Ltd.
Six prizes each of a Durham-Duplex Razor	Durham-Duplex Razor Co., Ltd.
Godwinex (1930) Model Eliminator	J. Dyson and Co., Ltd.
Ediswan Raymond Fire; Ediswan Kettle; Electric Iron	Edison Swan Electric Co., Ltd.
Electrolux Model XI Portable Cleaning Outfit	Electrolux, Ltd.
Eltron Electric Heater	Eltron, Ltd.
Audio Frequency Transformer	Ferranti, Ltd.
Electric Iron (6 lb.)	J. Fotheringham.
Pedestal Cone Loud Speaker; Lamp Standard	General Electric Co., Ltd.
L.F. Transformer or Mains Choke	Graham Farish, Ltd.
Noritake Table Standard Lamp with Hand-painted shade	L. G. Hawkins and Co., Ltd.
Six Prizes each of 1 dozen Henley Tennis Balls	W. T. Henley's Telegraph Works Co., Ltd.
Ensign All Distance Folding Camera	Houghton-Butcher Mfg. Co., Ltd.
Mahogany Loud Speaker	L.E.S. Distributors, Ltd.
Italian Alabaster Bowl	Marryat and Place.
Two Prizes each of a Mullard Speaker type "C"; Two Prizes each of a Mullard Speaker type "H"	Mullard Wireless Service Co., Ltd.
Ormond Loud Speaker	Ormond Engineering Co., Ltd.
Two Prizes each of Loud Speaker (No. 2026)	Philips Lamps, Ltd.
Players Cigarettes	John Player and Sons.
Electric Iron	Francis Polden and Co., Ltd.
Electric Iron	Premier Electric Heaters, Ltd.
Electric Iron	John Shaw and Son (Wolverhampton), Ltd.
Six Prizes each of a Waterman's Fountain Pen	L. G. Sloan, Ltd.
Stuart Model Electric Launch "Magician"	Stuart Turner, Ltd.
Ultra Violet Ray Lamp No. 4	Sun-Vi-Lite, Ltd.
Set of 2V Tungsram Barium Valves	Tungsram Electric Lamp Works, Ltd.
Two Prizes each of a 2 V Accumulator	Van Raden and Co., Ltd.
Stop Watch	Venner Time Switches, Ltd.
Radio Components value £3 3s.	Ward and Goldstone, Ltd.
100 W Lamp Fitting	Wardle Engineering Co., Ltd.
Slow Motion Condenser	Wingrove and Rogers, Ltd.
Table Standard Lamp with Fittings	Wood Fittings and Standards, Ltd.
Three Prizes each of an Electric Warming Bottle; Electric Heating Pad	A. E. G. Electric Co., Ltd.

INDIVIDUALIST LUNCHEON.

Sir Arthur Balfour on Home Influences and the British Empire.

THE characteristic of "individualism" which existed in British life was traced to the influence of mother and home by Sir Arthur Balfour when he presided over the 33rd "Individualism" Luncheon at the Hotel Cecil, London, on April 9th. There would be no British Empire, he claimed, but for this individualism, and he honestly believed that unless we went back to old conditions and spent more time at home, thus preparing to face the difficulties of the day, those difficulties were likely to increase rather than decrease.

Sheffield, whence he came, had suffered more than any other town in the country from post-war readjustment, but the businesses which were maintaining their trade were nearly all family businesses. Some great amalgamations had failed, he thought, because at the critical moment the individual big and broad enough to guide those amalgamations through their teething stage did not exist. We in Britain had to face the very grave problem of adjusting our production costs to a point at which the world would buy from us freely. During the time when the nation was the biggest centre of production in the world we tied round our necks all kinds of millstones in the form of demarcation problems and social services. These were well enough in themselves, but nowadays unless we could face the competition of the world we should not maintain our trade or standard of living.

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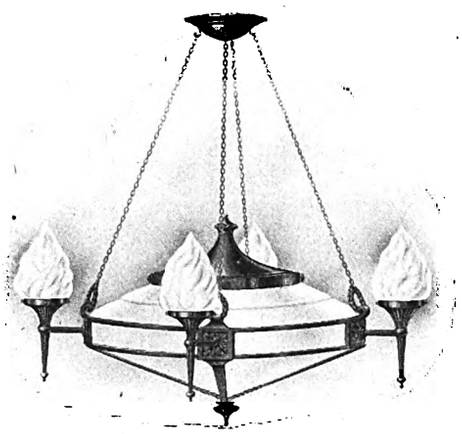
DOMESTIC ELECTRICAL APPLIANCES.

New Items of Interest in the Domestic Range—Tungsten-Cored Filament Valves—Further Spring Trade Possibilities.

AMONG the new appliances of interest to the electrical contractor and supply authority may be mentioned a new design of "Xcel" fire of outstanding merit and cheap in price called "The Homely." It is made by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38, Upper Thames Street, London, E.C.4, in 1 and 2 kW sizes, standard finish black stove enamel, and is also supplied in porcelain enamelled finish in six different colours. All the fires are fitted with earth terminals and 6 ft. of flex. They are useful models to put forward for some of the bigger schemes such as municipal housing, etc., and they are also particularly suitable for hotels and similar work.



One of the new fittings by Hailwood and Ackroyd, Ltd.

Two new lighting fittings have been introduced by HAILWOOD AND ACKROYD, LTD., of Morley, Leeds, in the shape of a wall fitting with silk hanging cord and tassel, the design being raised in relief on a frosted base: the second fitting is made up of a "Hailwood" bowl, supported and enclosed in ornamental metalwork with four flambeau lights incorporated. The design is original and a very pleasing effect is obtained whether the glassware is plain, tinted or decorated. The metalwork can be obtained in any finish of brass, bronze or oxidised metal.

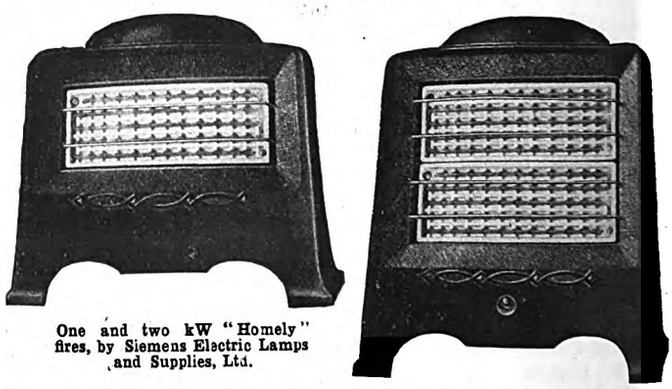
A new h.t. radio battery is announced by the EVER READY CO. (GREAT BRITAIN), LTD., of Hercules Place, Holloway, London, N.7. It is known as the "High Power Sixty," and is claimed to give 40% greater service on high emission receiving sets than the company's "popular power" batteries, though the increase of price is only slight. The battery is sold in 60 V units only, intermediate tappings being at 15, 27, 39 and 51 V. The size is 13¾ in. by 5½ in. by 3⅞ in., the weight is 14 lb., and the battery is designed for 20–25 milliamp discharge.

We have obtained details from the MIDLAND ELECTRIC MANUFACTURING CO., LTD. (Barford Street, Birmingham) of their "M.E.M. small fuseboard." This board has been designed to eliminate the trouble and expense of drilling iron cases or end plates, and it can be handed to the workman ready for erection upon any type of installation. Each board is drilled with two holes for mains, one top and one bottom, and the hinging of the door is reversible, so that it is possible to adapt the standard boards to any of the following arrangements:—All circuits and mains at top; all circuits and mains at bottom; all circuits at top, mains at bottom; all circuits at bottom, mains at top; all circuits at top, mains at top and bottom; and all circuits at bottom, mains at top and bottom. All holes are stopped by a pressed steel disc, and, as the cases are enamelled after assembly, the holes remain dustproof and watertight. It is only necessary to knock out the discs as required—the holes are clearance size for conduit, which is fixed by internal and external lock-nuts. When special cables, such as C.T.S. or lead-covered, are used without conduit, the holes are suitable for standard nipples and nuts. Other features of the fuseboard include direct-pressure contact between main cable and busbar, swivel movement of fuse banks for ease in wiring and provision of indicator way labels. It is stated that the "Kantark" fuses used in these boards are tested as d.p. fuses, and have successfully cleared short circuits up to 6 500 A on a pressure of 240 V.

During the past year the PULSOMETER ENGINEERING CO., LTD., of Nine Elms Iron Works, Reading, have added several new designs to their refrigeration and ice-making section. One of the most noteworthy of these is a small self-contained ice-making machine designed to meet the requirements of the resident in hot countries. It is solidly constructed on the same principle and on the same mechanical lines as the ordinary larger-sized machines employed in the tropics. The plant can be worked by a 1 H.P. electric motor, requiring an input of approximately ¾ H.P. It is capable of an output of approximately 240 lb. of ice (in 10 lb. blocks 2½ in. thick) in a continuous working day of 24 hours. If necessary the same plant can be used for a cold store capacity of 200–250 cubic feet if hand controlled. If automatically controlled the capacity may be up to 400 cubic feet.

The basis of the latest output of valves produced by A. C. COSSOR, LTD. (Cossor Works, Highbury Grove, London, N.5) is the tungsten-cored filament. It is claimed that this filament is remarkably strong and that its emission qualities are unique. Its construction is stated by the manufacturers to contribute substantially to non-microphonic qualities. The process of manufacture now employed by the firm is said to ensure mathematical alignment of electrodes. Among recently introduced valves are three special types—the 620 T, the 680 H.F. and the 41 X.P. The 620 T is an efficient output valve for large amplifiers, and it may also be used as drive valve for a large bank of power valves. Used as a transmitting valve it may be run on full wattage on wave-lengths of 80 m. and upwards. The overall dimensions are, length 5 in., and width 3⅛ in. (127 and 80 mm.). The 680 h.f. is intended for use as first amplifier valve in apparatus using high voltage, and is also useful as the first amplifier after a gramophone pick-up. It is very suitable as anode bend detector and will handle the output from two stages of S.G. amplification on loud signals. The 680 H.F. used as a transmitting valve will operate successfully on full dissipation on wave-lengths down to 40 m. The valve is also suitable as frequency doubler for M.O.P.A. type transmitters. Its length and width are respectively 5 5/16 and 2¼ in. (135 and 57 mm.). The 41 X.P. is of the power type. It is stated to provide ample volume for address work, on a small scale, and where only comparatively low h.t. voltage is available. In dimensions it is the same as the 680 H.F.

The range of domestic appliances marketed by LIGHTING TRADES, LTD. (30–31, Farringdon Street, London, E.C.4), includes electric irons, kettles, toasters, saucepans, tea infusers and coffee percolators. The No. E 75595 iron is a nickel-plated unit with thumb-rest and bakelite connector, 5½ in. high, 5⅝ in. long and 4 in. wide, and weighing 6 lb. A smaller iron is the E 77166, with a weight of 4¼ lb. Both are rated at 450 W. An attractive kettle is the E 76661; it is of polished copper, with a capacity of 2 pints. Adaptor and connector



One and two kW "Homely" fires, by Siemens Electric Lamps and Supplies, Ltd.

are of bakelite, and the consumption is 750 W. The toaster offered by the firm is made for toasting two pieces of bread simultaneously, and is rated at 500 W. Saucepan No. E 77089 is nickel-plated, is 6⅞ in. high by 12½ in. long by 6⅝ in. wide, weighs 3½ lb., and has a consumption of 750 W. The tea infuser has a capacity of 6 cups, and a rating of 420 W.

ERRATUM.

With reference to the line on page 332, March 14th issue, towards the end of the second column, which reads "the suspension of the conductor being dependent on the bind," the word "not" has been missed out. The principle of the new patent bracket is that the conductor weight is *not* taken on the bind.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

EDINBURGH EDUCATION AUTHORITY, April 21st.—Electrical installations at Dean, Gorgie (Infant), Longstone, St. Patrick's, Torpichen Street, and Dr. Bell's Schools. Specifications, etc., from the Authority's Offices, Castle Terrace, Edinburgh.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., April 22nd.—Supply of incandescent lamps. Forms of tender, etc., from the Controller of Supplies, His Majesty's Office of Works, etc., King Charles Street, Westminster, S.W.1.

DUNDEE EDUCATION AUTHORITY, April 22nd.—Electric lighting and central heating installations in new Central School at Rockwell, Lawton Road, Dundee. Specifications, etc., from Messrs. Allan and Friskin, architects, 26, Castle Street, Dundee.

GLASGOW CORPORATION, April 22nd.—One year's supply of materials for the Lighting department, including electrical fittings and accessories, etc. Specifications and forms of tender from the office of the department, 20, Trongate, Glasgow.

GLASGOW CORPORATION, April 22nd.—Supply and erection of steam piping at Pinkston power station. Specification, etc., from Mr. L. Mackinnon, general manager, Transport Department, 46, Bath Street, Glasgow.

DUNDEE CORPORATION, April 23rd.—One year's supply of stores and materials to the tramways department. Specifications, etc., from the General Manager, Transport Office, Dundee.

BIRMINGHAM CORPORATION, April 25th.—May 8th.—Electric light and power wiring of City Sanatorium, Rednal Road, West Heath, Birmingham. Specification, etc., from Mr. F. H. C. Wiltshire, town clerk, Council House, Birmingham, until April 25th; deposit £1 1s.

LIVERPOOL CORPORATION, April 25th.—Supply of tramway rails and fishplates (schedule No. 1); fishbolts (No. 2) and tiebars (No. 3). Applications for tender forms, stating No. of schedule, to the City Engineer, Municipal Buildings, Dale Street, Liverpool.

DARTFORD URBAN DISTRICT COUNCIL, April 26th.—Supply of approximately, 785 yds. of 0·1 sq. in. h.t., three-core, and 640 yds. of l.t. four-core lead covered and armoured cable. Further particulars from the Electrical Engineer, Electricity Works, Dartford.

NEWTOWNARDS (CO. DOWN) GUARDIANS, April 26th.—Electrical plant and wiring, etc., in connection with conversion of workhouse into a district hospital. Specification from Mr. John Warden, clerk to the Guardians; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, April 28th.—Supply and erection of 33 kV, 11 kV and 6·6 kV switchgear, for connecting Board's supply to electricity supply undertakings, under N.W. England and North Wales scheme. Specification (No. N.W.E.—G.S. 4) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit, £2 2s.

ILFORD CORPORATION, April 28th.—Supply and erection of (*a*) rotary convertor plant of 500 kW capacity, with automatic control; (*b*) rectifier plant. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Ley Street, Ilford.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, April 30th.—Supply and erection of h.t. and l.t. switchgear. Specification, etc., from Mr. David J. Keep, Town Clerk; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 5th.—Supply and erection of 33 kV transmission line crossing of the river Witham, Boston, under Mid-East England scheme. Specification (No. M.E.E.–S.L. 3) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, May 6th.—Supply and erection of induction voltage regulator. Specification from Mr. R. W. Willis, 37, High Street, Cheadle; deposit £2 2s.

DUNDEE CORPORATION, May 10th.—Supply and erection of two electrically driven, vertical spindle, main circulating water pumps, in pump room, in connection with Carolina Port generating station. Specification, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12th.—Supply and erection of 66 kV and lower voltage switchgear. Specification (No. M.E.E.–G.S. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12th.—Supply and erection of 66 kV and lower voltage transmission lines, under the Mid-East England scheme. Specification (No. M.E.E.–S.L. 2) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, April 22nd.—Supply of braided switchboard cable. (Reference B.X. 6 201.)

ORADEA MARE (RUMANIA) MUNICIPALITY, April 24th.—Lead covered, double steel tape armoured underground cables. (Reference B.X. 6 298.)

CHRISTCHURCH (N.Z.) MUNICIPALITY, April 25th.—Supply of electricity meters. (Reference B.X. 6 309.)

ST. GILLES (BRUSSELS) MUNICIPALITY, April 26th.—Supply of 6 000 metres of 10 sq. mm. armoured cable, 100 metres of 35 sq. mm. and 1 000 metres of 70 sq. mm. Cahier des Charges (fr. 5) from Service de l'Electricité, 40, Rue de Bethléem, St. Gilles, Brussels.

ANTWERP MUNICIPALITY, April 28th.—Supply of cables and junction boxes. (Reference B.X. 6 312.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, April 28th.—Supply and erection of electrically driven high lift and low lift pumping plants, etc., for South-West Tableland Water Supply (tender No. 51, 1929/1930). Reference A.X. 9 219.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of single-phase transformers, with accessories, for Lake Coleridge power scheme, section 219. (Reference B.X. 6 035.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29th.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, April 30th.—Supply and erection of h.t. overhead transmission lines in isolated basins of Upper Egypt. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1; £10 5s., not returnable.

VICTORIAN ELECTRICITY COMMISSION, May 5th.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000V circuit (specification No. 30/19). (Reference B.X. 6 226.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6th.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

CAPE TOWN MUNICIPALITY, May 7th.—Supply of l.t. iron-clad switchgear. (Specification No. 492/1930.) (Reference B.X. 6 293.)

COPENHAGEN MUNICIPALITY, May 10th.—Supply of switchgear and rectifier plant for Eskildsgade sub-station (Reference B.X. 6 271.)

COPENHAGEN MUNICIPALITY, May 12th.—Supply and erection of two turbo-generators. (Reference B.X. 6 297.)

VICTORIAN ELECTRICITY COMMISSION, May 12th.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13th.—Supply of 110 kV, single-phase, oil immersed self-cooled, transformers, suitable for outdoor service. (Reference B.X. 6 096.)

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NEW ZEALAND POSTS AND TELEGRAPHS, May 13th.—Supply of terminal strips (P. and T. 151/2,000). (Reference B.X. 6 209.)

CHILEAN MINISTRY OF MARINE, May 15th.—Supply of three metric ton travelling electric crane and four-metric ton stationary electric revolving crane. (Reference A.X. 9 186.)

POWER SECURITIES CORPORATION, May 15th.—Works and materials in connection with Pykara hydro-electric scheme, including transmission line towers (specification E2; price 22s. 6d.); (insulators E5; 7s. 6d.); steel-cored aluminium conductors (E6; 4s. 6d.); steel earth wire (E7; 4s. 6d.; guying materials (E13; 4s. 6d.); generating plant (E14; 37s. 6d.); crane (E16; 7s. 6d.); and transformers (E18; 7s. 6d.). General conditions, 3s. 6d. Specifications, etc., from Messrs Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 20th.—Supply and erection of one 25 kVA, three-phase, 400/230 V 50 cycle generator. (Reference B.X. 6 307.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20th.—Supply of terminal strips (schedule No. C. 578). (Reference B.X. 6 247.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20th.—Supply of telegraph instruments (schedule C. 579). (Reference B.X. 6 248.)

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22nd.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc. (Reference A.X. 9 212.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators, for Mangahao power scheme, section 215B. (Reference B.X. 6 300.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of cable clamps, for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27th.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

CAPE TOWN MUNICIPALITY, June 4th.—Supply of heavy current d.c. testing motor generator, and starting gear (specification No. 494/1930). (Reference B.X. 6 341.)

BULAWAYO MUNICIPALITY, June 13th.—One 5 000 kW turbo-alternator, condensing plant, switchgear, transformers, etc. (Reference B.X. 6 321).

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14th.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17th.—Supply of indicators (schedule No. C.588). (Reference B.X. 6 333.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24th.—Supply of 110 kV outdoor steelwork and switchgear, for Waitaki power scheme—section 71. (Reference B.X. 6 238.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25th.—Supply of condensers (P. and T. 151/2 240). (Reference B.X. 6 308.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8th.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15th.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (£10 5s., not returnable.)

Tenders Accepted.

WATFORD GUARDIANS.—J. W. Russell, Ltd., supply of electric lamps for six months.

CHESTER GUARDIANS.—F. J. Jones, electrical materials required at poor law institution.

HOVE CORPORATION.—Edison Swan Electric Co., Ltd., supply of electric lamps for 12 months.

ILFORD CORPORATION.—D. P. Battery Co., Ltd., supply of battery for electric vehicle, £195 16s. 6d.

SOUTHERN RAILWAY.—British Insulated Cables, Ltd., 150 000 rail bonds, £20 000. (Approximate).

FORFAR SHERIFF COURT HOUSE.—W. Milne and Son, electric light installation, £245. (Recommended.)

EASTBOURNE CORPORATION.—W. T. Henley's Telegraph Works Co. Ltd., low tension lines, £2 646. (Revised tender.)

PORT OF LONDON AUTHORITY.—British Thomson-Houston Co., Ltd., six months' supply of Mazda electric lamps.

OLDHAM CORPORATION.—W. J. Furse and Co. (Manchester), Ltd., overhead line equipment; Union Cable Co., Ltd., supply of l.t. cable.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—Arthur Lyon and Co., installation of synchronised clocks at municipal offices, £314 15s. 6d.

KETTERING URBAN DISTRICT COUNCIL.—British Electric Transformer Co., Ltd., and Crompton, Parkinson, Ltd., supply of transformers.

BASINGSTOKE CORPORATION.—General Electric Co., Ltd. —Supply of a 950 kW three-phase Diesel alternator, £12 997. (Recommended.)

SMETHWICK EDUCATION COMMITTEE.—Young, Osmond and Young, electric heating system at Uplands school, £3 856. (Recommended.)

Pump Motors.

GUILDFORD CORPORATION.—Harland Engineering Co., provision of pump motors etc. at Millmead water works, £792 5s. (Recommended)

MANCHESTER CORPORATION.—A. Loudon, electric lighting at St. Philip's school; C. A. Parsons and Co., Ltd., supply of two 750 kVA transformers.

BARKING URBAN DISTRICT COUNCIL.—Metropolitan Cable Co. (£680 10s.), and Edison Swan Cables, Ltd. (£114), supply of cable. (Both recommended.)

PLYMOUTH CORPORATION.—Supply of cables: British Insulated Cables, Ltd., Derby Cables, Ltd., and Metropolitan Cable Co. (Both recommended.)

BATTERSEA (LONDON) BOROUGH COUNCIL.—British Electric Transformer Co., Ltd., two 500 kVA transformers, £467; J. G. Statter and Co., switchgear, £115.

COLCHESTER CORPORATION.—F. S. Slater and Co., 140 kW motor-generator, £220; Crompton, Parkinson, Ltd., 18 kW motor-generator, £95. (Both recommended.)

ARGYLL EDUCATION AUTHORITY.—Kinniard and Co., electric light installation at Dunoon Grammar School, £326; Small and M'Donald, wiring Kirn School, £49.

STOKE-ON-TRENT CORPORATION.—Supply of electric lamps for 12 months, Blackburn, Starling and Co., Ltd., Barnett and Soans, and Robinson and Hands Electric Co., Ltd.

ALSAGER URBAN DISTRICT COUNCIL.—Electricity Distribution of North Wales and District, Ltd., public lighting with 95 lamps, including maintenance, £322 per annum.

HULL CORPORATION.—Devonport Engineering Co., Ltd., natural draught cooling tower, £15 193; Jas. V. Coonan Co., electric light installation at golf house, £135 17s. 6d.

ILFORD CORPORATION.—Metropolitan Electric Cable Construction Co., Ltd., and Union Cable Co., Ltd., 12 months' supply of cable. (Both recommended for renewal).

POPLAR (LONDON) BOROUGH COUNCIL. Davenport Engineering Co., provision of further cooling tower, £4 402; and construction of cooling pond, £5 498. (Recommended.)

LEEDS GUARDIANS.—Marshall and Kelly, extension of electric lighting and bell installation at the Vagrant Wards, Holbeck Institution, 2, Lane End Place, Holbeck, Leeds.

WOKING URBAN DISTRICT COUNCIL.—Wallwin Engineering Co., Ltd., electric machinery at Mayford and Goldsworth pumping stations, alterations, etc., £2 200 (approximate).

SANDBACH URBAN DISTRICT COUNCIL.—Electricity Distribution of North Wales and District, Ltd., public lighting at Hightown, High Street, and The Square, £90 per annum.

WIMBLEDON CORPORATION.—A. Reyrolle and Co., Ltd., alterations and additions to switchboards, £3 285 5s.; Siemens Bros. and Co., Ltd., replacement of h.t. main, £3 808 11s. 8d.

BRITISH BROADCASTING CORPORATION.—Radio Communication Co., Ltd., supply and erection of three 500 ft. lattice steel masts at North Regional broadcasting transmitter, Slaithwaite, near Huddersfield.

LEEDS CORPORATION.—Supply of cable: W. T. Henley's Telegraph Works Co., Ltd., £1 441; Enfield Cable Works, Ltd., £2 460 15s.; Macintosh Cable Co., £4 557; Croydon Cable Works, Ltd., £2 683.

SHEFFIELD CORPORATION.—British-Thomson-Houston Co., Ltd., 36 tramcar controllers, £41 each; British Insulated Cables, Ltd., 800 copper bands, £8 12s. per 100; 1 000 at £10 18s.; 100 at £15 19s.; and 300 at £16 17s. (Both recommended.)

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Supply of cables: Enfield Cable Works, Ltd., 3 500 yds. of 0·15 by 0·08 by 0·15 sq. in. three core, £1 977; 200 yds. of 0·25 by 0·15 by 0·25 sq. in. three core, £178; 500 yds. of 0·25 sq. in., £132; 550 yds. of 0·06 by 0·04 by 0·06 sq. in. three core, £177 13s.; 800 yds. of 0·15 four core, £636.

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METROPOLITAN ASYLUMS BOARD.—Schall and Son, Ltd., installation of X-ray apparatus at High Wood Hospital, £250; Jones Sewing Machine Co., Ltd., installation of electric sewing machines at Southern Hospital, £204 17s.; Read and Partners, Ltd., installation of electric motors at workshops, Darenth training colony, £235; T. Clarke and Co., Ltd., installation of automatic telephone system at Grove Hospital, £1 231; Synchronome Co., Ltd., installation of synchronised clocks at Joyce Green Hospital, £579 7s. 6d. (All recommended).

GLASGOW CORPORATION.—T. B. and J. A. Mathieson, electrical installation work at City Hall, £828 7s. 6d.; English Electric Co., Ltd., five motors, new, £102; Jas. Keith and Blackman and Co., Ltd., one fan motor, new; eight fan motors, exchanged, £113; A.S.E.A. Co. Century Motors, 51 motors, new, £427; A. and P. Stevens, Ltd., three lift motors, reconditioned, and two lift motors, new, including fitting, £143. Hobart Manufacturing Co., two motors, exchanged; three motors, new, £118. Barber and Colman, Ltd., supply of three two-way three-colour electric signals for attaching to existing tramway standards, and one two-way three-colour electric signal for attaching to a plain steel tube, with controlling cabinet and plain steel post, £129.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—British Electric Transformer Co., Ltd., supply of two Scott-connected sets of transformers, each of 2 000 kVA, £1 772 (recommended). An alternative tender by the same company, £1 590, and tenders by the English Electric Co., Ltd., £1 300; Foster Engineering Co., Ltd., £1 698; and Hackbridge Electric Construction Co., Ltd., £1 710, were not in accordance with specification. In the case of the tender of the Yorkshire Electric Co., Ltd., £1 540, details of plant were not submitted. Also tendered: Bruce Peebles and Co., Ltd., £1 596, and General Electric Co., Ltd., £1 856. General Electric Co., Ltd., supply of switchgear, £2 890 16s. 3d. (recommended). Also tendered: Switchgear and Cowans, Ltd., £2 700 10s.; A. Reyrolle and Co., Ltd., £2 876 16s. 6d.; Ferguson, Pailin, Ltd., £2 895 14s. 6d.; English Electric Co., Ltd., £2 896 7s. 3d.; Park Royal Engineering Co., Ltd., £2 897 2s.; J. G. Statter and Co., £3 200; Superheater Co., Ltd., supply of three new superheaters, £1 515 (recommended). Also tendered: Stirling Boiler Co., Ltd., £1 575. Macintosh Cable Co., Ltd., supply of 550 yards of lead covered and 100 yards of lead covered and armoured three-core 0·2 sq. in. cable, £598 (recommended). Also tendered: Croydon Cable Co., Ltd., £584; Standard Telephones and Cables, Ltd., £606 12s.; Union Cable Co., Ltd., £608 10s.; Hackbridge Cable Co., Ltd., £609; Siemens Bros. and Co., Ltd., £610; W. T. Henley's Telegraph Works Co., Ltd., £612; Pirelli-General Cable Works, Ltd., £616; British Insulated Cables, Ltd., £617; Enfield Cable Works, Ltd., £620; Callender's Cable and Construction Co., Ltd., £624; Johnson and Philips, Ltd., £626 15s.

THE NATIONAL REGISTER.

Further Thirteen Names Added During March and April.

MEETINGS of the Executive Committee of the National Register of Electrical Installation Contractors were held on March 7th and April 4th, when twenty-two applications from electrical installation contractors for registration were considered. At the first meeting four applications of the eight received were declined, while at the April meeting five out of fourteen were declined.

The names and addresses of the successful applicants are given below:—

MARCH 7TH.—Winters, B., and Son, 85, Digby Road, Finsbury Park, London, N.4; Booth Bros., 1/5, Norton Street, Middlesborough; Osbaldestone and Bancroft, Grosvenor Square, Ashton-on-Mersey; Crawford, James, 4A, Dublin Road, Belfast.

APRIL 4TH.—Bowden, Joseph, Carlisle Works, Water Street, Stalybridge; Lewis's, Ltd., Market Street, Manchester; Sturgeon, E. P., Hart Street, Hartlepool; Ramsbottom, J. S., and Co., Ltd., Bow Street, Keighley; Casse, H. H., 29, Chapel Street, Bradford; Jago and Thurlow, 10, Walton Vale, Aintree, Liverpool; Marr, Robert, 51, Victoria Street, Blackburn; Jones, T., and Co., 7, Charles Street, Whitechapel, Liverpool; Northern Electric Light and Power Co., 61, West Street, Oldham.

"Realism from Records" is the title of a new issue by GAMBRELL RADIO, LTD., Buckingham House, Buckingham Street, London, W.C.2, concerning the "Novotone" compensator, by Dr. N. W. McLachlan.

OVERSEAS TRADE.

Three Months' Exports Over £2 500 000 in Excess of Imports.

SHIPMENTS of electrical machinery and apparatus from the United Kingdom during March last amounted to £1 602 993 as against £1 372 691 for the same month of 1929, representing an increase of £230 302. Exports for the three months of this year at £5 003 408 showed an increase, over the same period of 1929, of £554 051.

Imports of electrical apparatus and machinery during March amounted to £783 179, as compared with £572 024 during 1929, an increase of £211 155. Similar imports for the three months of this year amounted to £2 501 335, or £822 400 more than during the same period of 1929.

Export items, which showed increases during March 1930, when compared with the March, 1929, returns included motors other than railway and tramway motors, increase £74 768; motors, all other sorts, £45 901; rubber insulated wires and cables other than telegraph and telephone wires, £18 813; wires and cables other than rubber insulated, not being telegraph and telephone wires, £57 913; electric glow lamps, £2 656; and batteries and accumulators, £6 575.

On the import side the same comparison shows that during the month under review acceptances of electrical machinery increased by £9 649; electrical instruments other than telegraph and telephone, £192 303; and various electrical apparatus, £19 976.

These figures show that the favourable balance of exports over imports for the month of March, 1930, was £819 814, while for the three months the balance was £2 502 073.

During the three months, exports of electrical machinery, when compared with the same period of 1929, increased from £1 661 461 to £1 734 786, while by the same comparison rubber insulated wires and cables improved by £24 747. Shipments of submarine cables also improved during the first quarter of this year, the return showing an increase of £57 452 over the corresponding period of 1929. Import figures for the three months show by comparison with the same quarter of last year increases in electrical machinery, various wires and cables, glow lamps, batteries and accumulators.

We give below detailed figures for the three months ended March 31st contrasted with the same periods of 1929 and 1928:—

	Three Months.		
IMPORTS.	1928 £	1929 £	1930 £
Electrical Machinery	446 244	427 237	490 705
Electric Wires and Cables, Insulated—			
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	43 859	47 088	52 124
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	135 032	145 291	211 367
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	29 451	15 804	9 695
Submarine Telegraph and Telephone Cables	—	—	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	150 582	317 446	262 959
Carbons, Electric	34 372	44 749	58 854
Electric Lamps and Parts thereof—			
Electric Glow Lamps	169 231	92 350	137 209
Arc Lamps and Electric Searchlights	1 185	3 107	908
Parts thereof (except Carbon Rods)	3 303	2 876	6 839
Batteries, complete, and Accumulators (including parts)	129 301	144 102	157 888
Electrical Instruments (other than Telegraphic and Telephonic), Commercial (including Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	71 853	62 303	664 994
Switchboards, other than Telegraph and Telephone	394	1 208	412
Electrical Goods and Apparatus, all other Sorts	353 968	375 374	445 381
Total	1 568 775	1 678 935	2 501 335
EXPORTS.			
Generators and Motors—			
Railway and Tramway Motors	174 714	109 763	59 545
Other Motors, and Generators	618 253	582 852	628 517
All Other Sorts	942 733	968 856	1 046 724
Electric Wires and Cables, Insulated—			
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	354 830	360 899	385 646
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	382 284	359 938	580 707
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	295 252	187 161	226 058
Submarine Telegraph and Telephone Cables	71 008	20 813	78 265
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	813 351	671 061	607 768
Carbons, Electric	6 835	1 730	1 251
Electric Lamps and Parts thereof—			
Electric Glow Lamps	118 554	137 003	141 676
Arc Lamps and Electric Searchlights	3 569	3 088	6 310
Parts thereof (except Carbon Rods)	560	1 941	1 493
Batteries, complete, and Accumulators (including Parts)	262 693	258 814	258 301
Electrical Instruments (other than Telegraphic and Telephonic), Commercial (including Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	97 788	83 655	89 453
Switchboards, other then Telegraph and Telephone	27 276	19 774	26 760
Electrical Goods and Apparatus, all other Sorts	604 117	682 009	864 9348
Total	4 773 817	4 449 357	5 003 408

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ELECTRICITY SUPPLY.

Stepney's Loan for Feeders—Ontario Power Commission's Expansion—Big American Power Projects—Bulk Supply for Southwark—Gillingham Rejects Hire and Purchase Scheme—Electricity in Yugoslavia.

ELECTRICITY supply is expected to be available in Dunoon by June next.

Cheltenham Electricity Committee is to relay a cable on the Promenade at a cost of £822.

The Ayrshire Electricity Board has inaugurated an electric street lighting scheme at Catrine.

Watford T.C. is to apply for a loan of £20 000 for the provision of new mains and for extensions.

Chatburn Council has protested against Clitheroe Corporation's proposal to proceed with the overhead system.

Accrington Electricity Committee has received sanction to borrow £33 174 to effect the change-over from d.c. to a.c.

Croydon Electricity Committee estimates that £6 540 will be required for the provision of posts and lanterns for street lighting for the next three years.

Gillingham (Kent) T.C. has rejected a recommendation that domestic electrical apparatus be purchased for supply to consumers on sale and hire-purchase.

Manchester electricity department has agreed to the proposal of Cheadle and Gatley U.D.C. to supply electricity under a Fringe Order to premises in Northern Etchells.

The agreement for the supply of electricity by the Liverpool Corporation to the Mersey Docks and Harbour Board has been renewed for a further five years on revised terms.

Manchester Electricity Committee has adopted a report of the Chief Engineer in regard to extensions to l.t. distributors and will submit an application to the Unemployment Grants Committee.

Stepney (London) Finance Committee recommends the B.C. to adopt an estimate of £39 307 for e.h.t. and l.t. feeders, and to apply to the Electricity Commissioners for sanction to borrow that amount.

Conway R.D.C. has decided to approach Colwyn Bay U.D.C. with suggestions that electrical connections to houses in the village of Glan Conway, which is much frequented by artists, should be made underground.

Luton T.C. has received from the Ministry of Transport sanction to the placing of overhead lines between Woburn and Toddington for the transmission of energy at 22 000 V, but the Minister reserves power to review the situation after five years.

The Ontario Hydro-Electric Power Commission has acquired extensive tramway and electric power services, mainly in the Niagara district, owned by the Dominion Power Transmission Co., of Hamilton. The cost of the acquisition is $21 250 000.

Eastbourne electricity department is to erect three sub-stations, in Ashford Road, Silverdale Road and Grange Road, at a cost of £7 940.—The Central Electricity Board has promised a partial bulk supply to the undertaking from the grid by October 1st.

Macclesfield R.D.C. has consented to the erection of an overhead transmission line from Macclesfield to Gawsworth, Siddington and Chalford, by the Macclesfield New Electricity Co. A supply of electricity is to be given at once to the parishes of Chalford and Snelson.

Hull Electricity Committee has received a report from the City Electrical Engineer that the supply to several industrial consumers and suburban areas has been affected, due to wilful interference with the apparatus on one of the department's e.h.t. overhead lines near the National Radiator Company's works.

The West Kootenay Power Co. has prepared plans for the erection of a dam 350 ft. in height close to the junction of the Pend d'Oreille and Columbia rivers. The plans of the company contemplate the development of 350 000 H.P., at a total expenditure of $18 000 000, and construction work is estimated to take three or four years.

The hydro-electric development of New England Power Association at the Lower Fifteen Mile Falls site is the largest hydro-electric development due for completion in the United States this year. This 200 000 H.P. plant will be the second largest hydro-electric station east of Niagara Falls and is expected to be in operation by October 1st.

In connection with the proposed laying of extra cables for bulk supply into the works, Bromley T.C. has decided to replace the 11 000 V switchboard, at an estimated cost of £2 050, and to add an extra panel to the 3 300 V switchboard to control the new transformer at an estimated cost of £130. It is proposed to spend £5 000 on general sub-station equipment and transformers.

Application will be made to the Secretary of State for Scotland on or before April 17th by the Grampian Electricity Supply Co. for a Provisional Order to extend the powers granted and the periods limited by the Grampian Electricity Supply Act, 1922, as extended by the Order of 1927, for compulsory purchase of lands, construction and completion of works, payment of interest out of capital, etc.

The New England Power Association, controlled by the International Hydro-Electric System, a division of the International Paper and Power Co., had 125 construction jobs under way during 1929, of which 90, involving the expenditure of more than $20 000 000, were finished. The most important single construction project under way during 1929 was a 200 000 H.P. hydro-electric plant on the upper Connecticut River at the Lower Fifteen Mile Falls site, which is expected to be in operation by October 1st.

In regard to Plymouth Corporation's application for sanction to borrow £106 300 for a new turbo-alternator, foundations and boilers, etc., the Electricity Commissioners have intimated that they are prepared to consider forthwith the application so far as it relates to the provision of two boilers and four main feeder switches, the application in respect of the remainder of the plant, etc., to be reviewed in the autumn. The Electricity Committee has decided to seek sanction to borrow £26 168 for two boilers and four main feeder switches.

The Central Electricity Board will complete the section of their main transmission system between Rayleigh and Colchester by October, 1931, and a supply from this course will be available to Colchester Corporation by that date; consequently the Electricity Commissioners are of opinion that it is unnecessary for the Corporation to give further consideration to the question of the installation of additional plant in the generating station. Colchester Electricity Committee proposes to report again to the Commissioners as to the development in output after the September meeting of the Committee.

The Electricity Commissioners have expressed the opinion that Southwark (London) B.C. should take bulk supply of electricity to the extent of 2 000 to 2 400 kW throughout the year, and use its own generating plant to meet any demand in excess of the amount of bulk supply during the winter peak load. The Electricity Committee recommends that the suggested procedure be adopted, that an arrangement be made to take a bulk supply from the City and London Electric Lighting Co., and that application be made for sanction to a loan of £35 000 to meet capital expenditure involved in the proposals with regard to the bulk supply.

Dover Corporation recently considered a report regarding a request by a local firm for a considerable supply of electricity. The Electricity Committee reported that the firm's demand was likely to be approximately 150 H.P. and their annual consumption 700 000 kWh, and suggested, on the assumption that the Corporation is able to obtain a bulk supply from the Central Electricity Board next year, that the following terms be offered, viz.: £5 per annum per kVA of maximum demand, paid quarterly, plus ½d. per kWh, with a rebate of 10% if current is metered on the 6 600 V supply at the customer's works. The Corporation referred the matter back to committee.

A correspondent of "The Times Trade Supplement" says many important electricity supply concessions have recently been granted in Yugoslavia. The French company "La Dalmatienne," which has sunk important sums in harnessing the Krka and Cetina for the purpose of electrifying Dalmatia, is planning to raise its capacity; so also is the Swiss "Falla" group in Slovenia. The Belgrade station is being reorganised with Swiss capital, and a number of power stations in the north are being erected with Swedish capital. Many municipalities are installing plant with money obtained from the United States. The probability is that within a year or two electrical production in Yugoslavia will be at least doubled.

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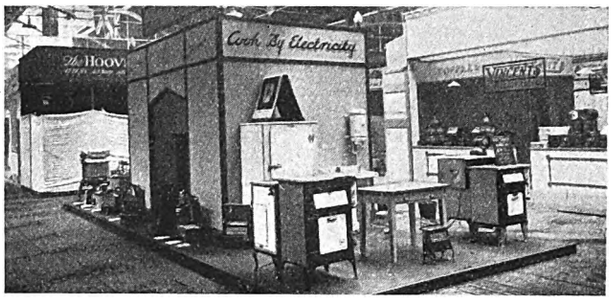
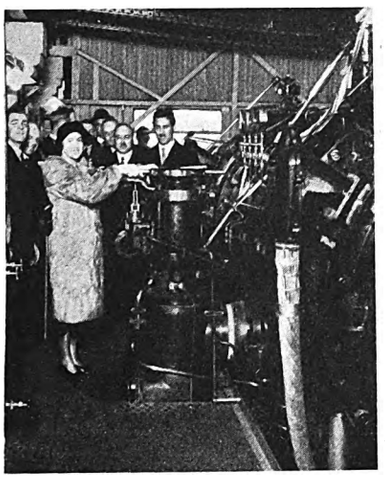
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

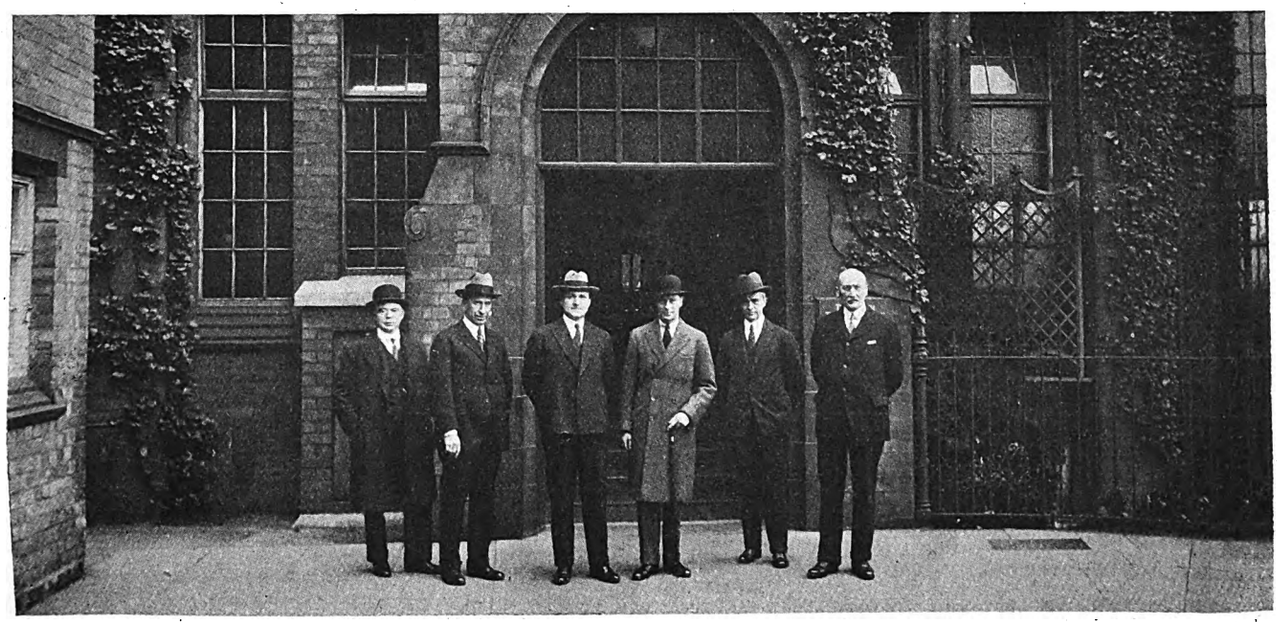
A party of electrical contractors, station engineers and representatives of firms using electricity in the Cambridge area, photographed at the Research Laboratories, Wembley, where they were the guests of the General Electric Co., Ltd. The party first visited the Osram Lamp Works, where Mr. C. Wilson occupied the chair at a luncheon.



The Birmingham Electric Supply Department is occupying a large stand at the Birmingham National Trades and Industrial Exhibition, which is being held at Bingley Hall during April. The stand contains a complete range of domestic electrical appliances, special prominence being given to water heating apparatus.



These pictures, taken at Kingston-on-Thames, on the occasion of the opening of the new extension on April 9th, show, on the left, Lady Brooke starting up the new 3 750 kW turbo-alternator, and on the right, a group taken outside the power house.



On April 8th, the Duke of York visited the Rugby Works of the British Thomson-Houston Co., Ltd., as President of the Industrial Welfare Society. He was accompanied by the Rev. Robert R. Hyde, Director of the Society. After being received by Mr. W. C. Lusk (chairman of the company) and Mr. G. M. Campbell, Mr. F. Fraser, Mr. J. L. Wilson, directors, and Mr. A. P. Young, manager, Rugby, the Duke commenced a tour of the works. A feature of the tour was the presentation to His Highness of employees with long service, there being quite a number who have been with the company for over a quarter of a century. This group, at the main office entrance, shows from left to right, the Rev. Robert R. Hyde, Mr. G. M. Campbell, Mr. A. P. Young, the Duke of York, Mr. W. C. Lusk, and Mr. F. Fraser.

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FINANCIAL INTELLIGENCE.

Some Particulars of Electricity Supply Companies' Accounts for the Year 1929 with Recent Quotations and Yields.

By "AUDITOR."

BANK RATE (1929-1930).

1929.			1930.	
Feb. 7 ..	5½%	Nov. 21 ..	5½%	Feb. 6 .. 4½%
Sept. 26 ..	6½%	Dec. 12 ..	5%	Mar. 6 .. 4%
Oct. 31 ..	6%			Mar. 20 .. 3½%

ANALYSIS OF RESULTS OF CERTAIN SUPPLY COMPANIES WHOSE 1929 ACCOUNTS HAVE ALREADY BEEN SUBMITTED.

1929 Accounts	Brought Forward £	Profit, 1929 £	Total £	Carried Forward £	Annual Dividend %	Recent Price	Par Value £	Yield	Remarks
Adelaide Elec. Supply	31 902	331 534	363 436	32 030	12	—	100	—	In September, 1929, the debenture debt was increased by the issue of £250 000 6% "D" consolidated stock. A resolution was passed at the annual meeting for the conversion of all shares into stock. Stocks are interchangeable London Adelaide registers.
" " 5% Deb.	—	—	—	—	5	104½	100	4¾	
" " 5½% Cons. Deb.	—	—	—	—	5½	98	100	5⅗	
" " 6% Cum. Pref.	—	—	—	—	6	20/6	1	5⅘	
" " 6½% "C" Pref.	—	—	—	—	6½	21/-	1	6½	
Aldershot Gas, Water & Dis. Light	7 323	60 428	67 751	6 451	—	—	—	—	Dealings in £98 955 new 5% perpetual debenture stock have been allowed.
" " 5% "A" Stock	—	—	—	—	£6/1/9	—	100	—	
" " 3½% "B" Stock	—	—	—	—	£4/11/9	—	100	—	
" " 5% "C" Stock	—	—	—	—	£5/0/0	—	100	—	
Charing Cross Elec. Supply—West End	79 706	174 231	253 937	87 584	8·151	25/6	1	6·40	The company is allowed to charge prices sufficient to cover all its expenses, including certain ordinary share dividends and reserve funds for the repayment of capital at par in 1971. The ordinary shares of the City undertaking are held by the West End.
" " 4% Deb.	—	—	—	—	4	—	100	—	
" " 4½% Cum. Pref.	—	—	—	—	4½	17/7	1	5⅛	
Charing Cross Elec. Supply—City	18 227	122 472	140 699	—	8·90	27/-	1	6⅔	
" " 4½% Debs.	—	—	—	—	4½	90	100	5	
Chiswick Elec. Supply	2 653	34 174	36 827	3 828	16	53/3	1	6	Owns Electric Lighting orders for Chiswick (1891) and Aberystwyth (1892).
Clyde Valley Elec. Power	84 586	354 495	439 081	88 288	8	36/9	1	4⅘	The entire system is in process of change to the Board's standard frequency of 50 cycles.
" " 6% Cum. Pref.	—	—	—	—	6	23/6	1	5⅛	
" " 8% Cum. 2nd Pref.	—	—	—	—	8	28/-	1	5⅔	
Electrical Distrib. of Yorkshire	21 905	96 482	118 387	23 657	9	35/4	1	5⅔	There are no debentures.
Kensington & Knightsbridge Elec. Light	10 664	36 650	47 314	2 123	1/7·18	26/9	1	6	One of the 10 constituent companies taking bulk supply from London Power Co.
" " 4% Deb.	—	—	—	—	4	77	100	5⅛	
" " 6% Pref.	—	—	—	—	6	—	5	—	
" " 5% Second Pref.	—	—	—	—	5	86/3	5	5⅝	
Kidderminster & Dis. E. Light & Traction	446	3 806	4 252	577	2½	—	10	—	A net loss of £9 381 on liquidation of Kidderminster & Stourport Tramway Co. was debited against reserve.
" " 5% Cum. Pref.	—	—	—	—	5	—	10	—	
London Elec. Supply Corp.	25 437	161 284	186 721	46 832	9	29/-	1	6¼	The London Electricity (No. 2) Act, 1925, provides for the transfer of this undertaking to the London and Home Counties Joint Electricity Authority in 1971.
" " 4% Deb.	—	—	—	—	4	95	100	4⅕	
" " 6% Pref.	—	—	—	—	6	5/16	5	5½	
Melbourne Elec. Supply	22 444	99 009	121 453	236	10	172	100	5⅘	The Melbourne and Geelong undertakings are being taken over by the State Electricity Commission as from September, 1930, on the basis of the book value, less depreciation. The £22 444 b./f. includes £21 287 from reserve.
" " 5% Deb.	—	—	—	—	5	93	100	5⅜	
" " 5% Cons. Deb.	—	—	—	—	5	93	100	5⅜	
" " 6% Mort. Deb.	—	—	—	—	6	100	100	6	
" " 8% Cum. Pref.	—	—	—	—	8	5½	5	7⅓	
Metropolitan Elec. Supply	87 149	348 200	435 350	84 746	10	41	1	4⅗	Recently there was a new issue of 1 share in 3.
" " 4½% Mort. Deb.	—	—	—	—	4½	89	100	5⅛	
" " 7½% Extension Deb.	—	—	—	—	7½	106	100	7⅛	
" " 4½% Cum. Pref.	—	—	—	—	4½	17/6	1	5⅛	
Midland Counties Elec. Supply	5 676	211 079	216 755	4 578	7	28/3	1	5	Further extensions are in progress.
" " 5% Deb.	—	—	—	—	5	95	100	5¼	
" " 6% Cum. Pref.	—	—	—	—	6	23/-	1	5⅘	
Midland Elec. Corp. for Power Distrib.	24 550	151 365	175 915	35 590	8	32/6	1	4⅘	Supply in bulk from West Midlands Joint Electricity Authority.
" " 7% Cum. Pref.	—	—	—	—	7	26/-	1	5⅜	
Newcastle & Dis. Elec. Light	15 564	68 361	83 925	15 055	7	26/6	1	5⅓	£5 020 2nd mortgage debentures, and £59 700 3rd mortgage debentures were redeemed during the year.
" " 4½% 1st Mort. Deb.	—	—	—	—	4½	83½	100	5⅖	
" " 7% 2nd Mort. Deb.	—	—	—	—	6	—	{100 / 20}	—	
Newcastle-upon-Tyne Elec. Supply	80 653	687 784	768 437	96 029	6	24/3	1	4⅝	During the year the additional connections amounted to 22 677 H.P., and 7 802 new domestic consumers were connected.
" " 5% Pref.	—	—	—	—	5	19/9	1	5⅛	
" " 7% Pref.	—	—	—	—	7	25/9	1	5⅝	
" " 4½% Deb.	—	—	—	—	4½	96	100	4⅔	
" " 6% Deb.	—	—	—	—	6	104	100	5⅘	
North Metro. Elec. Power Supply	28 202	400 225	428 427	28 146	10	48/-	1	4⅕	On February 25 last, resolutions were passed for the creation and issue of further cumulative preference shares and debenture stock.
" " 5½% Deb.	—	—	—	—	5½	105	100	5¼	
" " 6% Cum. Pref.	—	—	—	—	6	23/-	1	5⅘	
Northampton Elec. Light & Power	9 690	64 455	74 145	9 770	10	44/6	1	4½	The sale of current provided £190 917, as compared with £158 487 for the previous twelve months.
" " 5% Deb.	—	—	—	—	5	96	100	5⅛	
St. James & Pall Mall Elec. Light	112 377	75 339	187 716	100 462	7·894	27/6	1	5⅔	In 1931 the standard rate of 7% will come into force.
" " 3½% Mort. Deb.	—	—	—	—	3½	70	100	5	
" " 7% non-Cum. Pref.	—	—	—	—	7	24/-	1	5⅝	
Salisbury Elec. Light & Supply	152	10 943	11 095	94	10	—	1	—	Controlled by Edmundsons' Electricity Corporation, Ltd.
Scottish Power	3 399	132 530	135 929	6 710	8	29/-	1	5⅘	Hydro-electric station with initial capacity of 42 000 H.P. is expected to come into operation at Rannoch in 1930.
" " 6% Cum. Pref.	—	—	—	—	6	23/-	1	5⅕	
Shropshire & Worc. & Staff. Elec. Power	—	180 520	—	—	8	29/6	1 (A & B)	5⅓	Over 5 000 additional services to domestic premises were connected during the year.
" " 5½% 1st Deb.	—	—	—	—	5½	—	100	—	
" " 6% Cum. Pref.	—	—	—	—	6	22/9	1	5⅖	
Smithfield Markets Elec. Supply	2 508	8 572	11 080	2 781	8	25/-	1	6⅖	Concession extended to 1972.
Tees Power Station	750	60 290	61 040	2 794	5⅞	—	1	—	Share capital was increased to £1 012 978 in 1929.

The following tables, showing the principal features of the recently submitted accounts of the City of London Electric Lighting Co., Ltd., and of the Isle of Thanet Electric Supply Co., afford a comparison of the figures with those relating to the previous financial period :—

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Net Revenue	£473 972	£462 221
Net Profit	264 638	253 341
Consumers' Benefit (London Electricity (No. 1) Act, 1925)	348 253	275 937
Co-partners' Share of Benefit	39 277	31 695
Company's Share of Benefit	58 042	45 989
Special Reserves	243 138	185 096
5% First Debenture Stock	400 000	400 000
4½% Second Debenture Stock	48 499	48 499
5% Consolidated Debenture Stock	553 925	553 925
6% First Cum. Pref. Shares	400 000	400 000
8% Second Cum. Pref. Shares	300 000	300 000
Ordinary Shares	1 200 000	1 200 000
Carried forward	6 971	7 657
Dividend	10%	10%

At 33s. 6d. the ordinary shares yield nearly 6%, and at 22s. 6d. the first preference yield 5⅛%. The second preference at 28s. 6d., return about 5⅛%.

ISLE OF THANET ELECTRIC SUPPLY CO. LTD.

	Dec. 31, 1929.	Dec. 31, 1928.
Gross Receipts—Tramways	£90 033	£87 550
Do. Light and Power	88 604	83 757
Net Earnings	73 930	73 416
Net Profit	59 074	58 416
General Reserve and Depreciation Account	154 605	128 470
4% Deb. Stock	282 194	282 194
6% Cum. Partg. Pref. (£1)	282 000	282 000
Ordinary Shares (£1)	150 000	150,000
Carried forward	8 358	6 203
Dividend	4%	4%

During the year the sum of £15 270 was expended, mainly in the development of the lighting undertaking. At 77 the debenture stock yields 5⅛%, and the preference shares at 23s. also return 5⅛%. Recently the ordinary shares were quoted at 30s., at which price they yield 2⅘%. After the ordinary receive 6% the two classes rank equally.

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COMPANY NEWS.

British Thomson-Houston Co's. Increased Profit—American Loan for German Company—Chairman of Chelsea Co. on Charges for Energy—Directors' Reports, etc.

BABCOCK AND WILCOX, LTD.—Fin. div. of 8% tax free, on ord. shs. is recommended, makg. 15% for year.

SCOTTISH POWER CO., LTD.—Subscriptions were invited last week for an issue of 650 000 £1 ord. shs. at 27s. p. sh.

ASSOCIATED ELECTRICAL INDUSTRIES, LTD.—Divs. of 6% on ord. and 8% on pref. shs. (both same as last year) are recommended.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Qrtrly. divs. of 15% on ord. and £1 10s. % on pfd. shs., less tax, are announced.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—Fin. div. of 5½%, less tax, is recommended on ord. shs., makg. 10% for year. Fwd. £5 765, agst £5 761.

BAIRD TELEVISION DEVELOPMENT AND BAIRD INTERNATIONAL TELEVISION COMPANIES.—The result of the poll taken last week regarding the scheme of arrangemt. and amalgamatn. is that all classes of shhldrs. of the Baird Television Development Co. voted in favour of the scheme, and of the votes of the "A" class of shhldrs. of the Baird International Television Co. 448 563 were for the scheme and 400 agst.

LONDON ELECTRIC WIRE CO. AND SMITHS, LTD.—Net pft. for 1929, £111 854; blce. from last acct., £22 760. To directors' fees, £1 250; to special res. acct., £25 000; div. on 7½% cum. pref. shs. for year ended Dec. 31, 1929, £30 000. Fin. div. on ord. shs. of 6¼%, less tax, recommended, makg., w. intm. div. paid in June, 1929, 7½%, less tax, for year. Fwd., £30 075. Business has increased throughout the past year, although, owing to keen competition, average prices obtained were lower.

ENGLISH ELECTRIC CO., LTD.—Pft. for 1929, after provisn. for depreciatn. and charging expenditure on tools, patterns, drawings, etc., £71 343. Int. on 5½% 1st mtge. debs., £37 480 and on 6% convertible deb. stk. £78 681; directors' fees, £2 034, and trustees' fees, £360. Loss in respect of year, £47 211, agst. £33 617. Scheme of financial reorganisatn. recently approved by shhldrs. and deb. hldrs. had not taken effect at end of 1929, and reconstructed blce. sht. will, if scheme is sanctioned by Court, be prepared at a later date.

BRITISH THOMSON-HOUSTON CO., LTD.—Tradg. pft. for 1929, £458 381, agst. £422 729. After provisn. for deb. and loan int., depreciatn., etc., net pft. is £166 196, agst. £150 554. Div. of 5%, agst. 4%, recommended on ord. shs. Fwd. £205 262, agst. £203 066. Results for year were better than those for 1928 both as regards volume of orders secured and factory output, but excessive competitn. at home and abroad continued to keep prices at unreasonably low levels, and therefore earngs., while better than those for 1928, were still inadequate. Amt. of orders on hand at end of the year was greater than at end of 1928.

BERLIN CITY ELECTRIC CO. (BEWAG).—An American banking group, headed by Dillon Read and Co., of New York, has concluded negotiatns. for the issue of $15 000 000 (£3 000 000) 6% 25-year debs. of the Berlin City Electric Co. The loan, it is understood, will be priced at slightly over 90, and a substantl. portn. will be reserved for placing in Europe. An unusual feature of the issue, indicatg. the extent to which German credit has improved since the acceptance of the Young Plan, is the fact that, in place of the usual obligatory sinkg. fund provisns., a purchase fund of $310 000 (£62 000) per annum, to be exercised only when the bonds are at or below par, has been substituted for redemptn. purposes.

Company Meetings.

HARLAND AND WOLFF, LTD.—Lord Kylsant, presiding at the meeting last week, said in regard to the electric propulsion of ships which was developing in certain directions, he did not suppose there was another shipbuilding company in the world that was in a better position to carry through the whole installation on this principle. Having their own electric manufacturing department, they were peculiarly well equipped, both as to appliances and technical staff, to deal with the problems connected with this form of propulsion, in conjunction with either steam or motor engines. Notwithstanding the prolonged shipping depression, he had no doubt as to the ultimate recovery of prosperity.

CARMARTHEN ELECTRIC SUPPLY CO., LTD.—At the recent general meeting Mr. J. B. Arthur, chairman, said that the year 1929 had been the most successful since the company was formed. The profit amounted to £3 242 17s. 2½d., to which was added the balance of £1 245 11s. 11¼d. brought forward. The directors proposed to transfer £1 046 4s. 10d. to depreciation fund and £100 12s. 1d. to capital reserve fund. Interim and final dividends on the preference, second preference and ordinary shares amounted to £2 073 15s. 9d., leaving a balance of £1 267 16s. 5¾d. to carry forward. The directors had decided to reduce the price of current for lighting from 8d. to 7d. The directors had been approached by certain gentlemen regarding a sale of the shares of the undertaking. No definite offer had been made, and he was not in a position to make any further statement, but the shareholders would, of course, be communicated with when something definite was known by the directors. The directors wished it to be known that they were not responsible for the negotiations regarding any scheme projected in this area. The report and accounts were adopted.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—At the meeting on April 10th, Mr. W. R. Davies, chairman, referred to the fact that the company's maximum price was now 5d. per kWh and 1½d. for power. Unfortunately, he said, it had not been possible to reduce the lighting price to 4½d., and the power rate to 1d., as he had hoped. The balance carried to net revenue was only £61 594, against £69 021 in 1928. Two customers had recently addressed complaints to the Borough Council, comparing their rates with those of neighbouring municipal undertakings. This was not a proper comparison, as municipal undertakings were not out to earn profits beyond sufficient to pay interest and sinking fund on their borrowed capital. The proper comparison was with other London companies. In three cases of London companies which were favoured by exceptionally good areas, rates were lower, while in 10 which were at least as well situated as themselves, lighting rates varied from 5d. to 5½d., and power rates, with one exception, from 1½d. to 2½d. The company was almost, if not quite, the first London company to give a public supply. Like all pioneers, they suffered from early mistakes, large scrapping of inefficient plant became necessary, and for many years dividends were negligible. Now their dividends were limited by Act of Parliament they had the right to earn these dividends, and they must charge rates to enable them to earn them. After paying the shareholders' proportion of consumers' benefit, and paying the co-partners their share, the carry forward was reduced by £2 221. The report and the dividends of 6% per annum on the preference shares and 8·833% on the ordinary shares were approved.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—Mr. H. R. Beeton, presiding at the meeting on April 10th, said the past year was the first complete year in which they had been able to enjoy the benefit of bulk supply under the 1925 Act. They were precluded from distributing any additional dividend in excess of the standard dividend until they had reduced their price sufficiently to confer a benefit six times greater on their consumers. To formulate a successful tariff policy under such conditions was no easy matter, because if they ventured, as they did last year, on a too generous reduction in price, they had to wait in some uncertainty for a restoration of equilibrium. At such times the directors must look for bouquets from consumers to compensate them for brickbats from shareholders. They sold 10 393 000 kWh in 1929, against 8 646 000 in 1928, but as the average price charged was 3·04d., against 3·95d., a reduction of upwards of 20% (representing a saving to their 11 000 consumers of nearly £40 000), receipts amounted to only £131 700, against £142 000, or about 7½% less, and yet, in spite of this, they were able to buy current so much cheaper than they had been able to generate it that they suffered little loss of profit. The combined figures of the London Power Co.'s four generating stations at present in operation showed a saving in cost per kWh of about 12½% compared with the previous year. To meet the requirements of flats, they were extending vertical service mains, to save the owners the expense of paying for inside cables; and in order to encourage the use of electricity by occupiers for other than lighting purposes, they had instituted a scheme for the hire of cookers and radiators with a tariff of 1d. per kWh, and for water heaters with a still lower rate. The report and the dividends recommended therein were approved.

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NEW COMPANIES.

H. A. BOOTH, LTD.—Cap., £1 000. Electrical engineers, ventilating and heating specialists, etc. Solicitors :—John Hand and Son, 97, Gresham Street, London, E.C.2.

PERFECT BATTERY CO., LTD.—Cap., £100. Electrical engineers, manufacturers of and dealers in electrical appliances, etc. Reg. Office :—11, Fitzroy Square, London, W.1.

BLUCK ELECTRIC WELDING MACHINES, LTD.—Cap., £1 000. Engineers, electric welding machine manufacturers, etc. Reg. Office :—21 and 22, Hatherton Street, Walsall.

SCENE-IN-ACTION, LTD.—Cap., £1 000. Manufacturers of, and dealers in, electrical and mechanical signs, electrical, mechanical and radio engineers, etc. Reg. Office : 202X, Abbey House, Westminster, S.W.1.

W. D. FOSTER AND CO., LTD.—Cap., £5 000. To acquire the business of manufacturers and sellers of magnetos and batteries, as formerly carried on by W. D. Foster and Co., at 26, Hampstead Road, London, N.W.1.

JOHN A. H. HUNT, LTD.—Cap., £10 000. To acquire business of electrical fittings manufacturer, etc., as formerly carried on by the late J. A. H. Hunt, at 233, Bradford Street, Birmingham. Reg. Office :—233, Bradford Street, Birmingham.

HOWELLS (ELECTRIC MOTORS), LTD.—Cap., £13 000. To acquire business of manufacturers of electric motors and accessories and electric appliances carried on by H. F. Howells and E. C. Howells as Howells and Co., at York Street, Hanley, Stoke-on-Trent.

STANDARD RADIO CO., LTD.—Cap., £400. Manufacturers of and dealers in electrical apparatus, wireless, broadcasting and television instruments and apparatus, etc. Solicitors : Harrington, Edwards and Cobban, 33, Southampton Street, Strand, London, W.C.2.

REFRIGERATING ECONOMISER CO., LTD.—Cap., £1 000. To acquire inventions known as Schneiders Economiser of Frigories and to carry on business of makers and repairers of refrigerating plant, electrical and general engineers, etc. Reg. Office : 65-68, Merchants Exchange, Cardiff.

HARLIE BROS. (EDMONTON), LTD.—Cap., £1 000. To acquire business of Harlie Bros., carried on by C. Watson and H. J. Camp at Balham Road, Edmonton, and to carry on business of manufacturers of and dealers in wireless and electrical apparatus and goods, etc.

J. L. EVE CONSTRUCTION CO., LTD.—Cap., £50 000. To construct works and conveniences of all kinds, including tramways, electrical works, cables, etc. ; to carry on business of electrical and general engineers and contractors, etc. Solicitors :—Cardew-Smith and Ross, 27, Ely Place, London, E.C.1.

HAMILTON BEACH SWEEPERS, LTD.—Cap., £20 000. To adopt agreement with Electric Sweepers, Ltd., and to carry on the business of manufacturers of and dealers in electrical or other sweepers, irons, kettles, heaters, radiators, lamps, wireless apparatus, etc. Reg. Office :—405, Oxford Street, London, W.1.

CABLES AND WIRELESS PENSION FUND TRUSTEE.—Cap., £50. To act as custodian trustee of funds for provision of pensions, superannuation allowances, or other benefits for employees, ex-employees, or the widows and dependents and connections of employees or ex-employees, of Cables and Wireless, Ltd., Imperial and International Communications, Ltd., Eastern Telegraph Co., Ltd., Eastern Extension, Australasia and China Telegraph Co., Ltd., Western Telegraph Co., Ltd., African Direct Telegraph Co., Ltd., West African Telegraph Co., Ltd., Direct Spanish Telegraph Co., Ltd., West Coast of America Co., Ltd., Pacific and European Telegraph Co., Ltd., Marconi's Wireless Telegraph Co., Ltd., and Pacific Cable Board. Reg. Office :—Electra House, Moorgate, London, E.C.2.

METAL AND CHEMICAL PRICES.

MONDAY, April 14th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£73 15 0	—	£1 os. od.
Electro Wirebars	,,	£83 10 0	—	5s. od.
H.C. Wire, basis	per lb.	11 1/16d.	—	—
Sheet	,,	11 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2 1/16d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10 1/2d.	—	—
Wire ,,	,,	10 1/16d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£20 0 0	5s. od.	—
Foreign or Colonial	,,	£18 12 6	7s. 6d.	—
Tin—				
Ingot	per ton	£167 12 6	£5 5s. od.	—
Wire, basis	per lb.	2s. 3 1/2d.	1d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£18 2 6	—	2s. 6d.
Mercury	per bottle	£22 15 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2 1/2d.
Sodium Bichromate—Per lb., 3 1/2d.

Rubber—Para fine, 8 1/2d. ; plantation, 1st latex, 7 7/16d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CALLINGTON MOTOR AND ENGINEERING CO., 6, Fore Street, Callington, wireless dealers. £10 9s. 1d. January 31st.

COPE, Mr. V., 3, Powis Gardens, Golders Green, wireless dealer. £93 16s. 10d. February 6th.

HASSAN, Mr. (trading as Texo Products), 2/3, Titchfield Street, Dean Street, W., wireless dealer. £44 os. 7d. February 5th.

RAYMOND, Mrs. K., 27 and 28A, Lisle Street, Leicester Square, W.C., wireless stores proprietress. £13 7s. 8d. February 10.

SCHOFIELDS, The Arcade, Waterfoot, wireless dealers. £20 18s. 8d. March 6th.

SHAW, T. R., (trading as Shaw, Fletcher and Co.), King Street, Wrexham, electrical engineer. £19 1s. 5d. February 4th.

SUMMERS, Mr. E., The Parade, Perranporth, electrical engineer. £13 7s. 8d. February 25th.

THOMAS, Dennis, 41, Bridgend Road, Aberkenfig, wireless dealer. £24 18s. 8d. February 13th.

Receiverships.

DAKOL ELECTRIC, LTD.—Sir Albert W. Wyon, of 3, Frederick's Place, Old Jewry, E.C.2, was appointed Receiver or Manager by Order of Court dated March 21st, 1930.

K.N. ELECTRICAL PRODUCTS, LTD. J. M. Ferguson, C.A., of Staple Inn Buildings, W.C., was appointed Receiver on March 6th, 1930, under powers contained in debentures dated December 7th, 1928, and May 30th and August 10th, 1929.

W. ROBSON AND SONS, LTD.—P. Taggart, of 30, Lord Street, Liverpool, was appointed Receiver on March 8th, 1930, under powers contained in debenture dated March 31st, 1926.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BARNETT (C.), LTD., London, W.C., wireless accessory dealers.—Registered March 21st, series of £2 000 3rd debentures, present issue £1 250 ; general charge. *£1 940. December 31st, 1929.

PONTYPOOL ELECTRIC LIGHT AND POWER CO., LTD.—Registered March 21st, £350 debentures, part of £15 000 ; general charge. *£8 200. January 2nd, 1930.

SHAW, FLETCHER AND CO., LTD., Wrexham, electrical engineers.—Registered March 21st, £360 debenture, to T. R. Shaw, Moniaive, Chester Road, Wrexham, electrical engineer ; general charge.

VOLTRON CO., LTD., London, W.C., wireless manufacturers. Registered March 27th, £3 000 2nd debentures, to S. B. Causer, 240 Baring Road, Lee ; general charge. *£2 500. December 31st, 1929.

Satisfactions.

CLEVELAND AND DURHAM ELECTRIC POWER, LTD., Newcastle-on-Tyne.—Satisfaction registered March 18th, £13 500, part of amount registered October 23rd, 1913 and January 17th, 1919.

GENT AND CO., LTD., Leicester, manufacturing electricians.—Satisfactions registered March 22nd, £6 500, registered June 6th, 1905, and June 25th, 1906 and £1 000, registered February 26th, 1908.

London Gazette, etc.

Notice of Dividend.

PEACE, Ernest Everitt, rear of 230, High Street, Erdington, Birmingham, trading as PEACE AND CO., manufacturing electrical engineer. First and final dividend, 1s. 4 1/2d. per £, payable April 23rd, Official Receiver's office, 191, Corporation Street, Birmingham.

Partnerships Dissolved.

DOOLEYS (Henry Hugo DOOLEY and Robert Stanley WRIGHT), wireless instrument dealers, 33, Broomfield Road, by mutual consent as from February 1st, 1930. Debts received and paid by H. H. Dooley.

SOUTHERN RADIO SUPPLY CO. (Aaron HITNER and Samuel COHEN) wireless factors and dealers, 22, Francis Street, London, W.C.1, by mutual consent as from March 31st, 1930. Debts received and paid by A. Hitner.

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ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

FRIG-O-MATIC. 508 373. Class 6. Electric refrigerating machines. Dominion Blower Co., Ltd., Morrell Street, Brantford, Ontario; manufacturers. December 2nd 1929.

LIMIPHONIC. 510 140. Class 8. Sound reproducing apparatus and parts thereof, wireless telephone apparatus and parts thereof, and wireless telephonic apparatus in combination with gramophones. Limit Engineering Co., Ltd., 17, Albion Street, London, N.1; manufacturers. February 6th, 1930.

PALADIN. 510 278. Class 8. Instruments and apparatus for radio signalling, thermionic valves, thermionic amplifiers, and sound reproducers, gramophones, gramophone pick-ups, and parts of same. The Mullard Radio Valve Co., Ltd., 45, Nightingale Lane, Balham, London, S.W.12; manufacturers. February 11th, 1930.

LIVER. 508 130. Class 13. Metal goods for electrical purposes, but not including lamps and not including any goods of a like kind to lamps. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. November 23rd, 1929. To be associated with No. 472 163 (2 536) and others.

TIME-O-STAT. 504 961. Class 8. Automatic controlling devices for gas, oil and coal burners, for electric refrigerators, mechanical stokers, furnace fans, industrial ovens, ice machines and for electric heaters and water heaters; automatic circuit breakers and makers for operating advertising signs; and mercury switches. Time-o-Stat Controls Co., McNaughton Street, Elkhart, Indiana; manufacturers. July 31st, 1929.

LIVER. 508 129. Class 8. Philosophical instruments, scientific instruments and instruments and apparatus for teaching; all being goods for use in connection with electricity, but not including cables or kinematograph films, and not including any goods of a like kind to kinematograph films. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. November 23rd, 1929. To be associated with No. 503 394 (2681) and others.

FOTOS. 509 331. Class 8. Parts of wireless telephonic apparatus. Concerton Radio and Electrical Co., Ltd., 256 and 257, Bank Chambers, 329, High Holborn, London, W.C.1; manufacturers. January 8th, 1930.

FRANKLIN (sign). 509 558. Class 8. Apparatus for use in wireless telegraphy or telephony. Ethel Winifred Johnston, 43, Cleveland Road, Ilford, Essex; merchant. January 16th, 1930. Registration of this trade mark shall give no right to the exclusive use of the word "Franklin."

BERO (sign). 509 676. Class 8. Electrical resistances, electrical measuring instruments, electrical relays and automatic electrical switches. The British Electric Resistance Co., Ltd., Ohmic Works, Queensway, Ponders End, Middlesex; manufacturers. January 21st, 1930.

GOLDEN FLAME. 509 725. Class 8. Electric batteries (not for medical purposes). S. Kalisky (Aldgate), Ltd., 75, High Street, Aldgate, London, E.C.3; merchants. January 23rd, 1930.

DIOLITE. 505 147. Class 13. Electric lamps (ordinary), electric lighting fittings and sparking plugs, tubing, staples, screws, bolts and nuts, all being metal goods not included in other classes. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2; manufacturing electrical engineers. August 8th, 1929. To be associated with No. 505 146 (2 710) vi and another.

FENO (sign). 502 862. Class 18. Electric fires. Johannes Schleper, trading as J. Schleper and Zonen, 217, Heerengracht, Amsterdam; manufacturer of electrical appliances. May 17th, 1929.

DIOLITE. 505 148. Class 18. Electrical heating apparatus. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2; manufacturing electrical engineers. August 8th, 1929. To be associated with No. 505 146 (2 710) v, and another.

LIVER. 508 135. Class 39. Paper for electrical insulating purposes. November 23rd, 1929. To be associated with No. 472 195 (2 536) and others. 508 136. Class 50. Electric lighting, heating, telephonic, telegraphic and wireless telephonic, telegraphic and television fittings, all being goods of material covered by Class 50, and not included in other classes. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. November 23rd, 1929. To be associated with No. 472 197 (2 536) and others.

PACENT RECORDER (sign).—505 901. Class 8. Sound reproducing and recording apparatus. Pacent Reproducer Corporation, 630, 9th Avenue, New York; manufacturers. September 9th, 1929. (By consent.)

SONESTRA.—508 191. Class 8. Gramophones and wireless telephonic apparatus. Ewing and McIntosh, Ltd., 425-427, Sauchiehall Street, Glasgow, C.2; musical instrument merchants. November 26th, 1929.

VAR-LAC.—509 525. Class 8. Electric cables. Flexible Electric Cords, Ltd., 7, Queensway, Ponder's End, Middlesex; electric cable manufacturers. January 15th, 1930.

FONOTIPIA.—509 163. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes, instruments and apparatus for teaching. Societa, Italiana di Fonotipia, 37, Viale Umbria, Milan; manufacturers. December 31st 1929. To be associated with No. 509 244 (2 712).

RHODOPHONE.—510 064. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Arthur Charles Lawler, trading as A. C. Lawler, 1-32, Linden Gardens, Notting Hill Gate, London, W.2; manufacturer. February 4th, 1930. To be associated with No. 510 065 (2 712), xli. (By consent).

PORCUPINE.—510 317. Class 8. Electric cables. The Enfield Cable Works, Ltd., Lincoln House, 296 to 302, High Holborn, London, W.C.1; manufacturers February 12th, 1930.

SINGER.—500 781. Class 13. Sewing machine needles, oil cans, screw drivers, pliers, stillettos, stools, electric switches (ordinary) and switch covers; and electric lamp fittings not forming parts of or accessories for motor vehicles and cycles; all being goods of ordinary metal not included in other classes. The Singer Manufacturing Co., 149, Broadway, New York; sewing machine manufacturers and dealers. March 8th, 1929. To be associated with No. 157 890 (716) and others. Advertised before acceptance, the applicants alleging distinctiveness.

POLIFLOR (sign).—B505 142. Class 6. Electric floor polishing machines. C.C.A (Vacuum Cleaners), Ltd., Swinton House, 324, Gray's Inn Road, London, W.C.1, manufacturers. August 8th, 1929. User claimed from October 8th, 1926. The applicants undertake that this mark, when registered, and the mark No. 505 143 (not yet advertised) shall be assigned or transmitted only as a whole and not separately.

BURCO (sign).—502 849. Class 6. Electric washing and wringing machines. Burnley Components, Ltd., Accrington Road, Rose Grove, Burnley, Lancashire; engineers. May 17th, 1929. To be associated with No. 426 132 (2 328).

REGENTONE.—506 511. Class 8. Wireless telephonic apparatus and parts thereof. Robert Henry Nunn, trading as Regent Radio Supply Co., 21, Bartlett's Buildings, Holborn, London, E.C.4; manufacturer. September 30th, 1929. Concurrent user claimed from September, 1925, Section 21.

WAVERLEY (sign).—508 050. Class 8. Wireless telephonic receiving sets. Harold Fratton Gidfrey, trading as the Waverley Wireless Co., 77, Great Titchfield Street, London, W.1; manufacturer. November 22nd, 1929. Registration of this mark shall give no right to the exclusive use of the word "Waverley."

PHILIFLOOD.—509 636. Class 13. Electric lamps and electric lighting fittings, all being metal goods not included in other classes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, 13D, Emmasingel, Noord-Brabant, Eindhoven; manufacturers. January 20th, 1930. (Date claimed under International Convention, November 15th, 1929.) To be associated with No. 505 341 (2 703) and others.

THE LEAD MARKET.

Following the reduction in the American price from 5.75 to 5.50 cents per lb., the market according to James Forster and Co., opened weak, April lead selling down to £18 2s. 6d., and forward to £18 7s. 6d. Closing prices on April 11th were £18 12s. 6d for April, £18 13s. 9d. for May and June, and £18 15s. for July, or unchanged on the week.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

293 387 SIEMENS-SCHUCKERTWERKE AKT.-GES. Arrangements for increasing the sensitiveness of alternating-current instruments. (5/7/27.)
292 617 M. URBINATI. Apparatus for the transformation of electric alternate currents into direct currents, and *vice versa*. (23/6/27.)
323 244 O. GERHARDT. Systems for reducing the disturbances caused by apparatus capable of producing high-frequency interference with radio-receiving apparatus. (18/7/28.)
323 245 O. TANTS. Wireless-message transmission. (23/7/28.)
323 206 W. STAFFORD. Electric sign controllers. (20/8/28.)
323 184 SIEMENS-SCHUCKERTWERKE AKT.-GES., and A. CALLSEN. Distant control plant utilizing electric resonance relays. (20/8/28.)
323 186 GENERAL ELECTRIC CO., LTD., and F. FORREST. Electrical precipitation of dust from gases. (23/8/28.)
323 190 H. H. BERRY. Electric imitation fires. (21/9/28.)
323 191 E. ALMEIDA and ALMEIDA ACCUMULATORS, LTD. Secondary electric cells. (21/9/28.)
323 192 L. A. LEVY and ALMEIDA ACCUMULATORS, LTD. Electrodes for electric batteries, electrolytic cells, and the like. (21/9/28.)
314 786 E. VION. Electromagnetic apparatus for the observation and correction of travel of aerial and marine craft. (2/7/28.)
323 194 A. D. FERGUSON, and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electric traction-control systems. (21/9/28.)
304 646 HERAEUS VACUUMSCHMELZE AKT.-GES. and H. HIEMENZ. Electric furnaces. (23/1/28.)
323 255 A. E. BOWYER-LOWE. Tuning devices for oscillatory circuits. (21/9/28.)
323 200 H. GREEN and CELEBRITONE, LTD. Microphones. (22/9/28.)
323 222 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.) Magnetic materials. (24/9/28.)
323 228 DR. M. WILDERMAN. Electric batteries. (25/9/28.)
297 747 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (20/9/27.)
298 078 L. MELLERSH-JACKSON. (TELEFONAKTIEBOLAGET L. M. ERICSSON.) Telephone receivers. (26/9/28.)
323 237 G. MARCONI. Wireless signalling apparatus. (27/9/28.)
323 265 C. J. NESBITT-DUFORT and O. AND S. OILLESS BEARING CO., LTD. Wireless receiving-apparatus. (28/9/28.)
323 268 J. A. CRABTREE and B. G. HARRISON. Electrical ceiling-roses, lampholders, suspension switches, couplings, and the like. (29/9/28.)
298 474 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (8/10/27.)
323 282 COVENTRY AUTOMATIC TELEPHONES, LTD., and J. ERIKSEN. Devices for the measurement of mechanical forces. (9/10/28.)
323 285 CHAMBERLAIN AND HOOKHAM, LTD., and S. JAMES. Prepayment electricity and other meters. (11/10/28.)
323 291 ELECTRIC FURNACE CO., LTD., and D. F. CAMPBELL. Electric melting-furnaces. (17/10/28.)
323 292 H. LABORENZ. Electrodes for use in dental surgery. (18/10/28.)
303 349 CONDUIT ELECTRICAL MANUFACTURING CORPORATION. Electric current-limiting reactors. (31/12/27.)
303 741 J. DIEUX. Thermionic valve circuits. (7/1/28.)
323 311 SIEMENS-SCHUCKERTWERKE AKT.-GES., R. J. PICK and P. STERN. Thermo-electric switches. (12/11/28.)
300 653 S. J. ZIEMBINSKI. Means for operating or controlling the ignition advance in internal-combustion engines. (18/11/27.)
323 329 A. WOLF. Railway signalling systems. (23/11/28.)
301 464 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Control systems for electric motors. (30/11/27.)
323 331 S. G. S. DICKER. (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Aerials for transmitting wireless signals. (26/11/28.)
301 505 L. SEGUIN and A. SEGUIN. Plug-and-socket electric couplings. (2/12/27.)
301 435 INTERNATIONAL GENERAL ELECTRIC CO., INC. Earth-fault protective arrangements for alternating-current generators. (29/11/27.)
301 746 BRITISH THOMSON-HOUSTON CO., LTD. Refrigerating-machines. (3/12/27.)
323 342 E. D. T. NORRIS and FERRANTI, LTD. Lightning or surge absorbers. (6/12/28.)
323 343 MICANITE AND INSULATORS CO., LTD., and G. E. HAEFELY. Electric insulators. (8/12/28.)
303 114 BRITISH THOMSON-HOUSTON CO., LTD. Incandescent electric lamps and mountings therefor. (28/12/27.)
323 363 ENGLISH ELECTRIC CO., LTD., and C. T. SCARF. Cam-operated electric contactor switches and like devices. (28/12/28.)
303 369 SOC. DES ETABLISSEMENTS INDUSTRIELS DE E. C. ET DE A. GRAMMONT. Cathode for electron-discharge devices. (31/12/27.)
323 370 A. W. G. TUCKER and FERRANTI, LTD. Electric transformers. (3/1/29.)
323 385 F. A. KIRSTEN. Electric immersion heaters. (21/1/29.)
318 221 WICO ELECTRIC CO. Magnetos. (31/8/28.)
304 790 K. MANGER. Electric lighter for pipes, cigars, and cigarettes specially for motor-cars. (27/1/28.)
305 944 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Energy-supply systems for thermionic valves. (11/2/28.)
323 404 L. MELLERSH-JACKSON (SIEMENS AND HALSKE AKT.-GES.). Apparatus for the supervision of electric power-distributing systems. (14/2/29.)
323 408 E. FRIES. Device for determining the temperature of the oil contained in oil-immersed transformers. (5/12/28.)
323 410 O. SCHNEIDER and A. WEIFFENBACH. Electric switch. (18/2/29.)
323 420 E. SCHARPENBERG. Cable-eyes or sockets for electric cables. (4/3/29.)
323 424 N. V. PHILIPS' GLOELAMPENFABRIEKEN. Electron-discharge tubes or thermionic valves. (4/12/28.)
309 486 FELTEN AND GUILLEAUME CARLSWERK AKT.-GES. Submarine cables. (11/4/28.)
323 431 E. L. WILDY and LONDON ELECTRIC WIRE CO. AND SMITHS, LTD. Method of and means for distinguishing electric cables. (20/3/29.)
308 366 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (8/10/27.)
323 440 R. SCHULTZ. Clamps for electric conductors. (25/4/29.)
315 757 GENERAL ELECTRIC CO., LTD. Luminous electric discharge tubes. (17/7/28.)
311 819 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Dynamo-electric machines. (17/5/28.)
323 271 HERAEUS VACUUMSCHMELZE AKT.-GES. Electric furnaces. (21/9/28.)
323 498 B. C. VON PLATEN and L. A. G. REILAND. Dynamo-electric machines. (3/7/28.)
323 499 S. Z. DE FERRANTI, J. TURNER, and FERRANTI, LTD. Radiators or coolers. (3/7/28.)
323 520 E. W. C. RUSSELL (C. B. SAWYER). Piezo-electric devices. (6/7/28.)
323 477 STATE RAILWAYS RADIO CO., LTD., and L. ZOLTAN. Means for the elimination of disturbances in radio-receiving sets for railway trains caused by the lighting system of the carriages. (21/9/28.)
301 062 SIEMENS-SCHUCKERTWERKE AKT.-GES. Non-interchangeable screw-plug electric fuses. (24/11/27.)
313 584 ELECTRICAL RESEARCH PRODUCTS, INC. Magnetic materials. (15/6/28.)
323 479 P. H. L. LEPAS. Electrical resistances and reactances. (26/9/28.)
323 491 G. T. S. DICKSON and J. A. CRABTREE. Switch-gear for controlling electric house-lighting plant and similar electrical installations. (27/9/28.)
323 492 T. DICKINSON. Apparatus to prevent the radiation of oscillations from dynamos, motors, and the like machines. (27/9/28.)
323 506 W. BREFFIT. Electric heating-elements or radiators. (29/9/28.)

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299 040 Automatic Signal Corporation. Self-regulating automatic traffic-control systems. (20/10/27.)
300 608 E. Granat and Compagnie des Forges et Acieries de la Marine et d'Homecourt. Distant electric control device. (16/11/27.)
323 486 L. Miller, C. Filmer, and Associated Electrical Industries, Ltd. Control systems of electric machines. (1/10/28.)
298 232 Siemens-Schuckertwerke Akt.-Ges. Electric switches. (6/10/27.)
299 041 Electrical Research Products, Inc. Electrical transmission systems. (21/10/27.)
323 533 Standard Telephones and Cables, Ltd., J. C. Chaston, and J. P. Johns. Manufacture of magnetic cores or like magnetic structures. (4/10/28.)
298 164 Standard Telephones and Cables, Ltd. Telephone systems. (4/10/27.)
298 165 Standard Telephones and Cables, Ltd. Telephone systems. (4/10/27.)
323 535 J. G. H. Budd and British Automatic Totalisator, Ltd. Totalisators. (4/10/28.)
323 540 Wireless Pictures (1928), Ltd. (O. Fulton). Electrical transmission and reception of pictures and other representations. (4/10/28.)
307 417 Electrical Research Products, Inc. Vacuum-tube circuits. (7/3/28.)
300 498 Associated Telephone and Telegraph Co. Impulse-senders for use in telephone or like systems. (12/11/27.)
323 558 Automatic Telephone Manufacturing Co., Ltd., C. Gillings, and J. McGavin. Telephone systems. (9/10/28.)
323 559 British Thomson-Houston Co., Ltd., and R. D. Given. Devices for controlling electric circuits. (9/10/28.)
323 560 British Thomson-Houston Co., Ltd., and H. Trencham. Electrical contacts. (9/10/28.)
323 561 N. R. Davis and Associated Electrical Industries, Ltd. Electrical induction furnaces. (9/10/28.)
323 563 M. C. Pollock and E. E. Pollock. Electrical connection-plugs. (9/10/28.)
323 564 J. R. Robertson and J. Vielle. Mercury-vapour lamps. (9/10/28.)
323 566 T. Okamoto. Electrically heated vessels adapted to contain liquids. (10/10/28.)
323 571 S. S. Wrightson and C. R. Matthews. Rail-chairs or tie-plates or rail-chairs combined with steel sleepers for tramways or railways. (12/10/28.)
323 574 N. Dennes and Associated Electrical Industries, Ltd. Thermostatic controlling means for electrically heated ovens or other appliances. (13/10/28.)
323 577 British Power Railway Signal Co., Ltd., E. E. Pierce, and S. L. Glenn. Route indicators for trains and other vehicles. (16/10/28.)
323 591 C. C. Mason, W. H. Apthorpe, and Cambridge Instrument Co., Ltd. Measurement of forces. (5/11/28.)
318 214 J. Robinson. Electric vaporisers. (31/8/28.)
323 600 A. C. Clark. Electrical cable connector. (16/11/28.)
323 605 H. Geffcken and H. Richter. Photo-electric cells. (19/11/28.)

Applications for Patents.

December 3rd.

37 017 F. V. Abbott, A. E. Honey and J. Stone and Co., Ltd. Electrical installations for railway vehicles.
37 041 R. J. Aiken. Device for controlling electric circuits.
37 058 Associated Telephone and Telegraph Co. Telephone systems. (10/12/28, U.S.).
36 980 R. H. Barfield. Radio direction finders.
37 024 C. D. Barklie. Electrical resistances.
37 021 British Thomson-Houston Co., Ltd. Electric discharge devices. (3/12/28, U.S.).
37 022 British Thomson-Houston Co., Ltd., C. J. Morton and T. H. Woodfield. Ignition devices.
36 959 T. A. B. Carver. Mechanism for electrically controlling mechanical motion.
37 059 P. H. Chase. Cables. (3/12/28, U.S.).
37 974 J. P. Davis. Portable electric fittings.
37 019 Electrolux, Ltd. Suction apparatus. (3/12/28, Germany).
37 020 Electrolux, Ltd. Vacuum cleaners. (3/12/28, Germany).
37 071 E. W. B. Gill and Marconi's Wireless Telegraph Co., Ltd. Aerial arrangements for radio receiving.
37 022 L. Griffiths. Ignition devices.
37 027 M. Haase. Electric illuminated advertising signs.
37 068 W. O. Heyne and Plessey Co., Ltd. Variable electrical condensers.
37 043 Hirsh Kupfer u Messingwerke Akt.-Ges. Doors of electric furnaces. (11/3/29, Germany).
36 939 W. R. Howles and J. and J. Siddons, Ltd. Dashpots.
36 958 E. S. Rowlands. Earth fault protective system.
36 941 Standard Telephones and Cables, Ltd. (A. G. Clavier). Thermionic oscillation generators.
37 015 K. Stevskal. Electric street car motors.

December 4th.

37 190 Associated Electrical Industries, Ltd. Insulating bushings. (10/1/29, U.S.).
37 221 Automatic Telephone Mfg. Co., Ltd., T. G. Rice and L. M. Simpson. Electric totalisators.
37 200 D. M. B. Beaumont. Electric switches.
37 103 British Thomson-Houston Co., Ltd., and G. O. Watson. Electric ship propulsion. (7/9/28.
37 104 British Thomson-Houston Co., Ltd., and G. O. Watson. Electric power supply systems. (7/9/28.)
37 107 British Thomson-Houston Co., Ltd., and G. O. Watson. Protective systems for a.c. generators. (7/9/28.)
37 108 British Thomson-Houston Co., Ltd., and G. O. Watson. Supports for wattmeters, etc. (7/9/28.)
37 169 British Thomson-Houston Co., Ltd. Electric condensers.
37 230 H. J. Coates and General Electric Co., Ltd. Motor control systems.
37 119 Falkirk Iron Co., Ltd., W. G. Johnson, H. J. Kennard and A. Kinnes. Electric cooking apparatus.
37 193 L. G. Gautron and H. Porret. Automatic electrical igniting mechanism for gas stoves. (5/12/28, Switzerland).
37 227 General Electric Co., Ltd. Luminous electric discharge tubes. (29/6/29, Germany.)
37 228 General Electric co., Ltd. Luminous electric discharge tubes. (13/7/29, Germany.)
37 229 General Electric Co., Ltd. Manufacture of electric lamps, etc. (1/7/29, Germany.)
37 231 General Electric Co., Ltd. Luminous electric discharge tubes. (9/7/29, Germany.)
37 170 International General Electric Co., Inc. Electric relays. (4/12/28, Germany.)
37 235 E. V. Mackintosh. Electromagnetic vibratory devices.
37 698 P. L. J. Miguet and M. P. Perron. Feeding primary materials to electric furnaces.
37 138 C. H. Pattman and Serck Radiators, Ltd. Electrical oil-heating apparatus.
37 146 K. Pfisterer. Cable connector. (3/4/29, Germany.)
37 189 Westinghouse Lamp Co. Radiation measurement, etc., apparatus. (24/12/28, U.S.)

December 5th.

37 331 J. H. Beaumont (Utilities Services, Inc.). Electrical power generating equipment.
37 253 J. W. Bowser, F. Lum and W. A. Newton. Cut-out devices.
37 315 British Thomson-Houston Co., Ltd., S. P. Hastings and T. H. Woodfield. Connections for electrical windings.
37 318 British Thomson-Houston Co., Ltd. Light sensitive electric cells. (27/12/28, U.S.)
37 355 C. N. Cadbury and Electro-Mechanical Brake Co., Ltd. Oil-immersed electrical apparatus.
37 361 California Institute of Technology. Switching apparatus. (26/12/28, U.S.)
37 365 R. Downey. Mercury arc rectifying installations.
37 372 Electrical Research Products, Inc. Motor arrangements. (5/1/29, U.S.)
37 307 General Electric Co., Ltd. Luminous electric discharge tubes. (6/8/29, Germany.)
37 350 Hirsch Kupfer u Messingwerke Akt.-Ges. Condenser batteries. (6/12/28, Germany.)
37 325 C. Kohler. Insulating material. (12/12/28, Switzerland.)
37 264 E. Lawley. Electric cooker.
37 330 E. Lyons. Electric switches.
37 342 E. H. F. Morris. Electric radiators, etc.
37 369 N. V. Philips' Gloielampenfabrieken. X-ray tubes. (5/12/28, Germany.)
37 396 J. F. Phillips. Insulators.
37 370 J. E. Pollak (Siemens und Halske Akt.-Ges.). Telephone systems.
37 270 J. R. Pullon. Joints of electrical conductors.
37 309 Standard Telephones and Cables, Ltd. and R. St. G. Terry. Polarised relays for telephone systems.
37 310 Standard Telephones and Cables, Ltd., and C. E. Strong. Thermionic tube circuits.
37 311, 37 312 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic telephone exchange systems.
37 313 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Thermionic valve amplifying systems.
37 308 Standard Telephones and Cables, Ltd. (L. Devaux). Protective devices for telephone systems, etc.
37 257 S. W. Watts. Wireless receiving sets.
37 323 Westinghouse Electric and Manufacturing Co. Thermionic cathodes. (14/12/28, U.S.)
37 366 W. D. Wilde. Venting devices for galvanic batteries.

December 6th.

37 510 Automatic Telephone Manufacturing Co., Ltd., and O. A. Pearce. Totalisators.
37 412 W. Bramham, C. H. Roe and C. H. Roe (1923), Ltd. Electric trolley omnibuses.
37 172 Celia, Ltd., and J. J. Drumm. Storage battery, etc.
37 507 J. E. Clark, F. W. O. Kennedy and Lissen, Ltd. Thermionic valves.
37 427 W. A. Davies. Attachment for adjusting height of electric lamps, etc.
37 537 J. N. Dean, H. J. Garnett and W. S. Smith. Insulating materials.
37 449 Electro-Mechanical Brake Co., Ltd. Mechanical connections.
37 492 Elliott Bros (London), Ltd., and F. N. Kirby. Telegraph relays.
37 523, 37 524 E. Gay. Lead accumulators.
37 466 General Electric Co., Ltd., A. Sherwin and H. C. Turner. Polarised relays, etc.
37 522 Gramophone Co., Ltd., and R. K. Spencer. Screens for electric conductors.
37 425 T. Jacks. Electric connections.
37 452 J. Lucas, Ltd., and S. A. Mason. Electrically operated windscreen wipers.
37 447 N. B. P. O'Brien. Electric switches, etc.
37 421 A. Smith. Apparatus for controlling electric switches, etc.
37 418 F. J. White. Sliding bracket for electric lamps, etc.

December 7th.

37 580 Arcturus Radio Tube Co. Vacuum tubes for radio sets, etc. (7/12/28, U.S.)
37 601 Celia, Ltd., and J. J. Drumm. System of railway electrification.
37 631, 37 632, 37 633 C. von Delwig and B. M. S. Kalling. Electric furnaces. (10/12/28, Switzerland.)
37 618 G. F. Howell. Wireless receiving apparatus.
37 622 F. O. Monkhouse and G. E. Tate. Electric switches.
37 556 J. Paterson and J. Shirley. Electrode rod, etc., holders for electric welding.
37 554 A. M. Taylor. Electric power transmission.

December 9th.

37 675 Associated Electrical Industries, Ltd. Electric locomotives. (7/12/28, U.S.)
37 753 J. L. Baird. Television apparatus, etc.
37 708 C. G. M. Bennett, and A. Reyrolle and Co., Ltd. Control desks, etc., for electrical systems.
37 724 G. M. Boyd, J. Stone and Co., Ltd., and J. F. B. Vidal. Locking arrangements for electric lamps.
37 752 British Electrical and Allied Industries Research Association and W. B. Whitney. Circuit breakers.
37 701 Chubbs Automatic Mfg. Co., Ltd., and J. H. A. Spaink. Electric fuses, etc.
37 695 Coventry Automatic Telephones, Ltd., and B. F. Moss. Telephone systems.
37 773 Electrical Research Products, Inc. Signal transmission systems. (29/3/29, U.S.)
37 774 Electrical Research Products, Inc. Translating devices.
37 692 Electrolux, Ltd. Suction, etc., apparatus. (10/12/28, Germany.)
37 775 R. M. Hamilton. Electrical totalisators.
37 697 J. Y. Hart. Wavetrap for wireless apparatus.
37 712 International General Electric Co., Inc. Brakes for electric railway vehicles. (8/12/28, Germany.)
37 715 International General Electric Co., Inc. Transformers. (22/12/28, Germany.)
37 719, 37 750 Kienzle Uhrenfabriken Akt.-Ges. Synchronous electromotors. (8/12/28, Germany.)
37 735 O. D. Lucas. Valve operated wireless receivers, etc.
37 778 Marconi's Wireless Telegraph Co., Ltd. Picture, etc., telegraph systems. (7/12/28, U.S.)
37 779 Marconi's Wireless Telegraph Co., Ltd. High frequency transmission systems. (8/12/28, U.S.)
37 710 J. Pintsch Akt.-Ges. Cable impregnation apparatus.
37 753 Television, Ltd. Television apparatus, etc.
37 696 J. Tweats. Microphones.

COMING EVENTS.

Tuesday, April 22nd.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Ordinary meeting.

Wednesday, April 23rd.

Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Papers by Mr. F. H. Clough and Mr. W. Fennell on "Transformers for Overhead Lines." 5.30 *p.m.*

Friday, April 25th.

Institution of Electrical Engineers (West Wales, Sub-Centre).—Swansea. Paper by Messrs. S. W. Melson, A. N. Arman and W. Bibby on "Surge Investigations on Overhead Line and Cable Systems."
Faraday Society.—Rooms of the Chemical Society, Burlington House, Piccadilly, London. Annual general meeting. 2.15 *p.m.*
Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. General meeting. Paper by Mr. F. Carnegie on "The Economical Production and Distribution of Steam in Large Factories." 6 *p.m.*

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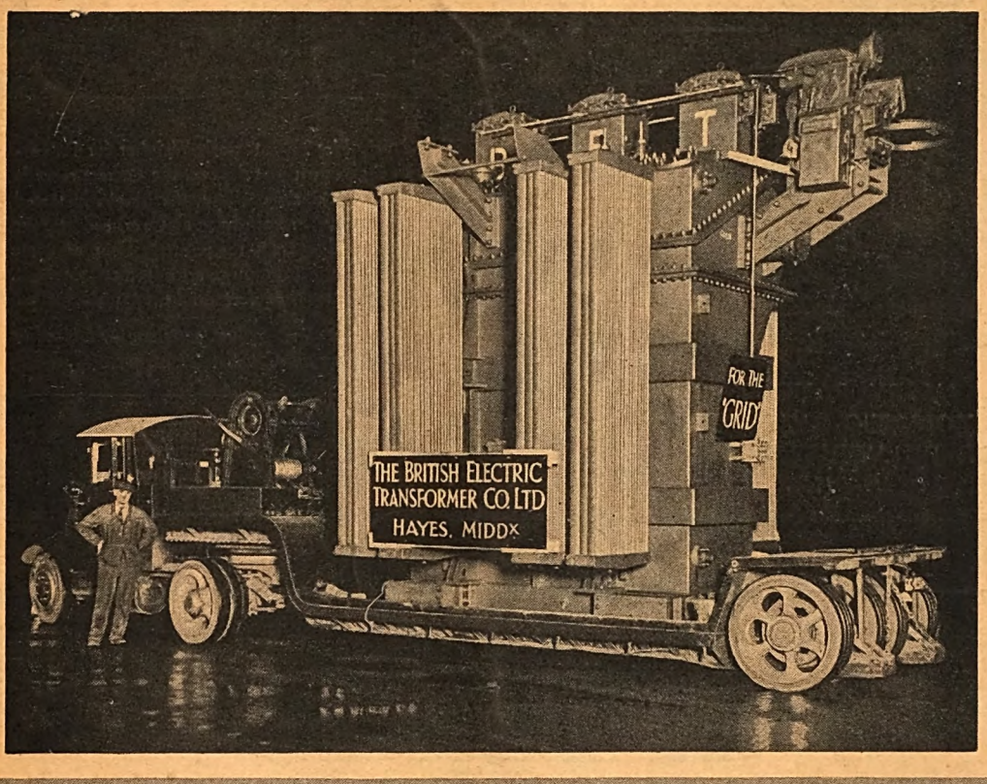
THE ELECTRICIAN

Vol. CIV.—No. 2708. Friday, April 25, 1930. [Registered at the General Post Office.] Sixpence



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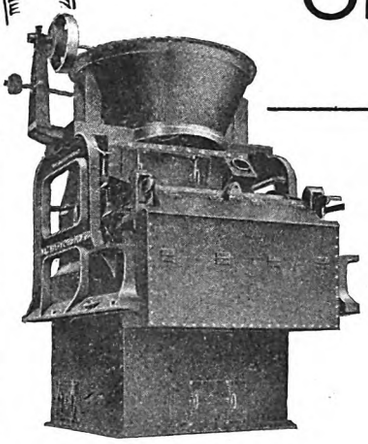

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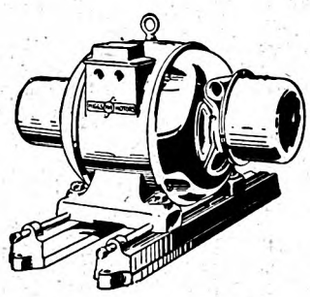
A.C.  D.C.

We know our machines are capable of giving remarkable results, but we were unable to put forward a suitable one to fulfil our prospective customer's requirements as requested in a letter received last week, copy of which is below:—

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Dear Sir,

I have heard your name and address from a certain friend of mine that you are the best manufacturer of all kinds dynamoes, medium sizes battery charging sets. So Kindly on receipt of this form sent me prices of all dynamoes which can charge three batteries; and can drive six cyclenders chevrolet machines or Motor Cars.

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

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Progress of the Grid.

NEXT Wednesday will be a notable occasion in the history of electric power transmission in Great Britain. On that day Lieut.-Col. the Right Hon. WILFRID ASHLEY, M.P., who was Minister of Transport in the late Government, is to open important extensions to the Portobello generating station of the Edinburgh Corporation, which is the selected station in the Lothians, and this ceremony will be followed by the official inauguration of the transmission system of the Central Scotland area of the Grid by Mr. HERBERT MORRISON, M.P., the present Minister of Transport. Central Scotland is the first of the ten areas into which England, Wales and Scotland have been divided by the Electricity Commissioners in connection with the National Grid scheme to reach a degree of completion which justifies an official celebration. Its main framework, which includes three notable river crossings —that over the Forth is carried on towers 338 ft. high, and has a span of 3 050 ft.—is constructed and at work. The extension linking up the main grid with the Grampian hydro-electric stations should be finished by the end of this year.

Central Scotland is at present a self-contained area, and is likely to remain so for some time to come, although the map of the National Grid, in its completed form, which we give on page 515, shows connections *via* Berwick and Carlisle respectively, between the Central Scotland and the North-East England and North-West England areas. It is not likely that these connections will be effected for several years to come. The linking of Central Scotland with the English grid depends on the possibility of elaborating a scheme for the difficult South Scotland and North England border region, which, like North Scotland, has few important centres of consumption. North Scotland may remain in the position of an outlying appanage of Central Scotland for an indefinite period, but South Scotland, being athwart the track of routes between Central Scotland and England, must, we imagine, find itself traversed by at least two main transmission lines in the comparatively near future.

In England there is still one area—the East Anglian peninsula, less Essex—for which no scheme has yet been made public. We understand that the proposals of the Electricity Commissioners for this region, which includes Norfolk and Suffolk, and will probably be known as the East England area, have reached an advanced stage, and are likely to be issued very shortly. The map of the Grid in its eventual form indicates Norwich as the primary selected station for this area, with a secondary station at Lowestoft, and 132 000 V transformer stations at King's Lynn and Yarmouth. The main transmission lines indicated on the map extend from Peterborough (S.E. England) *via* King's Lynn, to Norwich and Yarmouth, along the coast to Lowestoft, and thence direct to Ipswich (S.E. England). With the publication of details of the East England scheme, the plans of the Electricity Commissioners in regard to the Grid for some time to come will have been announced. Actual construction is well under way in many parts of the country. Whether it is far enough advanced to justify the withholding of consent to applications for power station extensions is at present a matter of controversy. At the general meeting of the County of London Electric Supply Co., last week, it was stated that consent had not yet been received to extensions at Barking for which the approval of the Electricity Commissioners had been sought. We understand that other London supply companies are in a similar position. Mr. QUIGLEY, in a further article in the "Financial Times," suggests that too high a percentage of old and uneconomic plant is being maintained in service all over the country, and that in calculating the percentage of spare plant only a.c. 50-cycle plant should be regarded as of significance. This is, perhaps, too drastic a restriction at the moment, but it is certainly necessary to give full weight to classification of generating plant when estimating the actual percentage in reserve.

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Current Topics.

National Register Progress.

APPLICATIONS to the number of 139 were accepted by the Executive Committee of the National Register of Electrical Installation Contractors during 1929 and the net number on the Register at December 31 last was 1 290. This had been increased to 1 318 by April 4. The nomination by the London and Home Counties Joint Electricity Authority of Mr. F. W. PURSE to represent the Authority on the Registration Board is a matter for congratulation, as Mr. PURSE'S valuable experience as a member of the Scrutinising Committee will in this way remain at the service of the Registration Board and the Executive Committee. At the request of Mr. P. V. HUNTER, the Central Electricity Board has also decided to support the Register and has nominated Mr. J. A. LEE as its representative, so that the authority of the Register has been further strengthened. Its finances also appear to be in a very healthy condition.

Hire Purchase.

THE extent to which the system of hire purchase has been developed makes it inevitable that occasional cases of hardship should occur. These affect both the suppliers and purchasers of goods. Dishonest individuals change their residences and endeavour to conceal their tracks from the dealer; others, the victims of unforeseen misfortune, are unable to go on paying and sometimes lose both the goods and the money they have already paid. Attempts to meet the latter difficulty by fixing a surrender value in hire-purchase agreements have been made from time to time but have been rejected as impracticable for good reasons. Yet it seems probable that a further effort of a more determined character is to be made to introduce legislation with this object. Miss ELLEN WILKINSON, M.P., who is drafting a Bill on the subject, recently received a deputation from the Hire Traders' Protection Association, which included representatives of the piano trade and branches of the furnishing and machine trades, and made it clear that she was inclined to favour the adoption of a surrender value in connection with hire-purchase agreements. The position will obviously bear watching by electrical and radio manufacturers and dealers.

Standardisation of Supply Voltages.

MANUFACTURERS of mains operated radio receivers will read with some apprehension one part of the statement issued by the Council of the Institution of Electrical Engineers in regard to standardisation of supply voltages. The Council feel that the best results in this direction will accrue from calling the attention of all undertakers who are supplying at a voltage near the standard to the power which the Commissioners possess of modifying the statutory voltage variation of $\pm$ 4 %. The Electricity Commissioners have agreed to exercise this power in the case of undertakings which may desire to work at a wider range of variation for the definite object of accelerating standardisation of voltage. Yet although at first glance it would seem that an extension of the permissible variation would add a good deal to the difficulties of designers of mains receivers and cause numerous complaints from users of existing sets, in actual practice the variation encountered frequently exceeds the permissible percentage, so that a moderate increase in the latter would not greatly alter the conditions within which mains receivers now have to work.

Cheaper Lamps.

AS it is estimated that, on a 30 W lamp basis, the number of non-standard voltage lamps in use in this country is between three and four times the number of standard voltage lamps, it is very evident that a greater measure of standardisation means a very important step towards cheaper lamps. In fact, manufacturers have agreed to offer a preferential discount on standard voltage lamps and parts of apparatus required for replacement in connection with standardisation of voltage. These benefits will far outweigh any temporary inconveniences that may be caused to owners and manufacturers of radio receivers to whom the sympathy due to sufferers in a good cause must be extended. The present chaotic conditions—there are 16 different supply voltages ranging from 100 to 250 in use in this country and the power voltage position is quite as bad—are as uneconomic as the multiplicity of railway gauges to be found in Australia and Chile.

Transformer Sizes for Rural Lines.

IN a circular addressed by the Electricity Commissioners to authorised undertakers having rural areas of supply and to various interested associations, attention is drawn to the desirability of constructing transmission and distribution lines in anticipation of demand, adopting suitable two-part tariffs which will encourage extended use of electricity when a supply is available, and providing assisted wiring and hire or hire-purchase schemes. The necessity for active propaganda is also mentioned. In connection with the adoption of standard technical practice it is suggested in the circular that in most cases the requirements of small villages and isolated consumers would be met by the adoption as standard sizes of pole transformers of 50, 20 and 10 kVA for 3-phase and 20, 10 and 5 kVA for single-phase supplies.

Triumphs of Telephony.

THE present year will always be considered notable in the history of the telephone. The first British experiments in commercial ship-to-shore telephony have been quickly followed by the establishment of a regular service. Elsewhere in this issue we give the first part of Col. Sir THOMAS PURVES'S account of how the technical problems involved have been solved. Ship and shore facilities are now being extended gradually to various countries in Europe. Last week successful conversations were held between Geneva and passengers on the " Majestic," and it seems likely that before very long Europe, America and the Atlantic will be regarded almost as forming one telephone network. Next Wednesday the wireless telephone service between Australia and England will be opened, and in the last few weeks the telephone has linked Spain with Chile and Paris with French Indo-China. It seems, too—to descend from the great to the small—that a new refinement of the telephone has been devised for homes and offices. For those who dislike using an intercommunicating telephone for giving orders, on the ground that the hands are not free or that it takes up valuable space, an arrangement has been devised that enables the caller to speak into the air after pressing a button, and to receive a reply from a concealed loud speaker. Transmitter and receiver are hidden behind a small panel in the wall.

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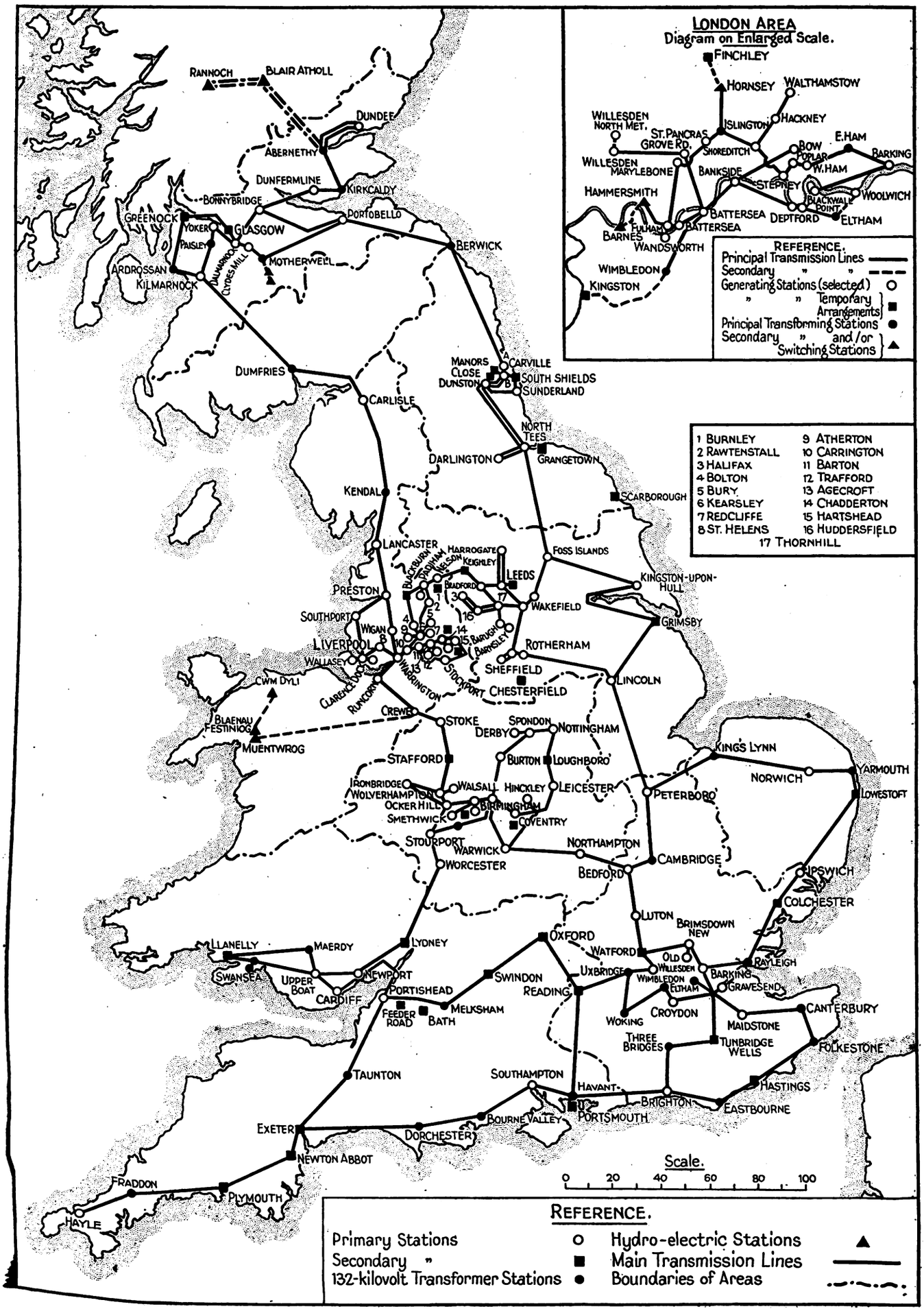

THE 132 KV GRID AS IT WILL BE WHEN COMPLETED.

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SHIP AND SHORE TELEPHONY.*

Wavelengths and Aerials—Baldock Receiving Station—Tuning and Amplification—Method of Overcoming Fading.

By COL. SIR THOMAS F. PURVES, President of the Institution of Electrical Engineers.

THE ship and shore telephonic services and experiments which are now being carried on are based on the use of short waves and, so far, consideration has been given only to the problem of communication with Transatlantic liners. In the case of the experiments made from America, effort was concentrated first of all upon securing reliable communication when the ship is comparatively near to the land. This is the most troublesome part of the problem. The attenuation of the "ground" wave is very rapid in the case of short waves and the "sky wave" does not materialise until a certain distance from the transmitter has been reached.

Fig. 1 shows the ground wave dying away at "A," and the first effective reflection of the sky wave reaching the earth's

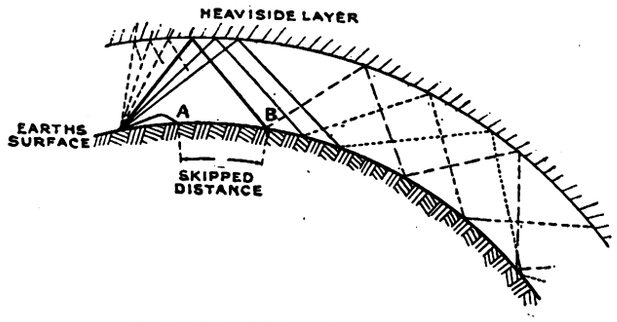

Fig. 1.—Skipped distance in radio transmission.

surface at "B." Between these two points "A" and "B" we get what is known as the "skipped distance" and it is this distance which is difficult to cover. This, however, has been done successfully in America :—

(*a*) By the use of longer wavelengths than those used for the longer ranges of distance. Frequencies of the order of 4 200 and 8 700 kilo-cycles (71 and 35 m.) are employed for the shorter ranges.

(*b*) By erecting the station quite close to the water's edge, so reducing the ground attenuation as much as possible, since the attenuation of the "ground" waves when travelling over sea is much less than over land.

Furthermore, the land transmitting station has been erected at a point where the direction of the ship's travel, while near the land, will intersect the coast line and thus make the transmission strongly directive for that portion of the voyage. Owing to the difference between the summer and winter routes normally taken by liners crossing the Altantic the direction of transmission from Rugby is far from constant.

Experiments made from this country have approached the problem from a point of view which differs somewhat from that of the Americans. The first steps taken were designed to cover the major portion of the voyage, leaving the short range problem for solution later. Moreover the conditions in this country differ appreciably from those on the other side of the Atlantic. There are several important ports to be considered, instead of one, and it is hardly possible, even if desirable, to locate the land radio stations where the near-in route direction intersects the land as in the American case.

Three principal wavelengths, of the order of 16, 24 and 36 m., are in use and experiments are also being carried out with wavelengths of the order of 70 and 100 m. The longer wavelengths (36, 70 or 100 m.) are used for short range transmission. They are radiated from plain (non-directional) aerials in order that they may communicate with ships near any British port. The two shortest waves (16 and 24 m.) are used for long range work and are radiated from directional aerial arrays which concentrate the transmitter energy into a "beam" in the required direction.

Unfortunately the wide bearings necessary to cover the ocean route prevent the use of a highly directional system, and a beam spreading at an angle of about 30 deg. has been provided. The 24 m. array is so directed that the beam covers the average position of the ship for the first 2 000 miles or so, while the 16 m. wavelength is arranged to cover the more distant portions of the voyage.

In order to radiate a given wavelength directionally, wires spaced at separating distances corresponding to calculated fractions of the wavelength are arranged, either horizontally or vertically, and are supplied with high frequency current. When correctly spaced the fields due to the various radiators add together vectorially, and in this way the resultant field strength in different directions can be effectively controlled.

By using an array of 16 similar vertical wires arranged in a line, with a space separation of one half the wavelength between adjacent wires, in preference to a single wire aerial, the distant field strength can be increased more than fourfold. With such an array the line of maximum field strength extends in opposite directions from the transmitting point.

The field strength in the desired direction may, however, be further increased by suppressing the field in the opposite direction, thereby obtaining an effect analogous to reflection. This is done by placing a curtain of similar wires one quarter of a wavelength behind the excited curtain. Their lengths should be adjusted to produce the best results. In practice, if the exciter wires of a transmitting array are half a wavelength long, the reflector wires should usually be a few inches longer. When correct adjustments have been made, the currents induced in the reflector wires lag approximately three quadrants (270 deg.) behind the currents in the exciter wires. Owing to this phase difference and the quarter wave space displacement between the exciter and reflector curtains the forward fields in a direction normal to the array will be 360 deg. apart, and therefore in phase ; whilst the backward fields will be 180 deg. apart, and therefore of opposite phase. Thus if the exciter and reflector curtains have equal currents, the forward field will be doubled whilst the backward fields will cancel out.

Fig. 2 is roughly symbolic of the conditions obtaining when an exciter wire "E" and a reflecting wire "R" are erected a quarter of a wavelength apart. The full line shows the forward and backward waves radiated by the exciter wire, and the dotted line shows the secondary waves emitted by the reflecting wire as a result of the absorption and re-radiation of the energy reaching it from "E." It will be seen that the latter waves reinforce the primary waves of the exciter wire in the forward and cancel them in the opposite direction.

Since "E" and "R" are a quarter of a wavelength apart each negative half-wave from "E" will excite the two secondary positive half-waves shown as emanating from "R." But since such excitation is a quarter of a period behind "E" in time, the phase relationship of the wave train in the forward direction will be the same as if "R" had been shifted to a position half a wavelength behind "E" producing phase superposition in that direction. For the same reason the origin of the backward train emanating from "R" must be assumed to coincide with "E," producing phase opposition behind the system. This ideal condition is not realised in practice, although a close approximation to it can be obtained. The "Marconi," "Koomans" and "Sterba" arrays utilise wires excited as half-wave or multiple half-wave radiators.

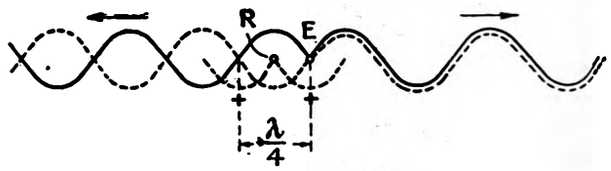

Fig. 2.—Directional radiation.

A type of aerial used extensively as a receiving aerial in the United States, and to a less extent in England, is the "Bruce" aerial. Each vertical and horizontal member is a quarter of a wavelength long, an exception being made in the case of the two end horizontal members, which are each an eighth of a wavelength long. The vertical members have all currents in the same direction, but the horizontal members have nodes of current at their centres and opposing currents at each side of the nodes. By this arrangement an incoming wave,

* Abstract of the presidential address to the Students' and Graduates' Section of the I.E.E., delivered on April 11.

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received from a direction normal to the array, produces currents in correct phase simultaneously in the verticals.

Recently the British Post Office has used an array (Fig. 3) having half-wave sections of the exciter wires in two planes, separated half a wavelength from each other. The currents in each plane have, therefore, a phase difference of 180 deg. in time, plus an equivalent separation in space, and the waves emitted by both are in phase. A reflecting curtain is built a quarter of a wavelength behind one exciter curtain, and, therefore, three-quarters of a wavelength behind the other. The object of arranging the exciter in two planes is economy in space and in the cost of the supporting towers. The array is known as the " T.W." aerial, from the initials of its inventor,

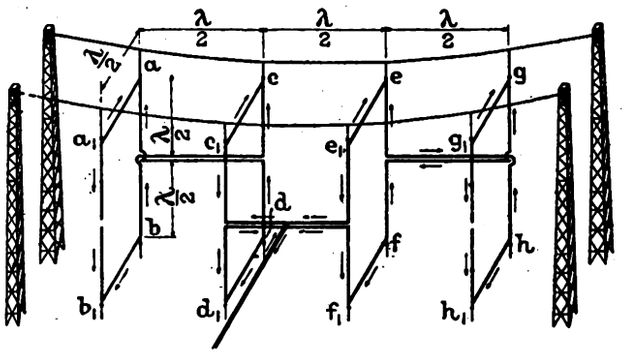

Fig. 3.—T.W. short-wave aerial (single vertical unit.)

" Tommy " Walmsley, of the Post Office Engineering Department.

In general, the field strength due to a single-plane array increases with the area enclosed by the boundary radiators, but the " T.W." aerial effects a considerable improvement as compared with other arrays occupying the same space.

The " T.W." array is built up of units of 16 radiators, which can be arranged either vertically, as shown in the figure, or horizontally. The complete array includes eight such units. At present the " Koomans " horizontal single-plane exciter types of array (in which groups of horizontal wires each half a wavelength long are energised), with reflectors, are being used for ship and shore telephony.

Fig. 4 gives some idea of the method of suspending arrays such as have been described. The array there shown is one of the " Sterba " type, at Rugby. The " Sterba " type utilises wires bent in half wavelengths, with the horizontal half-wave sections arranged in pairs, so as to neutralise each other.

The British main receiving station for the ship and shore service is situated near Baldock, about 30 miles north of London. The buildings and antennæ are placed in the middle of a large, flat site, in choosing which it was carefully observed that no roads were nearer than a quarter of a mile from any of the proposed array positions. This was necessary in order to prevent interference from short waves radiated from the ignition systems of motor-cars. For a similar reason, no rotating electrical machinery is placed in the vicinity of the receivers.

The operating wavelength of the ship and shore radio receiver is continuously variable over the range 10 to 100 m., and the tuning is effected by means of variable condensers in conjunction with interchangeable plug-in coil units. The frequency band width passed on over the land lines extends from 200 to 5 000 cycles. The receiver is of the double detection type, allowing of amplification on three frequency bands.—i.e., high (radio) frequency, intermediate frequency and audio frequency. The antenna arrays at Baldock consist of a number of vertical or horizontal elementary aerials of the " Koomans " and " Bruce " types. Carefully balanced transmission lines connect the arrays to the receivers.

The receiving connections are arranged so that the transmission lines are terminated at the receiving apparatus in their " characteristic " impedances, on an " antenna input " panel, so that reflection losses are prevented. The radio signals are then amplified at the radio signal frequency by a two-stage transformer coupled high frequency amplifier.

The frequency of the incoming signals is of the order of 10 000 kilo-cycles, and before subjecting them to further amplification and control they are heterodyned by means of a beating oscillator, and reduced to a rectified intermediate frequency of about 450 kilo-cycles.

In order that the receiver may be easy to operate, it is necessary that the tuning operations of the first detector grid circuit and of the beating oscillator should be independent. The beating oscillator voltage is, therefore, introduced into the anode circuit and the signal voltage into the grid circuit of the first detector, the grid to anode capacity being neutralised by means of a small condenser. The beating oscillator is of the push-pull type, and it must be carefully designed to give good frequency stability, since a variation of frequency of 0·05% is all that is required to tune into a neighbouring band. After being thus changed in frequency, the signal is amplified by means of a seven-stage intermediate frequency amplifier having a maximum amplification of approximately 100 decibels—i.e., a voltage amplification of 100 000 times. This amplifier is arranged to pass a band of frequencies about 10 000 cycles wide.

In order to overcome the effects of the " fading " which is experienced on short waves, an automatic gain control is provided. After passing the second detector, the signals enter a band pass filter, passing a band of frequencies from 200 to 5 000 cycles. This filter is followed by a standard telephone repeater, which introduces a gain variable up to 40 decibels. A volume indicator, which gives readings on a milli-ammeter of the strength of the speech passed to line, is provided so that the correct level of speech is sent into the cable circuit between Baldock and London. The receiver is equipped with long-life valves, and the total filament current is of the order of 10 A. The plate battery supply is at 130 V, and the current taken is approximately 0·15 A. Alarm fuses and relays are provided in the anode circuits of all valves (except the detectors).

An intermediate frequency oscillator is supplied for checking the band passed by the intermediate frequency amplifier, and in order to adjust the beating oscillator so that the intermediate frequency corresponding to the carrier wave of the distant station lies in the middle of the frequency band of the amplifier. In order to facilitate exact tuning of the receiver a signal frequency oscillator is also provided. If this oscillator is not employed, it is difficult to tune the set when fading is

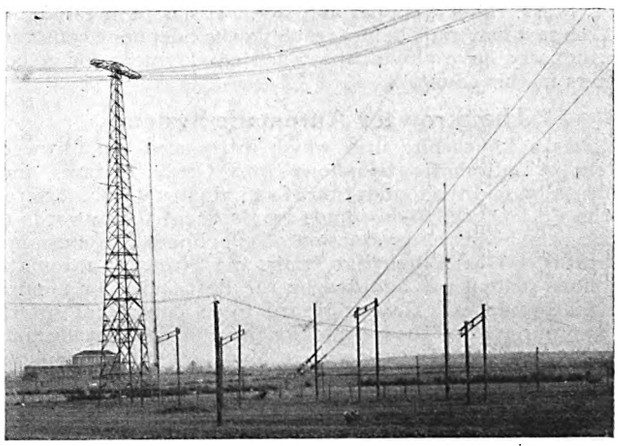

Fig. 4.—" Sterba " array at Rugby.

occurring, since the automatic gain control must be cut out during this operation, for obvious reasons.

As the incoming carrier, after being heterodyned by the beating oscillator, produces an audible output note when heterodyned by the intermediate frequency oscillator, it is easy to adjust the signal frequency oscillator to give the same beat note. The signal frequency oscillator is strong enough to swamp the incoming waves and tuning is effected on this local signal.

An audio-frequency oscillator (1 000 cycles) is also provided as a local source of energy for checking the performance of the audio-frequency amplifiers and of the land lines.

The automatic gain control device contains a high impedance valve operationg as a third detector, and connected in parallel with the second detector. A resistance of 100 000 Ω is connected in the anode circuit of this third detector, and the the varying drop in voltage across it, due to the variations of anode current, is applied as a variable negative bias to the grid of the first detector and first amplifying valve, the bias thus varying in accordance with the signal strength. An increase in the strength of the received carrier signal causes an increase in anode current of the gain control valve, and consequently an increase in the negative grid bias of the detector and amplifying valves. This increase in bias reduces the gain of the receiver, and thus maintains a fairly constant output level.

(To be concluded.)

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TELEPHONE MANUFACTURING INDUSTRY.

Effects of Post Office Policy—Employment given to 100 000 British Workers—Large Export Trade Built Up.

(CONTRIBUTED.)

THE policy consistently pursued by the Post Office over a long series of years in the encouragement of home industry has made the manufacture of telephonic apparatus one of the important private industries in this country, with a substantial export business. About 30 years ago the Post Office began the task of extending the telephone service in London, partly in competition and partly in co-operation with the National Telephone Company. Previously the bulk of telephonic apparatus was purchased in America and Sweden. At the outset the Post Office had to import its equipment, but as a result of pressure to foster home industries, the American Western Electric Company was induced to establish a factory at Woolwich, so that supplies might be made by British labour, and, as far as possible, from British materials. British firms were encouraged to undertake this work, and among the pioneers was a Lancashire firm, British Insulated Cables Ltd. At their instrument works at Helsby, and later in Liverpool, was manufactured the Post Office trunk exchange equipment for London, Manchester, Cardiff, Newcastle and Birmingham. At the present time exchange equipment is being manufactured and installed by five important companies in this country, viz.: Standard Telephones and Cables, Southall; Siemens Bros. and Co., Woolwich; Automatic Telephone Manufacturing Co., Liverpool; General Electric Co., Coventry; and Ericsson Telephones, Beeston.

Telephone apparatus is also obtained from other British companies, while very large supplies of cables and other line plant are obtained from British companies. Manufactured cotton plays an important part in the make-up of telephone cables and equipment, as well as steel, glass, ebonite, nickel-silver, brass, rubber, copper and silk. It has been estimated that the raw materials before reaching the telephone construction industry have already provided employment for 20 000 workers in this country.

The Strowger Automatic System.

It was a Lancashire firm which introduced the Strowger system of automatic telephony into Great Britain, and, incidentally, laid the foundation of an industry which, fostered by the Post Office, to-day finds employment for upwards of 16 000 persons in the production of telephones and exchange apparatus. After exhaustive trials, the Strowger automatic telephone system was adopted by the Post Office for London and the provinces. Having regard to its county of origin, it is appropriate that the contract for the equipment of the main automatic telephone exchange in Manchester, at Telephone House, should have been allotted to the Automatic Telephone Manufacturing Co., Liverpool, the value of the contract being upwards of £400 000. The other Strowger automatic exchanges in the Manchester area are being equipped respectively as follows: Ardwick, by Siemens Brothers and Co.; Collyhurst, by Standard Telephones and Cables; Moss Side, by the General Electric Co. These firms, together with Ericsson Telephones, manufacture Strowger automatic telephone equipment under licence from the Automatic Telephone Manufacturing Company, an agreement having been entered into for the pooling of essential patents, whereby the resources of the entire industry are placed at the disposal of the State, and there is no question of a monopoly in the manufacturing field. By a recent agreement with these firms, the Post Office has laid down a programme of telephone construction for a number of years. As a result, the contractors have been able to organise their works with the prospect of regular work assured, and the Post Office has reaped the advantage of a considerable reduction in the price of telephone apparatus.

The telephone manufacturing companies not only cater for the home market, but the main organisations, which have been built up largely as a result of encouragement by the Post Office administration, are able to do a thriving export business. It is estimated that half of the production of telephonic apparatus by the five firms mentioned is used in this country, the other half being exported. When it is remembered that the telephone manufacturing industry, with its suppliers and auxiliary services, employs about 100 000 persons, the significance of the fact that half of the product is exported cannot be overlooked in days of widespread unemployment.

There is a further benefit, although an indirect and unexpected one, which has accrued from this State encouragement of the telephone industry. Thanks to the ingenuity and flexibility of Strowger automatic exchange apparatus, it has been possible to adapt it to the requirements of totalisator working, and two of the firms previously mentioned, the Automatic Telephone Manufacturing Co. and Ericsson Telephones, are supplying such equipment to the British Racecourse Betting Control Board. It is probable that the successful functioning of this equipment will result in another outlet for British products overseas. Another application of Strowger automatic switches is for the selective supervisory control of power sub-stations from a central control point, and good foreign business has already resulted. Both these adaptations may justly be said to have sprung from State encouragement of the British telephone industry.

The matter of an augmented export business is all-important; without the home demand it would have been impossible for British manufacturers to have competed in the world's markets for telephone material, and from negligible figures in 1911, British exports of telephones and associated equipment now rank in a class apart, and appear independently in the official returns of the country's foreign trade. One firm alone exported upwards of £500 000 worth of telephone equipment during the past twelve months, and that in direct competition with American and Continental suppliers.

In any review of the telephone industry the production of cable and line equipment must not be overlooked. Under private enterprise, most of the telephone circuits of the country were above ground, and the demand for underground telephone cable was small. The consistent policy of the Post Office in putting all circuits, as far as practicable, underground, has encouraged the design and development of multi-core air-space cables, many thousands of miles of which have been manufactured and laid by British cable makers.

In the matter of research and development, too, the Post Office, in addition to first-hand activity on a considerable scale in its own laboratories, has consistently encouraged British manufacturers to keep abreast of American and Continental progress.

I.M.E.A. CONVENTION.

Provisional Programme for May 26-30 Meetings at Eastbourne.

THE provisional programme for this year's I.M.E.A. Convention, to be held at Eastbourne from May 26 to 30. is as follows:—

Monday, May 26.—Delegates assemble. President's Reception in Winter Garden, 8.15.

Tuesday, May 27.—Paper by Ald. R. S. Chatfield, Chairman of the Eastbourne Electricity Committee, on "The Obligations of Electricity Committees."

Reception by the Mayor in the Winter Garden, 8.15.

Wednesday, May 28.—Paper by Mr. G. H. Lake, A.M.I.E.E., on "Pulverised Fuel Firing in relation to Economic Boiler Operation."

Visit to Brighton Electricity Works. Tea will be provided by the Brighton Corporation.

Thursday, May 29.—Paper by Mr. J. W. Burr, M.I.E.E., M.I.Mech.E., on "Electrical Heating of Buildings." Informal discussion, which will probably be introduced by Mr. A. E. McKenzie, M.I.E.E., M.I.Mech.E., on "Domestic Water Heating.

Annual Dinner, Grand Hotel.

Friday, May 30.—Coach trip, visiting Bexhill, Hastings. Winchelsea and Rye.

As in past years, an electrical exhibition will be held (in Devonshire Park), comprising electrical cooking, water heating and refrigeration, with other apparatus and appliances of interest to supply authorities.

The Faraday Medal (Ninth Award) will be presented to Sir Ernest Rutherford, F.R.S., at the ordinary meeting of the I.E.E. to be held on May 1 at 6 p.m. The presentation will precede the Twenty-First Kelvin Lecture, which will be delivered by Mr. R. H. Fowler, F.R.S., on "Some Recent Advances in the Electron Theory of Metals." This will be followed by a dinner at the Waldorf Hotel at 7.45 p.m.

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ELECTRICITY ON THE FARM.*

Equipment in Lincolnshire—Tariffs—Agricultural Machinery—The Farm Load—Economics of Electric Farming.

By R. BORLASE MATTHEWS. Wh.Ex., A.M.I.C.E., M.I.E.E., F.R.Ae.S.

FOR educational purposes the Supply Authority operating in a rural area should earmark at least one per cent. of its total annual revenue to carry out this work in the form of newspaper advertising, distribution of suitable literature, direct mail publicity, liberal use of posters, exhibitions and demonstrations, travelling exhibition vans equipped with cinema and lantern lectures by fully qualified persons. This activity should be developed systematically from district to district. For such educational work to have its maximum effect it is essential to render available hire, hire purchase and deferred payment schemes for electric services, wiring, motors cookers, and other current-consuming devices. The Power Supply Authority, when providing assisted wiring schemes, should pay special attention to the wiring of the contumers' houses. By accepting financial responsibility to the contractor, it will be in a position to see that the wiring and apparatus are of a robust and simple character.

The author proposes, in the Lincolnhire area, to provide each consumer not only with five lighting points and two outlets, but also with a flat iron, a thermal storage cooker, a thermal storage water heater and one 500 W bowl type radiator. The whole of these accessories will be supplied at one inclusive charge, the consumer to repay the capital charges over a period of years. In the case of a farm, a novel general utility machine on the disintegrator principle (described and illustrated on pp. 404 and 405 of THE ELECTRICIAN of March 28) will also be included, and at the same time a special effort will be made to induce the farmer to install a water pump, chaff cutter and electric motor on a hire-purchase basis. The thermal storage cooker will be of a 750 W long hour use type, as opposed to the present English practice of installing cookers of 6-8 kW demand—a type that is almost unknown on the Continent. The general arrangement of the cooker is shown in Fig. 1. The thermostatic control operates as follows :—

(*a*) The block is kept at a temperature of 932 deg. F. (500 deg. C.) by electric heaters totalling 750 W.

(*b*) When the above temperature is attained the low temperature cooking oven is raised to 194 deg. F. (90 deg. C.).

(*c*) When the temperature of the low temperature oven is raised to 194 deg. F. (90 deg. C.) the current is automatically switched on to the thermal storage water heater.

(*d*) By means of a two-way switch the current can be switched off the block on to the roasting and baking and grilling oven. Also additional heat can be switched on this oven. When the required temperature is attained the current is thermostatically switched back on to the heating block.

To provide as good a load factor as possible, one of two methods will be adopted ; (*a*) an automatic relay or load levelling switch will be provided, whereby when several lights are turned on in a house, the cooker will be switched off, or (*b*) relay switches on each premises wil be controlled by a load dispatcher during hours of peak load on the whole system, by means of relays operated by a superimposed current in the distribution system. The apparatus for the latter method has not yet been fully developed, hence the alternative. In both systems time clocks are eliminated. Owing to the introduction of the thermal storage principle, the consumer will not be inconvenienced at all by the cutting off of the current on his cooker and water heater.

Pre-payment Meters.

For small consumers it will be found advisable to install pre-payment meters, so calibrated that the consumer can pay for his electricity at the ordinary rate per unit, and, at the same time pay the additional charge in respect of the cost of the wiring. In the case of current-consuming devices it is of importance that the hire-purchase terms should be so based that the rate at which the consumer pays for them is spread over a period of not less than three years.

An ever-present difficulty in the case of equipping a farm on the hire-purchase system is the number of potential consumers who are tenants and not owners. The author suggests an agreement between owners of buildings and tenants whereby the former agree to recoup the tenant farmer subject to depreciation at 10% per annum if the tenancy is terminated within ten years from the installation of equipment. He has been experimenting with an easily installed and removable wiring system which would be a tenant's fixture. The Supply Undertaking should, if possible, earmark a sum of about one-tenth of its total capital for the financing of wiring and equipment facilities.

It is essential to supply current on a suitable two-part tariff. The author proposes to adopt the following tariff for the Lincolnshire area :—

(*a*) A sum payable quarterly or monthly in advance of 15s. per living room, omitting bedrooms, per annum, and an additional 1d. per unit for all units supplied for purposes other than apparatus consuming current, continuously or on off-peak periods, for which the additional rate is to be ½d. per unit.

(*b*) The rate for agricultural purposes on farms of over 50 acres will be 2s. 6d. to 3s. per acre per annum, payable in advance in monthly instalments, in addition to 1d. per unit for all current supplied.

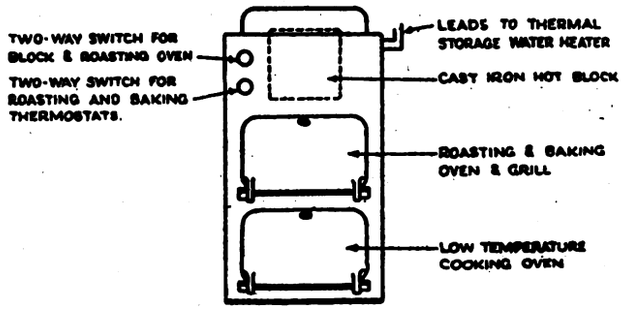

Fig. 1.—Lincolnshire thermal storage cooker.

(*c*) A flat rate of 8d. per unit, accounts to be rendered monthly where slot meters are not installed. The meters will be made weatherproof and fitted outside the houses to economise the time of meter readers.

Experience has shown that the substitution of electricity for horse and manual labour lowers the cost of production. It will also enable the farmer to bring under cultivation those large areas which are to-day only half cultivated, and thus, not only will it increase production, but also give additional employment. The number of uses to which electricity can be put on a farm is very large, in fact, the author has compiled a list of over three hundred uses (while on his own 600-acre farm at East Grinstead he uses it for sixty-seven different purposes).

Even to-day it is a difficult matter to obtain really suitable equipment for electro-farming work. It is refreshing to note, however, that one of the largest British electrical manufacturing companies has now formed a separate agricultural department, one of the largest agricultural machinery making firms has an electrical manufacturing department, and another electrical firm is now associated with a large group of manufacturers of agricultural machinery. Progress, therefore, though slow, is actually being made. There are in Great Britain to-day over 2 000 farms connected to public supply mains, and in the whole world there are well over a million farmers using electricity on their farms.

Experience shows that the annual consumption of electricity in farm buildings alone is proportionate to the arable acreage of the farm, the load being concentrated at the farm buildings. Hence the need for basing calculations on the length of route instead of the area supplied. The only correct basis of comparison between rural and urban loads is on the kWh supplied per mile of distribution. In Great Britain consumption by farms is usually under 10 units per acre, but this figure is increasing. On the European Continent 20 units is a usual figure. In 35 areas in Germany it is about 40 units, the record being 100 units (without electric ploughing). A farm of 300 acres equipped with ordinary machines would consume at least 6 000 units per annum. Ploughing and

* Abstract of a paper read to the Society of Engineers (Inc.) on April 7.

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cultivation would add 4 500 units, and threshing from 2 000 to 3 000 units.

Electric ploughing has a number of outstanding advantages over all other methods. Most of the successful electric ploughing equipments in use to-day are of the large size, capable of ploughing up to thirty acres per day. These equipments are so expensive and the areas, which they plough in a season so large, that they are suitable only for contractors or co-operative societies. There are a few small ploughs available, but the demand for these is not yet great as the farmer has not been properly educated up to use them. The author employs a small electric plough on his farm at East Grinstead. This plough operates on the roundabout system and is driven by a 15 H.P. motor. With this equipment it is possible to plough about five acres a day with a current consumption of about 15 units per acre on heavy land with a furrow six inches deep, and 25 units with a ten inch deep furrow. Several electric ploughs have been built in England recently. There should also be a considerable field for developing the small types of ploughs for use in market gardens. A number of these are to be seen in use in the South of France to-day. The rotary tiller also lends itself conveniently to an electric drive and it seems probaqle that there will be a future for this type of machine.

Savings on a 70 Acre Farm.

The following is a typical example of the economies that can be effected on a comparatively small farm, say, of about 70 acres when electricity is installed. The cost of electricity is taken at 4d. per unit, which is quite a reasonable figure.

LIGHT.—About 60 gallons of paraffin oil would be consumed on a farm of this size per annum, the cost of which would be about 1s. per gallon, i.e., £3. To this must be added about 150 hours of labour at 6d. per hour for cleaning and trimming, making the total cost £6 15s. From 15 to 20 electric light points would be necessary on such a farm and the consumption of electricity would be about 260 units, costing £4 6s. 8d., leaving a gross profit of £2 8s. 4d. This figure would be much higher if it were possible to attach a money value to the many indirect advantages of electric lighting.

MILKING.—The time taken for hand milking would be about 3½ hours per day, whereas machine milking would cut down this time to 1¼ hours. The cost for labour per annum at 6d. per hour would therefore be £31 13s. and £15 16s. 6d. respectively. To the latter must be added the cost of electric current which would be about £4 (240 units at 4d. per unit). Mechanical milking would therefore show a gross profit of £11 16s. 6d., with greater convenience and cleanliness.

CREAM SEPARATING.—It is assumed that 7 000 gallons of milk are separated during the year. When done by hand it would take about 300 hours at 6d. per hour. this would cost £7 10s. An electrically driven separator would take about 40 hours of a man's time and consume about 70 units of electricity, the total cost of which would be £2 3s. 4d. showing a gross profit of £5 6s. 8d. An electrically driven separator owing to its steady drive also works at a higher efficiency.

PUMPING.—On a farm of this size at least 350 hours per annum would be spent on pumping water. This would cost £8 15s. in labour and a great deal more in backache. An electrically operated pump would eliminate all manual work; it would consume about 80 units costing £1 6s. 8d., thus showing a gross profit of £7 8s. 4d.

CHAFF CUTTING.—The electrically operated chaff cutter can be operated by one man while it is often necessary to employ two for the hand-operated machine. When the latter is used, about 150 hours would be taken to do the work as against 50 hours with the former, showing a saving of 100 hours at 6d. per hour, £2 10s. From this amount must be deducted 60 units of electricity at 4d. per unit, or £1, leaving a gross profit of £1 10s.

GROSS PROFIT.—The total gross profit shown when electricity is used for carrying out these simple everyday farm operations is £28 10s. 8d. The cost of the electrical installation would be about £121. After allowing 15% on this figure for interest and depreciation there would be a net profit of £10 7s.

Such a farm as the one described could hardly be termed an electrified one, but even with a minimum of equipment a good profit is shown.

In addition to the importance of electricity to the farming industry, its effect on the development of rural industries must also be taken into consideration. Many of the industries to-day located in the towns should, from an economic point of view, be situated in the countryside, providing an ample supply of power was available.

WANING OF TRAMWAYS.

Result of Unfair Rating Policy—Financial Juggling.

By THEODORE RICH.

HALF a century ago horse tramways came into being, and those in charge of the then government, encouraged by many municipal authorities, insisted that the companies operating the tramways on the public highway should pay not merely for the upkeep of the rails but also for the upkeep of a section of roadway between and alongside them, a very heavy burden, although a great deal of traffic was being put on to steel rails and not on to road metalling.

This policy was akin to that adopted in London, where the District and Underground Railways were mulcted in crippling rates and taxes as a reward for taking millions of ton miles of traffic off the streets.

In recent years, in accordance with the modern progressive policy of reaping where they have not sown, many municipalities have taken over tramways from the companies that did pioneer work in city transport, only to realise that the tramways departments had then to pay those heavy charges which were, of course, perfectly justifiable when they had to be paid by others. Municipal trading has to show good results on paper in order to be popular, and that is one of the reasons why in a number of quarters tramway tracks have been allowed to get into very bad condition, money which ought to have gone for their upkeep having been utilised in relief of rates.

To-day, therefore, municipal tramway authorities find it necessary to make paper transactions by which they hand large sums over to the highways authorities, being "hoist by their own petard" of fifty years ago, and in many cases have to face heavy sums for making good the fruits of past neglect to tramway tracks.

If the tramways are pulled up and trackless trolleys or motor buses substituted then the bus department pays nothing whatsoever directly to the highways department and only pays indirectly such money as comes in from government grants out of motor taxes or sums from any local licence fees. Many tram tracks, therefore, have been taken up in order to rob Peter to pay Paul.

In America many of the street tramways are in a bad way as they have had to pay heavy sums for concession rights and upkeep costs, and run on their own tracks, while their motor bus competitors run on the ratepayers' roads and, as a rule, do not pay their fair share of the costs thus incurred.

Where a tramway is in the hands of a municipality people of the working class on the one hand are prone to support through the ballot-box the demands of traction employees for increased wages and burdensome rules, out of a feeling of so-called class loyalty; but when the bill has to be paid working men object to pay out of their own pockets the amount sufficient to make up what they demand for others, so one arrives at the absurdity of taking thousands of workpeople to and from their work at a loss, and sponging on the ratepayers for the balance; that is one reason for the decline of municipal tramways; it is easier to balance matters where road traffic is concerned.

From the point of view of traction as such for carrying large numbers of people around large cities, electric tramways can still hold their own, but only when conditions which apply are fair as between them and other competing methods of surface passenger traffic.

WORLD POWER CONFERENCE.

Subjects of the General Addresses.

AS mentioned in the summary of the provisional timetable of the second World Power Conference to be held in Berlin in June, which appeared in our issue of April 11, a series of general addresses is to be given in addition to the papers to be read before the various sections of the conference. The first of these general addresses will be delivered on June 16 by Dr. Einstein, the subject being "The Physical Problem of Space and the Ether." On June 17 Dr. Surruys will give an address on "Different Conceptions of Rationalisation in Various Countries." On June 18, Mr. H. F. Bain will speak on "The Place of Minerals in a Power-sustained World." On June 19, Dr. Oliver will address the Conference on a European Grid (Europas Grosskraftlinien). On June 23, Professor Eddington's address on "Subatomic Energy" will be given, and on June 24 Mr. D. N. Dunlop will speak on "Power and Civilisation."

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SURGES ON OVERHEAD LINES AND CABLE SYSTEMS.*

Measurements under Working Conditions on 33 kV Lines—Effect of Salt Deposits—Value of Klydonograph Recorder.

By S. W. MELSOM, M.I.E.E., A. N. ARMAN, B.Sc., A.M.I.E.E., and W. BIBBY, B.Sc., A.M.I.E.E.

THE paper describes measurements of surge voltages made under actual working conditions on 33 kV transmission lines both overhead, underground and composite.

The apparatus used for the measurements was the klydonograph, and the paper gives a description of this instrument in its final form and a discussion of its working principles.

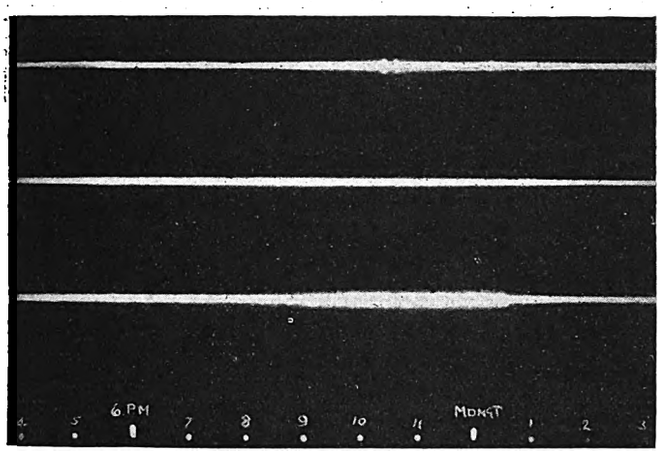

Fig. 1.—Nightly surges on 33 kV line in South Wales.

The specially designed auxiliary condensers required to subdivide the line voltage are also described.

The first set of gear was erected in South Wales, to investigate the conditions on a most troublesome overhead line feeding a number of collieries and villages. The line pressure was 33 kV. The line was a composite one in so far as the terminal poles were in each case some distance from the substation, the current from the pole to the substation being carried by 3-core belted-type cable.

Inspection and consideration suggested that the most suitable place for the erection of the gear would be at one of the terminal poles, where the abrupt change in line characteristics from the overhead line, of high inductance and low capacity, to the cable, of high capacity and low inductance, might be expected to be the point of maximum surge value, and the gear was erected on the hillside at this pole.

The main fact that emerged was that during most nights there was a distinct thickening of the line, a sample of which is shown in Fig. 1, where for a period of nearly four hours a series of almost continuous surges occurred. It will be seen that the effect was greatest on one phase, and that the phase recorded on the middle line of the record is practically immune. An oscillograph was installed more definitely to analyse the characteristics of the surges. These results proved that apart from switching surges of a momentary nature, with which the line was fully capable of dealing, there was no disturbance due to the machinery, and that the frequency of the surges was well above 3 000 cycles per sec.

In November, 1927, at a time when the klydonograph was in temporary use on another system, a series of shut-downs occurred during a heavy storm, or rather immediately after it. Investigation led to the conclusion that salt brought from the sea was the cause of the major part of the trouble.

Heavy brushing was noticed at the sealing ends and it was not until the weather changed that the line would give continuous service. Dr. G. C. Simpson, F.R.S., showed that the line trouble coincided with the somewhat rare occurrence of an abnormally dry south-westerly wind, and this led to the conclusion that a salt deposit was the trouble, not only on this but on many other lines throughout the country. This particular part of the line was 20 miles from the coast, and everything pointed to the conclusion that while with a normal moist south-west wind the salt taken from the sea would fall out quickly owing to its being wet, and therefore heavy, with the drier wind the salt spray taken up would immediately be dried by the air and be carried for a considerable distance as a fine, almost impalpable, powder. This salt impinges on the insulator in a high wind and, helped by the electric stress, adheres firmly to the insulator and does not wash off. While the dry wind continues the danger of complete flash-over is not great, but—and this is borne out by every case observed—flash-over occurs when the humidity of the air returns to a more normal value. The particles of salt then take up moisture from the air and the surface of the insulator is covered, or partially so, with a good conducting brine. If the insulator is not cleaned after the salt storm a part of the salt remains on the surface and causes the surging shown in Fig 1 during hours when dew falls.

An insulator was removed from the line some weeks after the heavy storm, during which interval it had been exposed to much heavy rain. Analysis of the surface deposit showed that there was a total amount of approximately 0·15 gramme of solid matter on the surface, consisting of chlorides, sulphates and carbonates of sodium, nickel, lead, tin and iron. Twenty-five per cent. of the solids that were soluble in water were sodium chloride.

In Figs. 2, 3 and 4 are shown some of the records obtained during and immediately after the storms in February, 1928, when there was much trouble with overhead lines all over the country. Fig. 2 shows first the comparatively clean normal-voltage line on each phase during the heavy dry wind. The point at which the line widens corresponds to that when the wind dropped somewhat and the atmosphere became cloudy. Then for some 2½ hours surging occurred, obviously due to brushing at the insulators, and at about 8.15 p.m. the breaker tripped. When attempts were made to reset it it would not remain in and it could not be reset until the following morning. When the switch finally held there was still considerable surging (Fig. 3), and at 1 p.m., when rain fell, the circuit breaker tripped out again. Then all the

Figs. 2, 3 and 4.—Records obtained during and after the storms of February, 1928 (see text). Fig. 5.—Surge produced by fall of phase wire causing interruption.

sealing-end insulators were scrubbed clean and the line was switched in again. Fig. 4 shows that the surging had practically disappeared.

It is noteworthy that the greater part of the surging occurred on one phase. That one was the nearest to the sea and the direction of the wind. Clearly the other two insulators were to a fair extent screened by the first and did not receive the same amount of salt deposit.

A number of other surges were recorded on the South Wales line. These were often of a minor nature, due to switching operations. Fig. 5 shows the surge produced when a phase wire fell and interrupted the current.

Only one or two lightning surges were recorded, and these were due to storms some miles from the recording gear. One

* Abstract of a paper read at the Institution of Electrical Engineers on April 10.

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of these is shown in Fig. 6. It should, however, be noted that during the last two or three years there have been comparatively few lightning storms in this country.

Similar investigations have been made on lines in the Midlands. The system in this case is a mixed one, consisting of a great deal of cable and several lengths of overhead line. In this case troubles with salt were not experienced, but some other interesting records were obtained. These results were not always fully explained, but in general the surging ceased when many line insulators had been replaced.

Curiously enough, the portion which consisted entirely of overhead line had, if anything, less surging than that which was partly overhead line and partly cable.

Perhaps the most outstanding record was where a cable fault occurred after a long period of surging, which latter was still evident after the fault had been repaired. Here it may be fair to say that the cable was probably injured and finally broke down as a result of many hours of oscillatory surging of comparatively small magnitude, i.e., about two or three times the normal line voltage. The beginning of the record shows the heavy surging which had started some hours previously. This continued for about 12 hours and then ceased during the hours from noon until about 8 p.m., after which it restarted and the cable broke down. On the repair being effected the surging continued for a further ten hours, fortunately without further breakdown.

Another case of a feeder breakdown occurring during periods of heavy surging is shown in Fig. 7. Here again the breakdown and repair interrupted a long period of small oscillatory surging. Again, Fig. 8 is a particularly clear example of the oscillatory surge line as compared with the normal voltage line. The surging ceased as soon as the sun had dried the insulators. Shortly after this several insulators of the older type were changed and the cracked ones renewed. When this was completed the surging ceased.

The atmospheric condition known as a silver thaw, when a slight thaw with rain occurs during a frost, followed im-

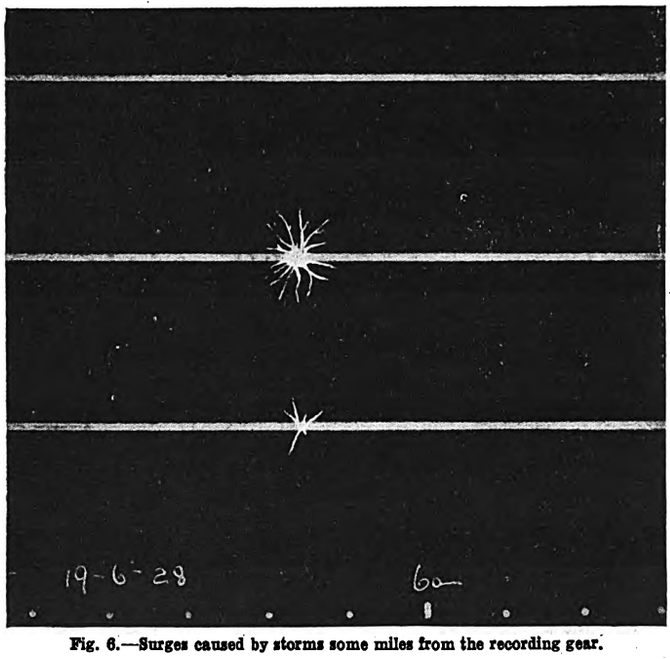

Fig. 6.—Surges caused by storms some miles from the recording gear.

mediately by another frost, often results in the formation of ice on insulators. This results in considerable surging.

While the surges recorded have not been of the magnitude experienced by American observers, the records generally show that the klydonograph, if intelligently used, is a valuable and inexpensive piece of apparatus for recording most types of surges in overhead and/or cable systems. The records in South Wales alone resulted in an enormous saving in maintenance charges due to localization of the main cause of the trouble. In addition, the serious consequences and cost of interruption of supply for considerable periods were avoided. The authors would, however, emphasize the importance of the long series of oscillatory discharges detected by the more sensitive methods used; these are apparently of more serious import than short-time surges of greater magnitude.

It is evident that the design of porcelain insulators for outdoor use requires a great deal of further consideration. It is usually found that, while pin insulators prove to be, on the whole, satisfactory in operation, the sealing-end insulators give trouble, quite severe brushing occurring at voltages less than the normal working voltage. The best design of insulator is that in which the surfaces subjected to the most fouling, i.e., the sheds in most shedded insulators, lie along equipotential lines in the electric field. With vertical sealing ends of the ordinary type this is not possible.

Fig. 9 (*a*) shows roughly the electric field surrounding a live conductor emerging from an earthed metal cylinder (the

Fig. 7.—Feeder breakdown during heavy surging. Fig. 8.—Oscillatory surge.

"box" of a sealing end), the dotted lines representing the equipotentials. Fig. 9 (*b*) shows clearly how the sheds of a vertical type sealing-end must needs lie across these equipotentials. Tests involving the determination of the field diagram and surface-potential distribution of a large number of insulators of different types and sizes, and their performance under all atmospheric conditions, have shown that, although it is not possible to make any appreciable improvement to the final flash-over voltage of an insulator, the voltage at which brushing becomes serious can be materially raised. The flash-over voltage is invariably higher than the line voltage, and it is evident from the klydonograph records that the brushing is the vital factor and that improvement must be effected in this direction.

For the lower voltages the inverted type of sealing end shown in Fig. 9 (*c*) can be employed, the performance of a properly designed insulator of this type being quite good, even under severe conditions. Experiments with a vertical sealing-end have shown that it is possible to improve the brushing voltage by inserting metal sheds between the porcelain sheds in such a way that they distort the natural field and cause the porcelain sheds to lie nearly on equipotential lines. Fig. 9 (*d*) is an example of this type of treatment. Field-controlling sheds of this sort need, however, to be very carefully applied since, if improperly placed, they may bring about a large decrease in the flash-over voltage.

A great deal can be done by systematic cleaning where the line or a portion of it can be taken out of service for the purpose. The authors understand that, in those parts of America subject to alkali dust, a steam cleaning plant is in continuous operation; as this would appear to be liable to set up small cracks in the insulators, cleaning at normal temperature would seem to be preferable. The authors have found that the vigorous use of a scrubbing brush and water is the most effective method of cleaning.

Even a larger insulator if left without cleaning will ultimately flash over, if it does not shatter owing to the heat set up by the brushing, and, moreover, for a 132 kV line we are getting near to the limit of size at which single-piece sealing-end insulators can be made. It is true that very large insulators are now advertised, but they are expensive and unwieldy.

For very bad positions special arrangements might be made, and in this connection the experience in South Wales indicates a line that may be taken. The whole of the observations showed that roughly 80 per cent. of the surging occurred on the line nearest to the direction of the dangerous wind, with the inference that the other two phases were to a great extent shielded by the first dividing box. Some intelligent shielding here might obviate a great deal of the trouble.

While there is no definite experimental work showing that high-frequency voltage of the type recorded results in damage to the dielectric of a cable connected to the line, it must be assumed that the cable is submitted to an undue stress. Whatever the frequency of the over-voltage, it is superimposed on the normal line voltage, and in the cases shown the existence of this condition for many hours is subjecting the dielectric to a stress much larger than that for which it is designed. Although the capacity of the cable results in a considerable reduction in the amplitude of the wave, it cannot eliminate

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it unless the capacity is infinite, and the first part of the cable must stand up to the whole of the over-voltage. Probably if the length of cable is greater than one-quarter of the wave-length of the oscillatory voltage the latter may be reduced to as much as one-half of its initial value. A considerable length of cable is required, however, to effect even this reduction, and if cable is to be expected to take care of the surges a long length, very much over-insulated, must be used.

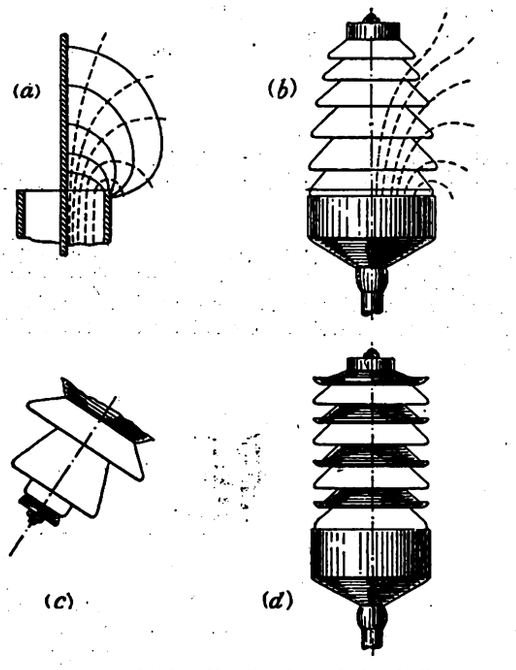


Fig. 9.—Electric fields of sealing ends (see text).

Some people hold the view that a cable having a high power factor, such as cambric cable, would deal with the surges by absorption through the wall of the dielectric, but consideration and experiment have shown definitely that this is not so.

The question of the discharges likely to occur from atmospheric conditions has been largely discussed in American publications, in which various authors, and notably Peek, have discussed atmospheric voltages, bound charges due to charged clouds, etc. The recent Kelvin Lecture by Dr. G. C. Simpson showed that the greater part of atmospheric potential had little energy and that the only condition under which appreciable energy may be discharged is by a direct lightning stroke. This clears up the situation so far as the engineer is concerned and leaves him to solve the problem of how to deal with the lightning discharge. Fortunately, in this country we are not subject to the severe lightning storms experienced in many parts of the world, but interruptions due to lightning will and do occur. The effects of lightning are not nearly so serious as the other difficulties enumerated. A lightning stroke almost invariably causes the line to trip out; one or other of the insulators flashes over and a circuit breaker operates. Apart from the short interruption, however, the line is usually undamaged and can be put back into service almost immediately. There is, however, one point to be made in connection with any system of spark gaps or weak-link insulators. For the protection of transformers and other apparatus it is essential that the protective device should operate at a definite voltage and be unaffected by weather conditions. This is hardly possible unless any gap on which operation depends is definitely under cover.

OVERHEAD LINES.

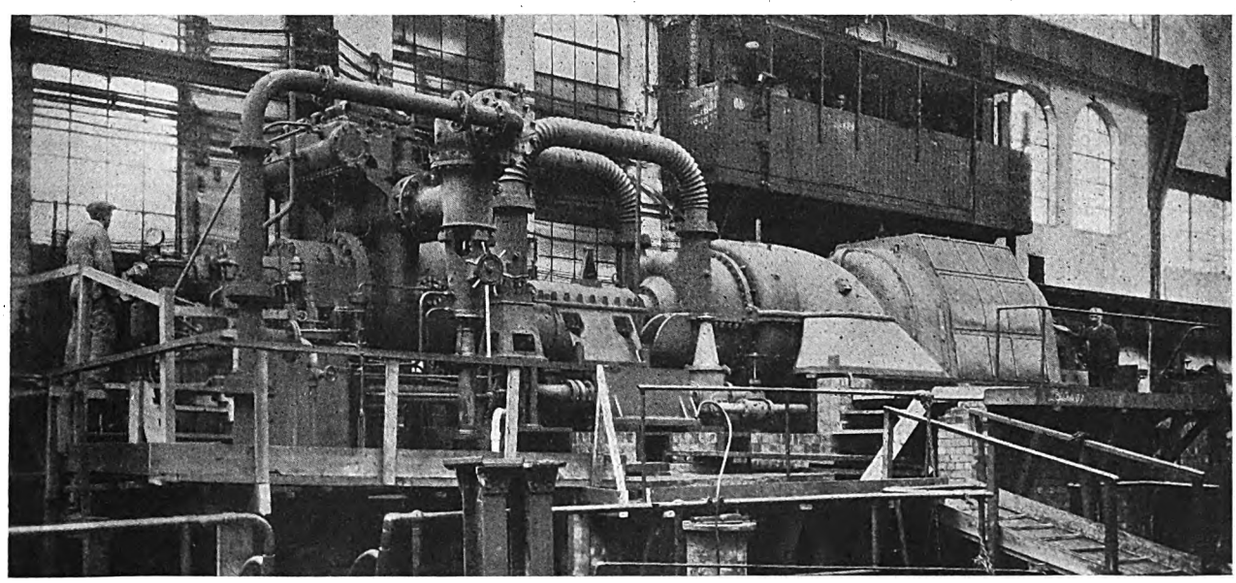
New Specification for Copper Conductors.

THE B.E.S.A. has recently issued Specification No. 125, 1930, relative to hard-drawn copper solid and stranded circular conductors for overhead power transmission purposes. This is a revision of the 1924 edition, and differs from the previous issue only in certain minor points of an editorial nature designed to bring it into line with the 1930 revision of the B.S. Specification for Aluminium Conductors for Overhead Power Transmission Purposes, No. 215. Specification No. 125 lays down standards for copper conductors with regard to the mechanical and electrical properties required for overhead power lines, and prescribes tests to ensure compliance with these requirements. The sizes of conductors are given in separate tables for primary and secondary standards respectively, these tables being unaltered from the previous edition. Copies of this specification may be obtained from the British Engineering Standards Association Publications Department, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

THERMIONIC VALVES.

In view of the rapid development that is taking place in the characteristics and uses of the thermionic valve in the various spheres in which it is now employed, the course of six lectures on "Thermionic Valves," to be given by Mr. W. H. Date, B.Sc., A.M.I.E.E., at the Polytechnic, should prove of great interest. The course begins on Wednesday, May 7, at 6.30 p.m., and the lectures, which will last for two hours, will be continued on succeeding Wednesdays except June 11. The lectures will cover the principles and working of the valve in rectifying, receiving and amplifying circuits, and will be fully illustrated by demonstrations, experiments and lantern slides. The fee for the course is 7s. 6d.

BRITISH TURBO-ALTERNATOR FOR THE UNITED STATES.



THIS high pressure 10 000 kW. 3 600 r.p.m. turbo-alternator has been made by the British Thomson-Houston Company for the Delray power station of the Detroit Edison Company, Detroit, Illinois, U.S.A.

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EDUCATION OF WOMEN.

Inadequate Facilities—Dearth of Trained Electrical Demonstrators.

By CAROLINE HASLETT.

ELECTRICAL education of women naturally divides itself into two main divisions—education of women who contemplate finding a career in industry, and of the housewife who wishes to acquire sufficient practical knowledge to be able to get the best results from the electrical apparatus in her home.

My experience during the last few years has proved that the electrical industry has not taken seriously the question of training women for the latter kind of work. Most of the women who are in the industry appear to have come straight from a Domestic Science Training School or College, and although they have been quite well equipped on the domestic side they have had themselves to ferret about for information on the electrical side of their work. Now, it is really in the interests of the electrical industry that the training of these girls should be taken very seriously.

Through the work of the E.A.W. and the Headmistresses Committee of the Ministry of Labour, one or two courses of training have been begun in London called "Electrical Housecraft," where it is possible for a girl who wishes to enter the electrical industry to obtain, not only a training on the domestic side, but to get some acquaintance with the electrical side of her work as well.

It is apparent, however, that even if they have had this training it is desirable for the girls to be drafted afterwards into electrical shops and showrooms as juniors, where they might begin to familiarise themselves with the commercial aspect of the work. A few of the more progressive firms have now consented to take juniors in their showrooms and a beginning is being made to train girls on practical lines. It would be a great help, however, if more electrical undertakings having showrooms, would be prepared to take in one or two juniors for a probationary period. It is practically true at the moment to say that there is a real dearth of trained women demonstrators and unless the electrical industry becomes alive to this question and gives facilities for training juniors, we shall be faced with rather a serious problem in the near future. One or two firms do give a short intensive training to their new staff, but what we require are more facilities for general training in connection with *all* domestic electrical appliances.

In industry generally it is recognised that every trade should carry its quota of apprentices and this point of view should be taken up by the electrical industry in connection with the sale and demonstration of domestic electrical appliances.

The excellent three days' course on Domestic Electrification which was recently held demonstrated fully the value of giving women in the electrical industry a more complete knowledge of modern electrical developments. Such work is a very sound investment for future success.

Instructing Housewives at Home.

Turning now to the housewife who wishes to acquire some simple electrical knowledge, I feel that this question is inevitably bound up with the problem of the woman demonstrator. While popular lectures and demonstrations can do very much, the best work will obviously be done by the woman demonstrator who can go into the home of the housewife and give her simple instruction on the subject. Over and over again I meet women who are conducting fairly large households who would welcome a visit from a trained woman in electrical housecraft to teach them and their domestic staffs simple facts about the maintenance and careful handling of electrical appliances.

An interesting fact is that the average housewife is very keen to acquire this knowledge, but owing to her lack of technical training it is necessary that such information be given to her in the simplest possible manner. The clever and tactful woman demonstrator can also very often help in explaining to the master of the house some of the difficulties with which he concerns himself. An irate householder who telephoned a store some time ago saying that his vacuum cleaner would not work, would have been less irate if he had known the simple rules of keeping the machine oiled and removing the dust from certain vital parts.

A possible new opening for women who can lecture and talk in a simple and interesting way on electrical matters is in connection with rural electrification. The Women's Institutes throughout the country are becoming more keen on understanding all the problems connected with rural electrification and are constantly asking for lecturers who can talk to them not only about the actual uses of electricity in the home but who can explain in simple language the economic factors which determine whether the supply is possible in certain districts.

The electrical industry has hardly yet realised the valuable services which can be rendered by trained women in electrical housecraft and the time must be fast approaching when it will become necessary to establish in the industry itself some practical training scheme to meet the demand which must inevitably come.

BOOK REVIEW.

Photoelectric Cells. By N. R. CAMPBELL and D. RITCHIE. (London: Sir Isaac Pitman and Sons.) Pp. vii+209.

This book explains the theory and application of the photoelectric cell, and should be of great value to all who are interested in the cells—from the professional physicist to the wireless amateur. The general conception of this book is a model which might well be copied by authors writing on a specialist subject.

The introductory matter is lucid and interesting. Throughout the whole work the mathematics are of such a character that anyone who has attended a technical college should be able to appreciate the mathematical arguments. The book is thoughtfully written, and the reader is continually led to think instead of absorbing the matter like a sponge—a likeable quality in any book.

The section of the work dealing with the characteristics of photoelectric cells is obviously written with authority resulting from practical experience. The wireless technician will be on familiar ground, since the current voltage characteristics for photoelectric cells are similar to those of thermionic valves, while the voltage characteristics for varying illumination intensities remind one of the valve characteristics which were so successfully portrayed by Dr. Eccles in model form.

Part II of the book deals chiefly with the use of photoelectric cells, and gives careful consideration of such matters as detection, comparison and measurement employing these cells.

Part III will make an appeal to the illuminating engineer, as it deals with the applications of photoelectric cells for such purposes as the measurement and detection of luminous flux, illumination, colour and absorption. It is claimed that electric lamps can be photometred within an accuracy of one quarter of one per cent.

In the latter part of this section, the book touches on the problems of television, talkies, and the part that the photoelectric cell may play in their elucidation; the different types of photoelectric cells available are given, and an indication made of the uses for which each is specially suited.

BOOKS RECEIVED

"Die Fernsprechanlagen mit Wahlerbetrieb. By Dr.-Ing. Fritz Lubberger. (Berlin: R. Oldenbourg.) Pp. 316. Bound, 15 marks; unbound, 13 marks.

"Television To-day and To-morrow." By S. A. Moseley and H. J. Barton Chapple. With a Foreword by John L. Baird. (London: Sir Isaac Pitman and Sons.) Pp. xxiii+130. 7s. 6d. net.

"Radio Data Charts." By R. T. Beatty. (London: Iliffe and Sons.) Pp. 82. 4s. 6d. net.

"Some Notes on Photometry of Neon Glow Lamps with Helical Electrodes and their Electrical and Photometrical Properties." Researches of the Electrotechnical Laboratory, No. 275. By Ziro Yamauti and Masayasu Okamatu. (Tokyo: Electrotechnical Laboratory, Ministry of Communications.) Pp. 24.

"Further Researches on Alternating Current Bridges with Perfect Earthing Device." By Kazukiyo Ogawa. Researches of the Electrotechnical Laboratory, No. 277. (Tokyo: Electrotechnical Laboratory, Ministry of Communications.) Pp. 22.

"Physics in Relation to the Utilisation of Fuel." By C. H. Lander. (London: Institute of Physics.) Pp. 28. 1s. net.

"Year Book of the American Institute of Electrical Engineers." (New York: American Institute of Electrical Engineers.) Pp. 601.

"The Theory of Electrical Artificial Lines and Filters." By A. C. Bartlett. (London: Chapman and Hall.) Pp. ix+155. 13s. 6d. net.

"Transmission Networks and Wave Filters." By T. E. Shea. (London: Chapman & Hall.) Pp. xvii+470. 32s. net.

"The Electric and Magnetic Circuits." By E. N. Pink. (London: Sir Isaac Pitman and Sons.) Pp. vii+124. 3s. 6d. net.

"Outline of Costing." By W. A. Smith. (London: Moore's Modern Methods.) Pp. 111. 5s. net.

"Electrical Wiring and Contracting." Vol. IV. Edited by H. Marryat. (London: Sir Isaac Pitman and Sons.) Pp. viii+237. 6s. net.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Safety in Domestic Electrification.

[To the Editor.]

Sir,—With all respect, I cannot agree that the further paragraph quoted by Mr. Clothier has any bearing upon my argument, except still further to expose the fallacy that domestic earthing is a safety measure.

In Mr. Clothier's somewhat amended scheme (he does not mention metal-clad bell pushes in his article) if he will examine his sketch he will find that he has achieved nothing like 100% safety, nor is he even reasonably started on the road towards that ideal. For instance, his elaborate arrangement will give him no indication of a failure of an earth connection between the appliance and the plug bell push, although this trouble is far too common to be ignored. With an unearthed appliance and an earthed plug the danger has thus been immeasurably increased. To enable this indication to be given the bell push must be fitted *on the appliance itself*, and I cannot think that even the most ardent earthing absolutist would say that this would be a desirable or convenient arrangement.

Also, I cannot agree that the occurrence of the two faults shown in my Fig. 2 is highly unlikely; in actual fact one is often the cause of the other. For instance, in the event of an earth fault developing on an appliance, the circuit fuse will blow on the line side, but a precarious earth connection—anywhere in the earth circuit, flexible lead, plug, main earth connection, etc.—will be destroyed. With the renewal of the fuse the job is left working, and no indication is given as to the failure of the earth connection. As pointed out above, should this failure occur in one of the most likely places—the connections between appliance and plug—even Mr. Clothier's bell system will not cover this contingency. Incidentally, this system appears to be contrary to I.E.E. Regulation 91.

What Mr. Clothier says regarding the earthing of heavy switchgear is perfectly true: few men can speak with greater authority in this connection. But the purpose of my article was to point out that domestic conditions are unique when considered from the safety point of view, and that as soon as we attempt to introduce heavy-engineering methods of protection into domestic installations our troubles at once begin and safety becomes remote.—I am, etc.,

T. C. Gilbert.

Folkestone, April 12.

[To the Editor.]

Sir,—Mr. T. C. Gilbert would probably be the first to admit (in private) that he has intentionally exaggerated the evils of earthing in his recent articles. The cases of failure that he instances are extreme cases, and earthing exponents could certainly produce extreme illustrations of the danger of unearthed fittings. The time will never come when electricity causes no accidents—probably even now statistics, if obtainable, would show that in dwelling-houses it causes no more accidents than open fires. But it is, of course, important to decide how near we can get to the unattainable 100% of safety without incurring heavy disadvantages in the shape of expense and inconvenience.

My summing up of Mr. Gilbert's remarks is this:—

(1) The ideal is for all electrical appliances to be so well insulated, with no metal parts exposed, that a shock is impossible.

(2) In the present state of affairs, earthing is so often badly done, not thoroughly done, or unreliable, that it is better not to earth at all.

I am entirely in agreement with his ideal, and in sympathy with everything that can be done to bring it about. But are insulating enamels likely to be produced during the next five years which can be depended on not to chip, and to be suitable for covering the "business end" of irons?

It is with Mr. Gilbert's remedy for the present state of affairs that I must disagree. All-insulated apparatus is not at the present moment available, and regulations, contractors and users must face this state of affairs and cater for it. I could not discover how Mr. Gilbert proposes to deal, for instance, with an electric iron which is *not* insulated, and is to be used in a damp scullery with a concrete floor. I cannot see any alternative to earthing it.

To abandon any system because it is badly carried out is to give way to the defeatists. Let us take the objections to earthing given in The Electrician of March 28, and see whether they can be dealt with.

(*a*) A supply authority does not earth the service cutout and meter casing. Because A does the wrong thing is no reason for B to do the same. Supply authorities who do not earth are in a small minority; and propaganda could reduce their numbers. Meters, cut-outs and main switch fuses should all be earthed and *not* fixed so that a fault "is not at all unlikely!"

(*b*) "Three pin plugs and sockets are unreliable." If Messrs. Reyrolle and other manufacturers are unable to make reliable three-pin plugs and sockets after making two-pin ones for years, there is something very wrong with British mechanical designers. But I do not believe that a good British three-pin plug is unreliable, or if it is, that it must remain so.

(*c*) Three-core flexibles. I agree that these are a weak link. But if the chance of a fault on a piece of portable apparatus is 1 in 20 000 and on the earth lead 1 in 10 000 the probability of the two occurring together is getting on for 1 in 20 000 000—very near complete safety. So earthing has been of some use even if accidents are still possible.

(*d*) The use of unsuitable or unreliable wiring systems.

(*e*) Bad workmanship.

These will always and everywhere be a source of danger, whether earthing or insulating is the watchword.

(*f*) The retailing by non-electrical stores of shoddy appliances. A shoddy all-insulated article, covered with poor enamel for instance, is as dangerous as a shoddy metal one.

Mr. Gilbert has done a valuable service towards the attainment of his ideal by raising this question and encouraging people to consider their opinions. Eliminate metal as far as possible by all means, but in the thousands of articles where metal cases are still used, either from choice, inertia, or necessity, earthing will enormously increase the already high factor of safety and should be insisted upon.—I am, etc.,

R. H. Tuson.

April 11.

[*Further letters on this subject will appear next week.—Ed.*]

Mr. Quigley's Position.

[To the Editor.]

Sir,—I find that quotation has been made from articles I have written over my own signature as if they were official pronouncements of the British Electrical and Allied Manufacturers' Association. It should be noted that such articles are based wholly on my own observations and deductions, and represent, as a consequence, my own views. Any attempt to construe them into official statements of any association is strongly deprecated by the writer.—I am, etc.,

Hugh Quigley.

Esher, April 22.

"THE ELECTRICIAN" TABLES.

Statistics Relating to British, Colonial and Foreign Electricity Supply and Traction Undertakings.

The 43rd annual edition of The Electrician Tables of Electricity Undertakings will be issued on Monday, by Ernest Benn, Ltd., Bouverie House, Fleet Street, London. The information given in the tables comprises particulars of 800 British and 1 300 Dominion, colonial and foreign undertakings. Amongst the details given are the population of the district supplied, the owners and the chief engineer of the undertaking, the systems of generation, transmission and distribution, generation, transmission and consumers' voltages, public lamps in use, motors connected, total connections, maximum load, prices charged for electricity for all purposes, price of gas in the district, steam raising and generating plant at the electricity works; output for the past year, number of showrooms, schemes for hiring domestic electrical apparatus, etc.

A new and useful feature in the new edition is a section containing authoritative details of the British electric railways, which have now attained considerable importance. The volume, which has been carefully revised up to the latest possible moment and is the only publication of its kind, is issued at the usual price of 10s. net, postage: inland 9d. and abroad 1s. extra.

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NEWS IN BRIEF.

Telephony to Australia—2 000 000 c.p. Beacon at Winnipeg—Canada to adopt B.B.C. System of Radio Control.

GELLYGAER U.D.C. has opened new electricity showrooms in Hanbury Road, Bargoed.

Oxford Corporation has decided to ask Mr. A. M. Sillar to report upon the electrical installation at the municipal buildings.

An England-Australia telephone service will be opened on April 30, when Mr. Scullin, the Commonwealth Premier will speak to Mr. Ramsay MacDonald.

The Post Office wireless telephone service to liners at sea is being extended to the "Leviathan" and "Homeric" from April 22 and May 3 respectively.

At the last meeting of the session of the Television Society at University College, Gower Street, London, on May 6, Mr. R. Neville Gray will lecture on "Liquid Photo-electric Cells."

Bermondsey (London) electricity department proposes to lay mains in two disused tramway ducts.

Glasgow Corporation has passed amended plans for the reconstruction of the Waterloo Street premises of the electricity department.

At the meeting of the Western Centre of the Institution of Electrical Engineers, at Cheltenham last week, the secretary, Mr. C. T. Allan, reported that the membership had been maintained at 677.

During the first nine months of 1929 wireless sets and parts exported from the United Kingdom to Estonia were valued at 6 715 kroons, compared with 13 552 and 13 690 for the whole of 1928 and 1927, respectively.

Dundee Electricity Committee recommends the placing of contracts for cable amounting to £3 301 with British tenderers, although foreign quotations amounting to £370 less have been received for foreign cables.

An inquiry is to be made by the Department of Justice, Washington, into the merger of the Westinghouse and General Electric radio interest with the Radio Corporation of America. The inquiry will determine whether the anti-trust laws have been violated.

In connection with night flying operations now established on the prairies, the Hudson's Bay Company has devoted the roof of its store at Winnipeg to the installation of a beacon visible for about 125 miles, and consisting of a 2 000 000 c.p. beam incandescent direction light surmounting a series of long neon tubes.

The twentieth annual May lecture of the Institute of Metals will be given on May 7, by Major F. A. Freeth, F.R.S., on "The Influence of Technique on Research." An election of members is due to be held on the same day, and persons then elected are entitled to membership privileges, in exchange for their first annual subscription, for the extended period ending June 30, 1931.

A portable demonstration set, to be used for the instruction of schoolchildren in the use of the telephone, has been designed by the Telephone Development Association. It comprises two dial telephones, battery, etc. Thirty of these sets are available for supply to education authorities who apply for them. Mr. Powell-Jones, director of the Telephone Development Association, is prepared to visit the chief centres of educational districts using the apparatus, and to give an explanatory talk to the teachers.

The National Safety First Association has inaugurated a special accident prevention service for industrial undertakings. This consists of an intensive campaign each month against one of the principal risks of industry. The series starts with "Handling Goods," and a bulletin and posters dealing with that subject have been issued. A new monthly magazine, "On Guard," is also published by the Association, and single copies can be obtained, price 2d, post free, from the offices of the Association, 119, Victoria Street, London, S.W.1.

The conference of the Association of Public Lighting Engineers will be held at Leicester from September 8 to 11.

In the Eynsham Institute Cup competition, the Oxford Electric Co.'s football club were defeated by the East Oxford Corinthians by 7 goals to 1.

The Des Moines, Iowa, Football Team expects to play all its home games during the present year, except Sunday games, by electric light at night.

Morecambe Corporation has opened new electrical showrooms, with a lecture room in which demonstrations of the use of domestic electrical apparatus are given.

Mr. J. W. Beauchamp addressed the South Wales and Monmouthshire Branch of the Electrical Association for Women on April 15, his subject being "Tariffs."

Walthamstow T.C. has decided to establish an installation department in connection with its electricity undertaking.

It is reported that the Government of Iceland proposes to terminate the contract with the Great Northern Telegraph Co. as from January, 1932.

New Zealand's imports of electrical equipment and machinery in 1929 were valued at £1 596 095, and the value of telephones and accessories imported was £390 756.

The operation of the deferred duty on electric dish-washing machines, which was to have come into force under the Australian Import Tariff on April 1, 1930, is further postponed to October 1, 1930.

The lily ponds at the Hotel Huntington, Pasadena, Cal., are now lighted by electric flood lights, and this has had the effect of stopping the croaking of frogs in the ponds which had previously been found to disturb the rest of residents in the hotel.

The annual meeting of the North Midland Students' Section of the Institution of Electrical Engineers will be held on April 29 at the Hotel Metropole, Leeds. The new committee will be elected, and the activities of the section will be discussed.

Members of the I.E.E. who desire to take part in the summer meeting in Ireland from June 2 to 6, but have not yet sent in their applications, should do so without delay. The railway companies in Great Britain have agreed to supply members of the party with railway and steamship tickets to and from Ireland at two-thirds the ordinary fare.

Middlesbrough Employment Committee takes the view that Middlesbrough and Tees-side generally will benefit little in the matter of reduction of unemployment by the conversion of electrical plant in the area to meet the requirements of the National scheme for North-East England. The Committee states that there are no firms in the district equipped for the manufacture of electrical goods on an economic scale, although a certain amount of employment may come to Tees-side in the form of contracts for steel standards for cables.

According to a speaker at a monthly luncheon of the Radio Manufacturers' Association, the Canadian Government is introducing a Bill to reorganise the radio system on our B.B.C. basis of Government control. Mr. Reginald Stewart, the Canadian conductor-pianist, who came to this country to conduct the London Symphony Orchestra at the Royal Albert Hall, stated at the luncheon that the Canadian Government was seeking to take over the present 63 stations existing in the Dominion and only use three powerful ones as a chain from coast to coast. The only difference between the proposed policy and the B.B.C. system is that the Canadian Government will be prepared to accept a limited number of advertising programmes which will be subjected to strict supervision and censorship.

LOOKING BACKWARD.

FIFTY years ago, in THE ELECTRICIAN *of April* 24, 1880, *reference was made to a proposal to floodlight the city of Boston, Mass., by means of a series of towers carrying powerful electric lights and reflectors.*

Electric lighting was used in one of the halls of the South Kensington Museum with satisfactory results.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of April* 28, 1905, *reported that a* 200 *line automatic telephone exchange on the Strowger system had been experimentally in use at the Berggasse exchange in Vienna since April* 1.

It was also mentioned that a horizontal type turbine of 11 340 H.P. (*described as the largest yet built*) *had just been assembled at the Niagara Falls power house of the Ontario Power Company.*

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PERSONAL.

MR. William Hollinghurst, electrical engineer, of High Street, Rayleigh, Essex, has been elected a member of the Urban District Council.

The marriage took place on April 5, at Chingford, Essex, of Mr. R. F. Winder, A.M.I.E.E., of Croydon, and Miss Doris Joan Gravatt.

The late Dr. H. L. Callendar, professor of physics at the Imperial College of Science, London, left £8 154, with net personalty £7 298.

Mr. Stanley A. Young, contract manager of the Post Office Telephones for the Reading district, has been appointed district manager at Aberdeen.

Mr. P. J. Pybus has consented to serve on the panel of representative industries, appointed to assist the Overseas Trade Development Court recently set up.

Mr. Osborne Mitchell, editor of the *Electrical News* (Canada) has sailed for London, was due to arrive in England on April 22, and expects to remain in this country until May 17.

Mr. F. H. Howell, assistant engineer in the Battersea electricity department, has resigned, and applications are being invited for the vacancy at a salary of £490 per annum.

Mr. E. W. Houghton has been re-elected chairman of the Radio Wholesalers' Federation, while Messrs. T. Beadle, E. J. Collier and P. L. Davies have been elected members of the council.

St. Helens Town Council has appointed Mr. H. L. Greer, of St. Helens, as shift charge engineer at the electricity works, and Mr. N. W. Kenwright to succeed Mr. Greer as switchboard attendant.

Congratulations to Mr. John Benn, a director of Benn Brothers, Ltd. (proprietors of THE ELECTRICIAN) and Ernest Benn, Ltd., and the eldest son of Sir Ernest Benn, upon the birth of a daughter on Easter Sunday.

Obituary.

Mr. NICHOLAS F. BRADY, on April 3, in his 52nd year. He was formerly president, and more recently chairman of the New York Edison Co. He established modern lighting systems in Tokyo and Osaka, and was a chief adviser to the Italian Government on electrical matters.

Mr. FREDK. KING, electrical engineer, proprietor of the firm of King and Co., Park Row, Bristol. He was 82 years of age.

Mr. ANDREW WILSON TAIT, on April 21, at the age of 54. Mr. Tait was chairman of the Metropolitan Electric Supply Co., Ltd., Ferranti, Ltd., the Delhi Electric Tramways and Lighting Co., Ltd., and other companies. He was also chairman of the British Aluminium Co. until a few months ago.

Mr. GEORGE WRIGHT, on March 17, 1930. Mr. Wright was a member of the Toronto Hydro-Electric Commission from 1918 until the time of his death, and had been chairman of the Commission since last April. Until about two years ago he was also one of the City of Toronto Transportation Commissioners.

ENTRANCE SCHOLARSHIPS.

AS a result of the Entrance Scholarship Examination held at Faraday House Electrical Engineering College on April 8, 9 and 10, the following awards have been made by the Governors of the College: John A. Evans (County School, Carnarvon) "Faraday" Scholarship of 80 guineas a year, tenable for two years in college, and one year in one of the works affiliated with the college. Nicholas Worobjeff (University College School) "Maxwell" Scholarship of 60 guineas a year, tenable for two years in college and one year in works. David A. Lamb (Downside School) an Exhibition of 40 guineas a year, tenable for two years in college and one year in works. Charles W. Sex (Tiffin Boys' School, Kingston-on-Thames) an Exhibition of 30 guineas a year, tenable for two years in college, and one year in works. William N. Bennett (Epsom College) an Exhibition of 20 guineas a year, tenable for two years in college, and one year in works. Eric M. Davey (Towyn County School, Merioneth) Entrance Prize of ten guineas, Kenneth A. Watson (Dollar Academy) Entrance Prize of ten guineas.

At the annual general meeting of the Mersey and North Wales (Liverpool) centre of the I.E.E. at the University on April 14, the following were elected for the 1930/31 session: Chairman: Mr. A. J. Pratt; Vice-chairmen: Mr. F. V. L. Mathias and Mr. P. M. Hogg; Ordinary Members of Committee: Mr. J. E. Allan, Mr. A. E. Malpas, Mr. R. A. Harrison Watson, and Mr. A. S. Wilson; Hon. Treasurer: Mr. L. Breach; Hon. Secretary: Mr. O. C. Waygood.

BUSINESS ITEMS.

J. G. STATTER AND CO. announce that as from May 1 the London office address will be 16, Great George Street, Westminster, London, S.W.1. The telephone number will remain unchanged.

THE LONDON ELECTRIC FIRM, Brighton Road, South Croydon, announces that, with reference to the lighting scheme of the Tilbury Docks, the lowering gear is of their make and has been supplied to all the principal installations, and consists of the "One working part Contact Suspension Device" and self-sustaining winches.

Among the important contracts recently received by the ENGLISH ELECTRIC CO., Stafford, may be mentioned 450 type CDB.2 Form F hand-operated camshaft tramcar controllers for Glasgow Corporation. These will be similar to those previously supplied; the value of the contract is £26 000; 94 maximum traction type tramcar trucks fitted with roller bearings, 28 in. diameter driving wheels, 4 ft. 6 in. wheel base, for the Union Construction Co. for service on the London United Tramways (the value of this order is about £14 000); also three additional double deck bus bodies, to seat 50 passengers, mounted on A.E.C. Regent chassis, for Newcastle Corporation."

We understand that SIEMENS BROTHERS AND CO., LTD., Woolwich, have recently completed the following telephone contracts:—*Great Moor, Stockport, (Cheshire).*—A new C.B. manual switchboard of the No. 10 type was brought into use for the public service at Great Moor on the 1st instant. This switchboard has 11 operators' positions. The initial equipment is for 1 520 lines and ultimate capacity for 1 900 lines. It was made and installed to the order of the General Post Office. *Italy.*—A new automatic telephone exchange for the public system was brought into use at Taranto on the 1st instant. The automatic equipment was made and installed by Siemens Brothers and Co., Ltd., and is of their No. 16 type with switching apparatus for 760 lines and an ultimate capacity for 3 000 lines.

THE SOCIAL SIDE.

THE tramway employees of the Lanarkshire Transport Co. held their annual staff dance at Harthill last Friday evening, when some 90 couples were present.

The fourth annual dinner and dance of Evershed's Social and Athletic Association was held on April 4 at Chiswick Town Hall, under the chairmanship of Mr. Vines, president of the Association. More than 230 members and friends were present.

The G.E.C. Dramatic Society opened its first season very successfully on April 9 with a series of sketches entitled "The Man in the Bowler Hat," "Tea for Three," "The Cook" and "Evening Dress Indispensable," which were produced by Mr. Dudley C. Pearman and Mr. Christopher F. Mayson. The artistes, who all acquitted themselves well, played to an appreciative Magnet House audience numbering about 350.

The final tie of the London Business Houses Amateur Sports Association (Football), for the Buchanan Cup, took place on April 12, between Johnson and Phillips, Ltd., and Centels (Central Telegraph G.P.O.) on the Sports Ground of Messrs. Van Den Berghs, Ltd., at Wimbledon Park. One outstanding feature of the game was the J. and P. defence, and they were the winners by three goals to nil. The Buchanan Cup was presented by Major Cokey, M.C., of Van Den Berghs, Ltd., to the J. and P. Captain, Mr. H. D. Parsons.

The Electrical Association for Women, Bristol and District branch, were entertained at an electrical play entitled "A King in Amber," by A. B. Wright, presented by the members of the Bristol Electricity Department Dramatic Society on April 14. The first scene opens in a peasant's cottage in the village of Athelney, Somerset, where the old dame (Miss C. Curry) is discovered soundly rating King Alfred (Mr. I. Robins) for burning her cakes. An Eastern salesman (Mr. R. Tomey) appears with a time-switch, which enables the King to do his cooking "whilst at his study, or engaged in battle with the Danes." Thus relieved of culinary cares, he musters his forces to do battle with the Danes again. This time he effects a glorious victory by the use of electricity. The final scene portrays the conversion of the cottage into a demonstration house, and leads up to mutual peace being declared between the Saxons and Danes by the adoption of the South West England Electricity Scheme.

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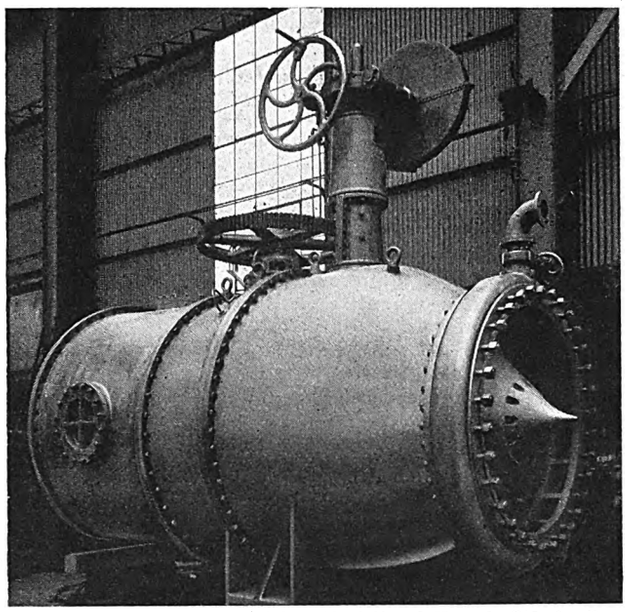
NEW MADRAS SCHEME.

A New Hydro-electric and Irrigation Scheme in India.

WE are able to give herewith an interesting photograph showing an 8 ft. 6 in. inlet diameter needle valve, with both mechanical and hand operation, for the Cauvery Metur scheme in Madras Province, India. This is one of four



An 8 ft. 6 in. needle valve supplied by Glenfield and Kennedy, Ltd., for the Metur Cauvery hydro-electric scheme.

valves being supplied by Glenfield and Kennedy, Ltd., Kilmarnock, along with other extensive equipment, and the subject is interesting because this is essentially an irrigation scheme, but with part of the water, because of the head and the volume, used for the generation of electricity by means of water turbines. This new scheme is on the Cauvery river, near the township of Metur, and a dam is being built 175 ft. high. This will form a lake of 59¼ square miles of water surface, with a capacity of 93 500 000 000 cubic feet, for the irrigation of 30 000 acres of land. Further, the dam will have 16 " Glenfield " roller sluice gates, 60 ft. wide between piers and 20 ft. deep, passing through the surplus water as usual, along with culvert sluices, an entirely new design of emergency sluice gate, and various other equipment. Also four turbines are to be installed, each with an inlet culvert of 8 ft. 6 in. diameter, lined with 9 ft. lengths of 8 ft. 6 in. diameter flanged cast iron pipe. Each of the culvert entrances is bifurcated, so that altogether there 8 inlets, of rectangular section, with a special cast iron taper connection piece, weighing 16 tons, forming the connection between the 8 ft. 6 in. diameter pipes, and the emergency gate frame. It is interesting to note that until the turbines are installed the 8 ft. 6 in. needle valves are to be provided with a 6 ft. effective diameter " Glenfield " jet disperser, each designed to discharge 2 000 cusecs of water, at 180 ft. head, harmlessly to the river. In this way all the water impounded as the work proceeds will be passed through without any trouble, these dispersers, it will be remembered, being on the " free vortex " principle, so that energy of thousands of horse power can be discharged harmlessly. For example, two dispersers are being supplied to the Arapuni station in New Zealand, each with 3 000 cusecs capacity, equal to 25 000 H.P., enabling this volume of water to be passed down to the Waikato river as an emergency installation until such time as corresponding water turbines are installed.

At the annual dinner of the Chartered Institute of Patent Agents last week, Sir Wm. Jarratt, Comptroller-General of Patents, etc., said the volume of work in the Patent Office had surpassed all previous records. Sir Duncan Kerly, K.C., said he thought a blot on our patent law was that claims were admitted which were too ambiguous. Sir Horace Hamilton (Board of Trade), said the profession of patent agent seemed to be in a happy position, for he was told that adversity acted as a spur to invention, and when times were good industry had more to spend on research, which also led to invention.

ITALIAN BROADCASTING.

New Short-Wave Transmitter for Long Distance Work.

IN accordance with the Italian Broadcasting Company's policy of modernising the Italian broadcasting system, a short-wave transmitting station has been erected near Rome to enable the Italian transmissions to be heard in those overseas countries outside the range of the broadcasting stations operating on the normal broadcast wave-band. The new station, which in its main features follows the design of the short-wave Beam transmitter has been supplied by MARCONI'S WIRELESS TELEGRAPH CO., LTD. The station is now completed, and tests made on 25.4 metres were observed in the Italian Colonies and elsewhere. Reports received from India, Australia, South Africa and New York were satisfactory. Arrangements have also been made to enable the transmitter to operate on a second wave length of 80 metres, which is suitable for reception throughout the whole of Italy and neighbouring countries, where the normal broadcast wave-band is indifferently received. The transmissions will normally take place on either 25.4 metres or 80 metres, the wave range of the transmitter. The equipment is rated to deliver from 9 to 12 kW of unmodulated carrier power to the aerial feeder system. The maximum degree of modulation is 70% and at this setting the transmitter is rated at 9 kW unmodulated input to the feeder. With 12 kW to the feeder the maximum degree of modulation is 55% to 60%. The complete transmitter consists of four panels. The first is the main magnifier unit operative over the whole wave band of 25 to 80 metres; the second contains the intermediate magnifier and drive units for the wave band 25 to 40 metres; the third comprises the intermediate magnifier unit and drive units for the wave band of 40 to 80 metres, and the fourth is the modulator and sub-modulator unit. Two separate transmitting aerials of the " Uniform " type are provided, both being suspended and insulated from a triatic slung between two masts 200 ft. in height and 400 ft. apart. The energy from the transmitter is conveyed to the two aerials by two separate copper feeder systems identical with those used in the Beam system. The feeders consist of two concentric copper tubes insulated from each other through porcelain insulators and accurately spaced throughout their whole length. The inner tube carries the high frequency energy, while the outer tube, which is carried on iron stanchions, is at earth potential. The aerial ends of the feeders terminate in aerial coupling boxes situated under the vertical aerials. These boxes contain inductances which are used to couple the aerials in the correct impedance relation to the feeders, in such a manner that the aerials act as pure resistance loads on the transmitter, thus avoiding reflected waves with their attendant losses. The speech or musical programmes received over the landlines from the studio in Rome will be amplified by two separate speech amplifiers.

INSTITUTE OF METALS.

Seaport Meeting and Coming Visit to France—Metallurgists and America.

SOUTHAMPTON will be the scene of this year's meeting of the Institute of Metals, which is being held from September 9-12. At the morning sessions a dozen papers of metallurgical and engineering interest will be presented for discussion. The afternoons will be devoted to visits to works in the neighbourhood and to Portsmouth Dockyard. There will be a luncheon on board the " Mauretania," also social functions each evening. On September 12, motor trips will take place in the New Forest and round the Isle of Wight. An excursion is being arranged for the week-end following the meeting, in the form of a trip to France and back in Atlantic liners.

Plans for an American meeting, to be held by the Institute of Metals in the United States and Canada two years hence, are now taking definite shape. The visit will include official meetings of the Institute in New York and joint meetings with allied societies in Detroit and Toronto. Other places to be visited include Pittsburgh, Cleveland, Chicago, Niagara and Montreal. In all of these, works will be thrown open for the inspection of the visitors. The party is expected to leave Southampton on September 3, 1932. The meeting in New York will begin on September 11, and the return journey will start from Montreal on September 30. Persons desirous of taking part in the seaport meeting and/or visit to America should communicate with the Secretary of the Institute of Metals, 36, Victoria Street, London, S.W.1.

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IN PARLIAMENT.

Points from Replies to Recent Questions in House of Commons.

ALL the "one-piece" telephone instruments supplied by the Post Office are manufactured in England.

The Government of the Federated Malay States recently advanced £850 000 to the Perak River Hydro-Electric Power Co.

During 1929 the number of new rural telephone exchanges opened was 165. The net increase of telephones in use throughout the United Kingdom was 125 885.

The Postmaster-General is advised that the Rugby and Baldock wireless stations are capable of maintaining telephone services for as many hours as the beam stations, and probably for more.

A new electrification law in Yugoslavia contemplates certain concessions for the attraction of foreign capital. Everything possible will be done with a view to obtaining orders for British goods.

The number of wireless receiving licences in force on March 31, 1930, was approximately 3 093 000. There were no statistics available showing how many licencees used portable receiving sets.

It is expected that the further investigation undertaken by the committee which is examining the question of constructing a tidal barrage across the River Severn for the purpose of an electrical power scheme will take about two years to complete.

It is impossible to separate the results of Telephone Development Association publicity and those of other causes promoting telephone development. The Post Office relies mainly on personal canvassing, supplemented by literature, for popularising the telephone.

Experiments have shown that telephonic communication from railway trains is practicable, but at present the demand for such communication does not seem likely to be sufficient to justify the expense involved to the railway companies in the provision of facilities.

An application under the Development (Loan Guarantees and Grants) Act in regard to the project of the electrification of the Great Northern lines of the L.N.E.R. from King's Cross to Welwyn Garden City is being considered by the Advisory Committee. It is understood that the work could be commenced in about nine months.

In accordance with the agreement between the Government of India and the Indian Broadcasting Co. the annual wireless licence fee was fixed at 10 rupees, of which 20% was retained by Government. The Secretary for India (Mr. Wedgwood Benn) has seen it stated that the total number of licences issued up to the beginning of this year was about 9 000.

Up to the present about 3 500 telephone subscribers have ordered the new micro-telephone receivers. The extra rental of 4s. a quarter for these instruments is due to the fact that it is a delicate instrument and requires more looking after than the original instruments. If it is found, after 12 months, that any undue profit is made, the cost will be reduced.

The question of utilising the telephone system for the reception of broadcasting has been considered on several occasions, but the conclusion has been reached that the disadvantages would outweigh the advantages. Such a scheme has been adopted for some time in Holland, and, it is understood, there have recently been some new developments.

Great Britain has through telephone circuits to Austria, Belgium, Denmark, France, Germany, Holland, Irish Free State, Italy, Spain, Sweden, Switzerland, and the U.S.A. By switching in an intermediate country a telephone service is provided to Canada, Cuba, Czecho-Slovakia, Danzig Free City, Gibraltar, Hungary, Luxembourg, the Sarre Territory and certain parts of Spanish Morocco, the Argentine, Finland, Lithuania, Mexico, Portugal, Norway and Poland.

The Postmaster-General, in a written answer to a Parliamentary question, states that the capital expenditure involved in the proposal to establish telephone services with Canada, Australia, South Africa, India and the Argentine is about £125 000, exclusive of land lines. This, however, depends on an agreement with the distant countries concerned as to the hours per day they wish the service to be open and the number of alternative wave-lengths they are prepared to use. The dates of opening, also, depend on the negotiations now proceeding with the telephone administrations concerned. In regard to India and South Africa it is doubtful whether those countries will be in a position to co-operate in opening a service for some time to come.

TRADE PUBLICATIONS.

THE ASEA ELECTRIC, LTD., 5, Chancery Lane, London, W.C.2, has issued a new motor price list.

Specification No. A 402, dealing with transformers, has been published by CROMPTON PARKINSON, LTD., Guiseley, Leeds.

The current stock list of the A.E.G. ELECTRIC CO., at Bay 9A, 1/3, Brixton Road, London, S.W.9, has been received.

Street lighting is the subject of Catalogue No. L.19, by the WARDLE ENGINEERING CO., LTD., Elsinore Road, Old Trafford, Manchester.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, has published two new issues, Nos. K 71 and K 78, entitled respectively "Metalclad Switchgear" and "Variable Speed A.C. Motors."

Two new publications of the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., are No. 6 650, describing the company's switch adaptor, and No. 6 653, relative to the "Neutrosonic" seven-valve receiver.

FERRANTI, LTD., Hollinwood, Lancs., have published a new descriptive catalogue for 1929/30, detailing meters, d.c. and a.c.; non-magnetic iron (Nomag); transformers; instruments and instrument transformers; radio; radiant heat fires, thermal storage tanks and equipment. These sections appear in the order given, and as the lists are numbered consecutively, the index at the beginning gives a ready means for identifying the position of each list. This catalogue has been issued under the company's master system, and will be kept up to date by means of loose leaf additions.

SCIENTIFIC AND TECHNICAL BOOKS.

THE Spring issue of the Classified Catalogue of Scientific and Technical Books, published by Ernest Benn, Ltd., includes a number of publications of electrical interest, as will be seen from the following list:—

ELECTRICAL ENGINEERING.—"Insulated Electric Cables," Parts I, II, and III, by C. J. Beaver, 36s. net; "Electric Winders," by H. H. Broughton, 52s. 6d. net; "The Electrical Handling of Materials," by H. H. Broughton, Vols. I and II, 25s. each, Vols. III and IV, 50s. each; "Primary Batteries: Their Theory, Construction and Use," by W. R. Cooper, 10s. 6d. net; "An Introduction to the Theory of Eddy-Current Heating," by N. Ryland Davis and C. R. Burch, with an Introduction by A. P. M. Fleming, 12s. 6d. net; "Electrical Measuring Instruments," Parts I to IV, by C. V. Drysdale and A. C. Jolley, 55s. net per volume; "Electric Shock Cards," 1s. 6d. each, or 50 copies, £3, post free; "Electrical Trades Directory and Handbook," 25s. net; "ELECTRICIAN Tables of Electricity Undertakings," 10s. net; "Electric Lighting of Shop Windows," by G. K. Fletcher, 3s. 6d. net; "Electric Switch and Controlling Gear," by C. C. Garrard, 63s. net.; "Electricity Meters," by C. H. W. Gerhardi, 18s. net; "Elementary Theory of Alternate Current Working," by Major G. L. Hall, 7s. 6d. net; "Electro-Magnetic Theory," by Oliver Heaviside, F.R.S., £5 5s., set of three volumes; "The New Electricity Act, 1926: A Popular Exposition for Municipal Officers, Electrical Engineers, and Others,', by W. S. Kennedy, 6s. net; "Electric Welding: Its Theory' Practice, Application and Economics," by H. S. Marquand, 12s. 6d; net; "Electro-Farming," by R. Borlase Matthews, 25s. net. "Wiring Calculations; for Electric Light and Power Installations," by G. W. Lummis Paterson, 5s. net; "Notes on the Theory and Design of Continuous Current Machines," by Stanley Parker Smith, 5s. net; "Sir Joseph Wilson Swan, F.R.S.: A Memoir," by M. E. S. and K. R. S., 7s. 6d. net; "The Control of the Speed and Power Factor of Induction Motors," by Miles Walker, 18s. 6d. net; "Insulating Materials," by H. Warren, 42s. net; "Electrical Engineers' Data Books," under the general editorship of E. B. Wedmore; "Lighting Traction and Power Distribution," by E. B. Wedmore and D. V. Onslow, 15s. net; "Manufacture, Design and Laboratory Work," by E. B. Wedmore and D. V. Onslow, 15s. net—two parts in one volume 28s. net; "Radio Engineering," by E. B. Wedmore and J. H. Reyner, 15s. net; "Rotary Convertors," by F. P. Whitaker (in preparation), 35s. net; "Di-Electric Phenomena," by S. Whitehead, with a Preface by E. B. Wedmore, in two volumes, 12s. 6d. per volume; "Forty Years of Electrical Progress: The Story of the G.E.C.," by A. Gowans Whyte. 5s. net; "Small Electric Generating Sets," by W. Wilson, 18s. net.

TELEGRAPHY, TELEPHONY AND WIRELESS.—"Automatic Telephone Systems," Vol. I, 25s. net, Vol II, 35s. net, Vol. III, 55s. net, and "An Outline of Automatic Telephony," by William Aitken, 5s. net; "Common Battery Telephony Simplified," by W. Atkins, 8s. 6d. net; "Beginner's Manual of Submarine Cable Testing and Working," by G. M. Baines, 7s. 6d. net; "The Poulsen Arc Generator," by C. F. Elwell, 18s. net; "Practical Television," by E. T. Larner and J. L. Baird, 10s. 6d. net; "Radio—Beam and Broadcast," by A. H. Morse, 12s. 6d. net; "Principles and Practice of Wireless Transmission," by G. Parr, 5s. net; "Radio Engineering" (Electrical Engineers' Data Books), by E. B. Wedmore and J. H. Reyner, 15s. net.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

AYRSHIRE EDUCATION COMMITTEE.—Electrical work in connection with the erection of new school at Annbank. Particulars from Mr. William Reid, master of works, Education Offices, Ayr.

BOSTON CORPORATION.—Electric light installation at Fever Hospital. Particulars from the Town Clerk.

DUMFRIES CORPORATION.—Electrical work in connection with lavatories to be constructed at St. Michael's Bridge. Particulars from the burgh surveyor, Mr. John Barker.

BIRMINGHAM CORPORATION, April 25—May 8.—Electric light and power wiring of City Sanatorium, Rednal Road, West Heath, Birmingham. Specification, etc., from Mr. F. H. C. Wiltshire, town clerk, Council House, Birmingham, until April 25; deposit £1 1s.

LIVERPOOL CORPORATION, April 25.—Supply of tramway rails and fishplates (schedule No. 1); fishbolts (No. 2) and tiebars (No. 3). Applications for tender forms, stating No. of schedule, to the City Engineer, Municipal Buildings, Dale Street, Liverpool.

DARTFORD URBAN DISTRICT COUNCIL, April 26.—Supply of approximately, 785 yds. of 0·1 sq. in. h.t., three-core, and 640 yds. of l.t. four-core lead covered and armoured cable. Further particulars from the Electrical Engineer, Electricity Works, Dartford.

ECCLES CORPORATION, April 26.—Supply of 500 kVA, three-phase, oil cooled transformer, ratio 6 600-400 V, 50 cycles. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

NEWTOWNARDS (CO. DOWN). GUARDIANS, April 26.—Electrical plant and wiring, etc., in connection with conversion of workhouse into a district hospital. Specification from Mr. John Warden, clerk to the Guardians; deposit £2 2s.

AYLESBURY CORPORATION, April 28.—Two vertical a.c. motors and sewage pumps. Specification from the Borough Engineer; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, April 28.—Supply and erection of 33 kV, 11 kV and 6·6 kV switchgear, for connecting Board's supply to electricity supply undertakings, under N.W. England and North Wales scheme. Specification (No. N.W.E.—G.S.4) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit, £2 2s.

ILFORD CORPORATION, April 28.—Supply and erection of (*a*) rotary convertor plant of 500 kW capacity, with automatic control; (*b*) rectifier plant. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Ley Street, Ilford.

WORTHING CORPORATION, April 28.—Borehole pump, coupled to electric motor, to deliver 60 000 gallons of water per hour. Specification, etc., from the Borough Water Engineer.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, April 30.—Supply and erection of h.t. and l.t. switchgear. Specification, etc., from Mr. David J. Keep, town clerk; deposit £2 2s.

WALTHAMSTOW CORPORATION, May 3.—Supply and erection of 2 500 kW motor-convertor. Specification, etc., from Mr. G. R. Spurr, Electricity Works, Exeter Road, London, E.17; deposit £1.

GOLBORN URBAN DISTRICT COUNCIL, May 3.—Electric light installation in 54 houses on Edge Green Lane site. Tender forms from the clerk, Mr. H. Eckersley.

CENTRAL ELECTRICITY BOARD, May 5.—Supply and erection of 33·kV transmission line crossing of the river Witham. Boston, under Mid-East England scheme. Specification (No, M.E.E.—S.L. 3) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

MANCHESTER CORPORATION, May 5.—Twelve months' supply of 125, 250, 500, 750 and 1 000 kVA static transformers. Specification (No. 278) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

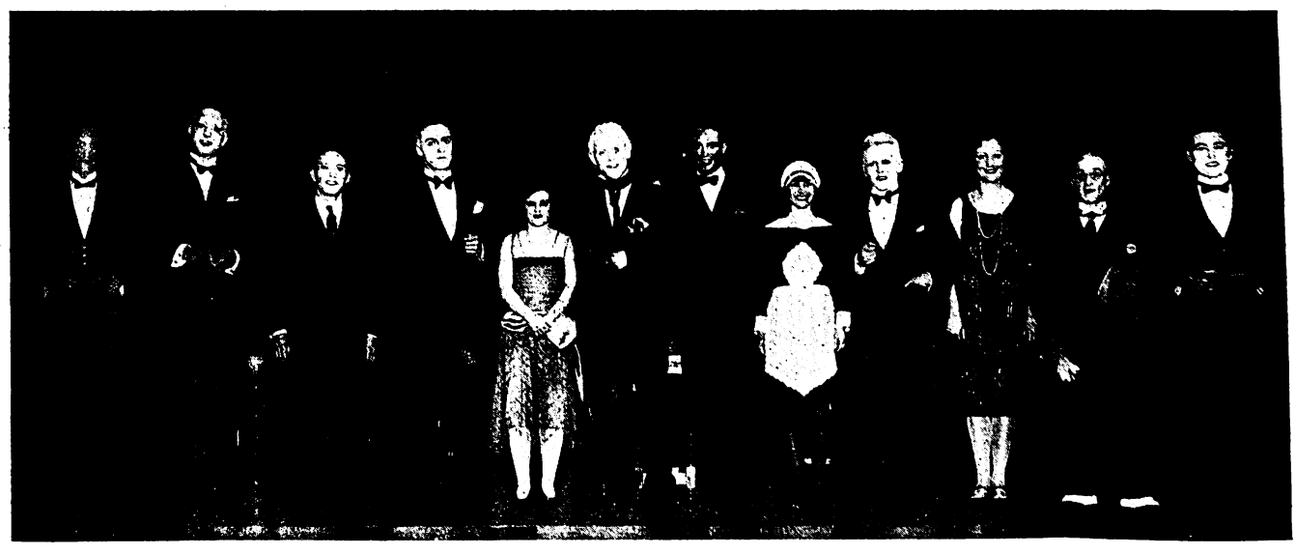
ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, May 5.—Supplies of l.t. and e.h.t. underground cables for 12 months. Tender form, etc., from the Chief Electrical Engineer, Town Hall, St. Marylebone, London, W.1.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, May 6.—Supply and erection of induction voltage regulator. Specification from Mr. R. W. Willis, 37, High Street, Cheadle; deposit £2 2s.

TYNE IMPROVEMENT COMMISSION, May 6.—Supply of five 3-ton electric, hand travelling, semi-portal, level luffing cranes, for Prince Edward Dock. Specifications, etc., from Mr. Albert Blacklock, secretary, Bewick Street, Newcastle-on-Tyne; deposit £3 3s.

DUNDEE CORPORATION, May 10.—Supply and erection of two electrically driven, vertical spindle, main circulating water pumps, in pump room, in connection with Carolina Port generating station. Specification, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee; deposit £2 2s.

BILSTON URBAN DISTRICT COUNCIL, May 12.—Electric light installation in Market Hall and Yard. Specification from



THE above picture shows the members of the Dramatic and Musical Section of Callender's Cable and Construction Co.'s Athletic and Social Club (London), who gave an excellent performance of the comedy-drama "Grumpy" at the Guildhall School of Music, London, on Tuesday of last week. This was the first public performance given by the Section.

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Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s. Only firms on the National Register are invited to tender.

CENTRAL ELECTRICITY BOARD, May 12.—Supply and erection of 66 kV and lower voltage switchgear. Specification (No. M.E.E.—G.S. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12.—Supply and erection of 66 kV and lower voltage transmission lines, under the Mid-East England scheme. Specification (No. M.E.E.—S.L. 2) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12.—Supply of 33 kV and other cables, in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.-G.C.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

EPSOM URBAN DISTRICT COUNCIL, May 12.—Kiosks and converting plant (section I); e.h.t. and l.t. cables and laying (section II); and supply only of l.t. cables (section III). Specification and form of tender from Mr. H. W. Watts, Electricity Works, Depot Road, Epsom; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 19.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme (London Area). Specification (No. S.E.E.-L.F.4.) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

STAFFORDSHIRE EDUCATION COMMITTEE, May 24.—Electric light installation in existing Infants' Council School, Pelsall, near Walsall, which is to be enlarged and converted into a Senior Mixed Council School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice,* essential.

CHRISTCHURCH (N.Z.) MUNICIPALITY, April 25.—Supply of electricity meters. (Reference B.X. 6 309.)

ST. GILLES (BRUSSELS) MUNICIPALITY, April 26.—Supply of 6 000 metres of 10 sq. mm. armoured cable, 100 metres of 35 sq. mm. and 1 000 metres of 70 sq. mm. Cahier des Charges (fr. 5) from Service de l'Electricité, 40, Rue de Bethléem, St. Gilles, Brussels.

ANTWERP MUNICIPALITY, April 28.—Supply of cables and junction boxes. (Reference B.X. 6 312.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, April 28.—Supply and erection of electrically driven high lift and low lift pumping plants, etc., for South-West Tableland Water Supply (tender No. 51, 1929/1930). Reference A.X. 9 219.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29.—Supply of 10 000 kVA synchronous condenser and accessories, for Lake Coleridge power scheme, section 218. (Reference B.X. 6 034.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29.—Supply of single-phase transformers, with accessories, for Lake Coleridge Power Scheme, section 219. (Reference B.X. 6 035.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, April 29.—Supply of 11 000 V switchgear for water rheostats, Waitaki power scheme, section 8. (Reference B.X. 6 048.)

ANDERLECHT MUNICIPALITY, April 30.—Supply of high and low pressure cable. Cahier des Charges (fr. 3) from Régie de l'Electricité, 4, Rue Van Lint, Anderlecht, Brussels.

EGYPTIAN MINISTRY OF PUBLIC WORKS, April 30.—Supply and erection of h.t. overhead transmission lines in isolated basins of Upper Egypt. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1; £10 5s., not returnable.

GHENT PORT AUTHORITIES, May 3.—Eight electric portal cranes. Cahier des Charges (No. W.4). (Reference A.X. 9 444).

VICTORIAN ELECTRICITY COMMISSION, May 5.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000 V circuit (specification No. 30/19). (Reference B.X. 6 226.)

CAIRO MAIN DRAINAGE DEPARTMENT, May 17.—Supply of electric lamps, etc., for one year. Particulars from the Department, 2, Sharia Maleka, Nazli.

INDIAN STORES DEPARTMENT, May 26.—Two vertical and two horizontal centrifugal pumps, switchgear, etc. (Reference A.X. 9 416.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 8.—Supply of telephonists' telephones. (Reference B.X. 6 352.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (£10 5s., not returnable.)

NEW ZEALAND GOVERNMENT RAILWAYS, July 16.—Supply of two overhead electric, 30 cwt., underhung, travelling jib cranes, with 12 ft. jib, for goods sheds at Wellington and Auckland. (Reference A.X. 9 442.)

Tenders Accepted.

AIR MINISTRY.—British Thomson-Houston Co., Ltd., supply of Mazda lamps for three months, or longer if required.

GENERAL POST OFFICE.—Telephone exchange equipment: Southall, Standard Telephones and Cables, Ltd.; Clerkenwell, Automatic Telephone Mfg. Co., Ltd.

GLASGOW CORPORATION.—General Electric Co., Ltd., electrical equipments in connection with tramcar re-building scheme, comprising 450 60 H.P. motors, 600 V, with resistances and circuit breakers.

BLACKBURN CORPORATION.—Material required by electricity department during 1930: 6 600 V paper insulated and lead-covered cables, Edison-Swan Cables, Ltd.; 660 V paper insulated lead-covered cables, Derby Cables, Ltd.; v.i.r. taped and braided wires and lead sheathed cables, Mersey Cables Works, Ltd.; flexibles, Siemens Bros. and Co., Ltd.; consumers' meters, Ferranti, Ltd.; gas-filled and vacuum lamps, General Electric Co., Ltd. and British Thomson-Houston Co., Ltd.

TORQUAY CORPORATION.—British Thomson-Houston Co., Ltd., supply and erection of one 7 500 kW, m.c.r., turbo-alternator and condensing plant, £26,595. Also tendered: Richardsons, Westgarth and Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Brush Electrical Engineering Co., Ltd.; C. A. Parsons and Co., Ltd.; General Electric Co., Ltd.; English Electric Co., Ltd.; Peter Brotherhood, Ltd.; British Brown Boveri, Ltd.; Escher, Wyss and Co., S.A.; Oerlikon, Ltd.; Siemens-Schuckert, Ltd.

MANCHESTER CORPORATION.—Twelve months' supply of electrical goods: Manchester Armature Repair Co., Ltd., armature coils; Metropolitan-Vickers Electrical Co., Ltd., insulated blocks for motor brush-holders, shoes for electro-mechanical brakes, and lightning arresters; British Thomson-Houston Co., Ltd., controller reversing fingers; Fairless Engineering Supplies Co., Ltd., B.510 two-way connectors; General Electric Co., Ltd., conduit tubing, switches for car lighting, thumb-turns and china covers for switches, gongs, magnet coils, backs for bell presses, cable for motor buses, and green and opal shades; Siemens Electric Lamps and Supplies, Ltd., two-way switches and lampholders; Taskers' Engineering Co., Ltd., tumbler type switches; S. Gratrix, Junr., and Brother, Ltd., fuses, bell presses, shades, etc.; Edison Swan Electric Co., Ltd., two-way switches for bells, porcelain fuses, etc.; Ward and Goldstone, Ltd., portable lamps, plug adaptors, etc.; Metro-Vick Supplies, Ltd., cells for bell circuits.

GLASGOW CORPORATION.—Thomas Bolton and Sons, Ltd., and F. Smith and Co., Ltd., copper trolley wire; Sturtevant Engineering Co., Ltd., and Met.-Vick. Supplies, Ltd., suction plant for depots; W. C. Yuille and Co., Ltd., electric magnet crack detector; Mather and Platt, Ltd., two new rotary convertors, £8 062; General Electric Co., Ltd., 35 new motors, two new portable drills, etc., £1 571 9s. 6d.; Harland Engineering Co., Ltd., 86 new and three reconditioned motors, £7 111; John Grieve and Co., six new crane motors, £350; English Electric Co., Ltd., 12 new motors, £223 15s. 6d.; Brook Motors, Ltd., eight new motors, £114 19s. 11d.; A.S.E.A. Century Motors, 12 new motors, £139 2s. 6d.; Metropolitan-Vickers Electrical Co., Ltd., 16 reconditioned and three new motors, etc., £1 456 3s. 6d.; J. Bennie, Ltd., two lift motors, exchanged including fitting, £317 10s.; T. Harding, Churton and Co., five new motors, £204 10s.; Wm. M'Gee and Co., six new motors, £414; Lancashire Dynamo and Motor Co., Ltd., 15 new motors, £781 10s.; British Thomson-Houston Co., Ltd., 29 new motors, £2 437 18s.

With reference to the advertisement of the Telegraph Condenser Co. which appeared in our last issue on page XXIV, the condenser illustrated is type H.F. and not H.S. as printed.

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ELECTRICITY SUPPLY.

Dumfries Hire-Purchase Scheme—Loan for Nottingham Extensions—Ballymena's Bulk Supply—Carlisle's Rural Extensions—Supply Commenced at Sorn—Discontinuance of Plymouth Free Wiring.

GLASGOW Electricity Committee has authorised mains extensions at a cost of £21 636.

Dumfries Town Council has approved of a hire-purchase scheme for wiring houses.

Buckie Gas Lighting Co. has lodged an objection to the electricity scheme put forward by the T.C.

Stoke Newington (London) Electricity Committee has obtained sanction for a loan of £10 000 for mains and services.

Malvern U.D.C. has applied for loans of £7 000 for mains and services, £2 000 for transformers and sub-stations, and £1 000 for meters.

Hastings T.C. is to extend the l.t. overhead lines to supply the Waites Farm estate at Fairlight and the Warren estate, at an estimated cost of £630.

Nottingham Corporation has approved the provision of a further sum of £150 000 for extension of mains and for works in connection with the assisted wiring scheme.

Uttoxeter U.D.C. has received sanction to a loan of £22 349 for carrying out an electricity scheme, under which energy will be obtained in bulk from Burton-on-Trent Corporation.

Northfleet U.D.C. has been informed by the Central Electricity Board that the erection of the Tunbridge Wells and Croydon transmission lines on one line of towers is not practicable.

Following the report of the Electricity Committee at a recent meeting of Ballymena U.D.C., it was agreed that a supply of electricity for the town be taken from the Antrim Electricity Supply Co.

Carlisle City Council has approved an expenditure of £13 238 for the extension of electricity supplies to the townships of Wetheral, Heads Nook, Warwick Bridge, and Brampton, on the eastern side of the city.

At a recent meeting of Sorn P.C. a letter was read from the Ayrshire Electricity Board stating that the electric lighting scheme for the village was nearly completed and at the close of the meeting the first of the lights were turned on.

Negotiations have been completed between the Tanganyika Government and the Power Securities Corporation, of London, for a supply of electricity, generated at the Pangani Falls, to townships in the district between the coast of East Africa and Lakes Victoria and Tanganyika.

The chairman of Exeter Electricity Committee and officials have been informed by the Central Electricity Board, that no obligation will be imposed upon the City Council to bring its undertaking within the South-West scheme unless circumstances prove that it is to the benefit of the city.

A Ministry of Transport inquiry has been held with regard to an application by the Central Electricity Board for sanction to erect a transmission line between Leicester and Loughborough. Col. N. H. Firmin, for the Board, said the line would be a portion of a loop which ran from Nottingham to Leicester.

Plymouth Electricity Committee recommends the discontinuance of the free wiring scheme, and that persons whose orders have not yet been executed be recommended to wire their houses under the Corporation's assisted scheme. The Electrical Engineer is to report regarding the existing system of supplying electricity through prepayment meters.

The Isle of Man Legislative Council has passed the Isle of Man Electric Light and Power Bill, which grants a monopoly to the Electrical Securities Trust, Ltd., to distribute electricity for lighting and heating purposes throughout the Isle of Man. The Bill has yet to be considered by the Manx Lower House—the House of Keys. The Manx Government reserves the right to acquire the undertaking after 50 years.

The Committee of Inquiry appointed by the Punjab Government has reported on the progress of the Uhl River (Mandi State) hydro-electric scheme. The Committee does not recommend the abandonment of the scheme. The supply of power to the public should begin by July, 1933. It is estimated that the ultimate cost will be 6¼ crores of rupees (about £4 688 000, instead of the original estimate of £3,200 000). It is recommended that an expert committee should, before the second stage of the scheme is started, examine the merits of an extension by means of additional storage pipes and plant to increase the output from 36 000 kW to 70 000 kW, compared with the generation of energy from canal falls and fuel-driven plant.

In view of the urgent need for more power at the Lurgan Corporation's electricity station, a deputation has been appointed to wait on the Ministry of Home Affairs. At a recent meeting of the Council, Mr. Lewis said it was evident there were influences at work to compel urban authorities to take a bulk supply. This would not be available for at least four years, and Lurgan could not wait that time.

A Ministry of Transport inquiry was held on April 10, relative to the application of the Scarborough T.C. to extend its electricity supply to Filey by means of overhead lines. It was stated that the North and East Riding County Councils, Scarborough R.D.C. and the Scalby and Filey Urban Councils had agreed to the scheme. One objection was that the poles would hinder the development of a building estate, and there was opposition to the payment of only 1s. per annum as pole rent. The Town Clerk said the Council would pay a fair sum for wayleaves, to be decided by the Ministry

The Kent Electric Power Co. has placed before Rochester and Chatham Corporations proposals in exchange for which the company asks for a 42 years' extension of tenure. The company offers to reduce the price of electricity for lighting from 6½d. to 6d. and for power from 2d. to 1½d., and the rent of meters up to 10A from 3s. to 2s. 6d. per quarter, to introduce a two-part alternative tariff and to provide a hire-purchase scheme for installations. The company offers to extend the distributing cables in Rochester, Chatham and Strood. The total cost of the work scheduled is estimated at £35 000. A Joint Lighting Committee of the Corporations has decided that the proposals made are quite inadequate.

Guildford Electricity Committee has received a deputation consisting of officials of the Central Electricity Board upon the proposed route of the Board's overhead transmission line from Guildford to Godalming and Hindhead. The Committee approved the proposed route, but strongly urged the deputation that the line should be placed underground where it is to cross the Hog's Back.—The Committee has granted an application for a supply of electricity to the Stonebridge Estate, Shalford. In order to give a supply it will be necessary to extend the mains, at an estimated cost of £273 11s.—Mains are also to be extended at an estimated cost of £393, to give a supply to 44 houses proposed to be erected at Stoughton recreation ground.

Col. T. C. Ekin held an inquiry at Burscough, recently, into the application of Lathom and Burscough U.D.C. for an Order to supply electricity in the district and the application by the Lancashire Electric Power Co. for an Order to supply current for domestic purposes in Lathom, Burscough, Skelmersdale, Wigan and West Lancashire. Mr. W. Gorman, for the company, said they could not supply Skelmersdale and the adjacent rural area unless they were allowed to carry out the whole of their scheme, which also included Lathom and Burscough. Mr. C. D. Tate, engineer to the company, said they proposed to spend £12 330 on cables in the districts they proposed to supply. They would take their supply from their station at Ormskirk and lay mains where there was a demand sufficient to warrant them. The company's application was supported by the East Lancashire Electricity Board.

Sanction to borrow £9 160 for electricity mains has been obtained by St. Pancras (London) Electricity Committee. The Committee reports that the Electrical Engineer advocates the adoption of the remote control system for a new sub-station in Arlington Road, as, although the necessary equipment would cost practically 50% more to instal, it would almost eliminate operating costs at the station. The Committee is advised that the most comprehensive and effective equipment offered is that of the General Electric Co., the total for h.t. and l.t. switchgear being £16 423. Certain of the apparatus, however, will not be needed, and the reduced total will therefore be £14 798. The Engineer has been impressed by the efficiency of the apparatus and its wholly automatic action. Two different types of reflectors have been used experimentally on street lamps in the borough, with a view to finding the best means of improving the lighting. Two adjacent circuits of lamps of equal wattage are being fitted with such reflectors, for purposes of comparison, and the Sub-Committee which is considering the matter will submit its recommendations after it has inspected them.

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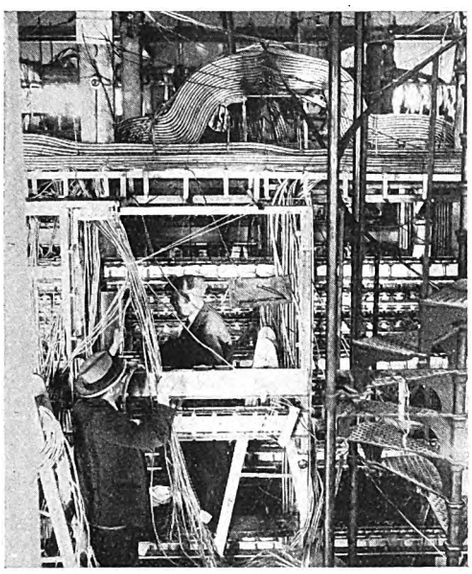
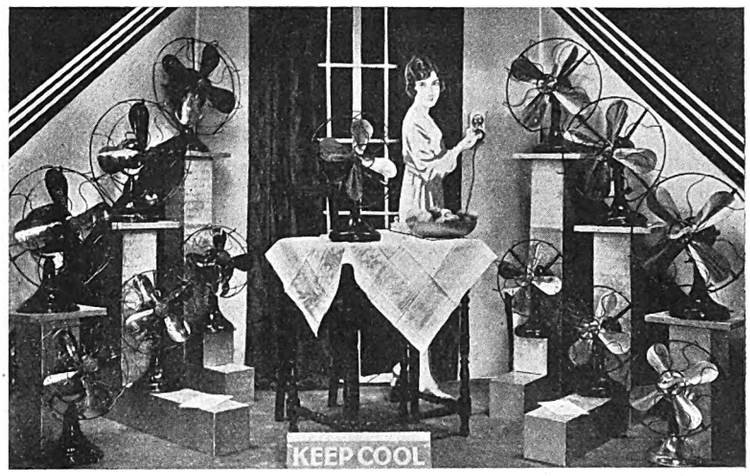
ELECTRICAL PICTURES OF THE WEEK.

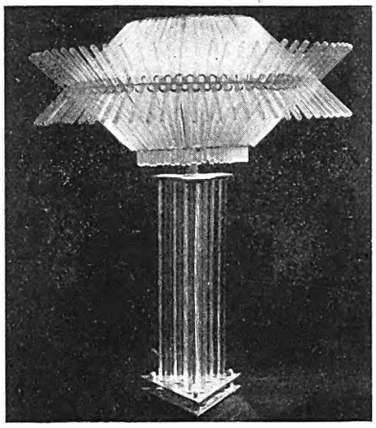


Part of the internal wiring of the Newmarket totalisator which is now in operation. The equipment is capable of handling a field of as many as forty horses.



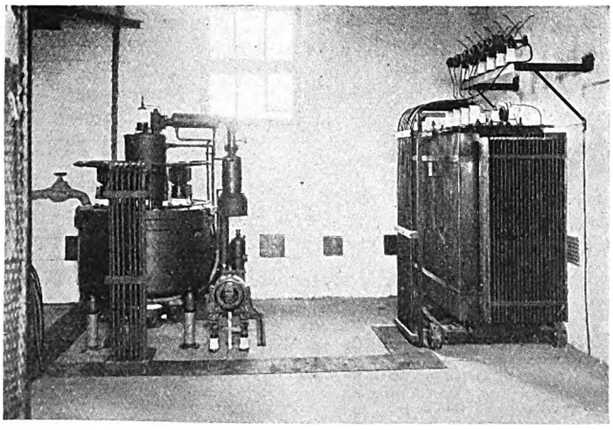
The April window display designed by the Electrical Development Association in connection with the Selling Campaign was devoted to electric irons. The May window is concerned with fans, and, as this reproduction shows, the same simple lines are retained.

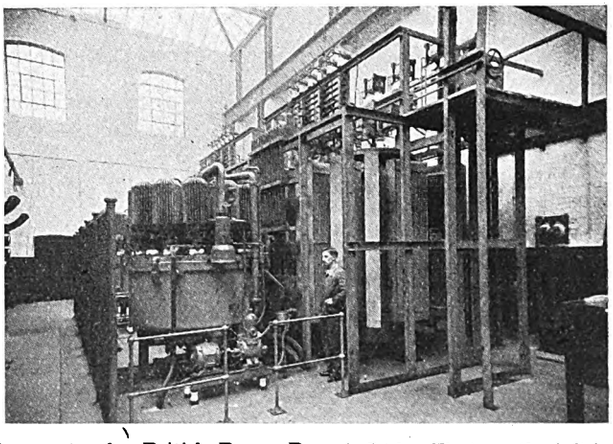
The latest electrical addition in the medical world is an apparatus for sterilising and drying the hands of operating staffs.



A " Dimea " table standard lamp made from fluted glass tubes. The tubes are so arranged that only diffused light is radiated.

Electrical penetration in the circus world has resulted in the adoption of modern methods of lighting, even to the use of appropriate reflectors.





Two of the latest high power rectifier plants to be put down in this country by British Brown Boveri, Ltd. That on the left is a 400 kW plant supplied to the Wycombe (Borough) Electric Light and Power Co., Ltd., and supplies 420 V d.c. to the High Wycombe network. The h.t. supply is three-phase, 5 300 V, 50 cycles. The second picture is an installation in the Blandford Street sub-station of St. Marylebone (London) B.C. Each set is rated at 3 000 kW, 490/530 V d.c., the incoming supply being three-phase, 6 600/6 900 V, 50 cycles. It is claimed that these units are the largest in operation in this country.

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Directors' Reports, etc.

SOCIETA IDRO-ELETTRICA PIEDMONTE (TURIN).—This company has arranged with Blair and Co., of New York, for a loan of $14 000 000 in 6½% mtge. bonds.

MONTREAL TRAMWAYS CO.—Operatg. rev. for 1929. $15 311 138, agst. $£14 826 622 ; and special rev. $358 773, Net earngs., $3 795 098, agst. $3 435 363.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Shhldrs. have been offered the right to subscribe to new stk. at par, in ratio of one new sh. for each six owned. This is expected to give the company $235 000 000 of new money.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Fin. div. on ord. sh. cap. of 7% actual for half-year ended Dec. 31, 1929, mkg. 12% actual for year, and a cash bonus of 5d. per ord. sh., both less tax at rate of 2s. in £, are recommended.

RADIO CORPORATION OF AMERICA.—The president of the corporation, Mr. David Sarnoff, announced on April 16 that it had purchased the radio business of the General Electric Co. of New York and the Westinghouse Electric and Manufacturing Co.

MID-CHESHIRE ELECTRICITY SUPPLY CO.—The shhldrs. have been advised that it will be approximately two months before the annual general mtg. will be held, by which time will be known the result of certain arbitration proceedings affecting the year 1929.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—It is reported that the International Telephone and Telegraph Corporation has arranged to acquire 36 000 fully-paid non-assessable shs. of the cap. stk. of the Standard Villa Mossagi concern, of Budapest.

GREAT NORTHERN TELEGRAPH CO., LTD.—Total div. and bonus, 20%, includg. 5% already paid, for year 1929. To res. and renewal fund £33 333 ; to pensn. fund, £38 889 ; fwd., £229 923, increased by £83 893 which appeared in last year's blce. sheet under " reserved for taxes."

WEST KOOTENAY POWER AND LIGHT CO.—Gross earngs. for 1929, $2 309 650, agst. $2 133 526. Deductg. exes., bond int., depreciatn. ($725 213), sinkg. fund appropriatn. and divs., left surplus $657 836, agst. $772 824 ; previous surplus brt. in $1 844 906 ; net pft. and loss blce., $2 502 740.

BRITISH COLUMBIA POWER CORPORATION, LTD.—Messrs. Nesbitt, Thomson and Co., Ltd., of Montreal, are offering for sale $10 000 000 of 5½% 1st refunding and collateral trust sinking fund gold bonds, series " A," of the British Columbia Power Corporation, Ltd., at 98 and accrued interest.

ASSOCIATED ELECTRICAL INDUSTRIES, LTD.—Pft. for 1929, £365 961, agst. £258 772, before provisn. for deb. stk. int. and depreciation. Deb. int., £41 454 ; written off works, plant, etc., £62 659, agst. £56 655 ; to gen. res., £15 273, agst. £25 000. Ord. div. 6%. Tradg. results include pfts. from subsidiaries to extent to which divs. have been declared. All works of the group have been comparatively well employed. Orders in hand have increased.

PUBLIC UTILITY HOLDING CORPORATION.—The corporation has acquired controllg. stk. int. in South American Railways Co., which was formed to finance and acquire a substantial interest in the Buenos Aires Central Railroad and Terminal Co. The latter company operates a steam railway 200 miles in length and also owns and operates the Lacroze Tramways Co. of Buenos Aires, and the Lacroze Light and Power Co. The Buenos Aires Central Railroad Co. is constructing an underground railway from the present terminus to a point in the business centre of Buenos Aires.

EVERLITE, LTD.—Rpt. for period from Oct. 16, 1928, to March 15, 1930, states that cap. is £100 000, divided into 2 000 000 shs. of 1s. each, all of which have been issued and are fully paid. After mtg. expenditure on purchase of inventns., experimental work, directors' fees, etc., cash in hand is £47 397, and stock is valued at £11 112. Much experimental work has been carried on, a suitable type of container has been evolved, and lamps are in commercial productn.

KOLSTER-BRANDES, LTD.—First rpt. states that net pft. for period of 14 months ended Feb. 28 (includg. pfts. of Brandes, Ltd., for two months prior to incorporatn. of company) amtd. to £32 195, to which is added premium of £8 250 received on issue of 66 000 shs. Income tax required £7 400, and £30 296 has been written off prelim. exes. Fwd. £2 748. Issued cap. is £1 166 000. Patents stand in blce. sheet at £103 130 and tradg. rights and developmt. at £618 169, while properties, plant, etc., are valued at £79 193, and stocks, work in progress, etc., at £257 836.

WESTERN UNION TELEGRAPH CO.—Gross operatg. rev. for 1929, $145 667 196, exceeded that of previous record year, 1928, by $9 217 682. Cable revs. increased 9·6%. Volume of traffic transmitted over the company's ocean cables in 1929 exceeded that of any other year. Operatg. exes., $129 364 897, Addg. income from divs. and int. and deductg. int. on bonds, left $15 474 894 to transfer to surplus acct., makg. total surplus $95 635 228. In conformity with company's policy to regulate wages according to individual merit, substantial increases were agreed to, and wage expense was further increased to meet demands of a greater volume of business and further to improve quality of service. Additional provisn. was also made for depreciatn., and larger sums were spent for repairs and rents. As a result of the reductns. in overnight and week-end cable letter rates, there has been substantial increase in volume of deferred service over North Atlantic system, and all classes of deferred services have now been extended to Germany and Belgium. Duplexing experimts. were successfully carried out in connection with company's high-speed cable laid in 1928 between Newfoundland and Horta, Azores Islands. A speed of 1 400 letters per min. in each directn. simultaneously was recorded, by far the highest record of any known existg. cable. This is the first time a loaded cable has been successfully duplexed. Controllg. int. in stock of American Telegraph and Cable Co. has been purchased at about $27·00 p. sh., and negotiatns. are in progress for acquisitn. of that company's property, consisting principally of two trans-Atlantic cables now held by Western Union under lease expiring in 1932.

Company Meetings.

BIDEFORD AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Presiding at the recent annual meeting, Sir Hugh Stucley (chairman) stated that, following conversations between the directors and the representatives of a great electrical combine, the former recommended the shareholders to accept the offer of the Whitehall Securities Corporation, Ltd., to purchase the shareholders' interest at the rate of 32s. per ordinary share and 23s. 6d. per fully paid preference share, in each case ex dividend. The acquisition of the property by the Corporation was subject to 75% of each class of shareholders accepting the offer.

LONDON ELECTRIC WIRE CO. AND SMITHS, LTD.—At the meeting on April 15, Sir George H. Fisher-Smith, chairman, said land, buildings, plant and machinery had a considerably higher value than the total appearing in the balance sheet. Value of stock showed a decrease of £32 561, accounted for by increased trade towards the end of the year. There was still further development to be carried through in their subsidiary, the Liverpool Cable Co., Ltd., and its buildings and plant could be quickly extended to meet any increased business. Net profit amounted to £111 854, making, with transfer fees and £22 759 brought in, a total of £134 630, and after making the distributions shown on the debit side of the profit and loss account, the profit balance was £70 329. He thought they could look to the future with every confidence. The report and the ordinary dividend of 7½% were approved.

METDURO, LTD.—The Marquis of Winchester, presiding at the first annual meeting on April 16, said it would be noticed that 40 253 preference shares were fully paid, of which 250 were paid for in full by the managing director and 40 000 were allotted fully paid to the vendors, Metropole Developments, Ltd., who undertook, in consideration of receiving those shares and 490 000 1s. ordinary shares, to discharge the whole of the cash consideration payable to the inventor, and the whole of the five yearly instalments of his salary. Uncalled capital amounted to £224 873, which, with cash in hand, £64 275, left them with available resources of £289 148. Expenditure on development accounted for £17 551, in which there was a debit item of £7 500, part of the consideration of the original contract with Metropole Developments. No payment, however, had yet been made to Prof. Schmid in respect of this transaction. The company had acquired the British Empire rights of a product made by Herold A.G., of Hamburg, and having the same basis as Metduro, and it would be produced at their Waltham Abbey factory by September next. This material, under the name of " Ivorax " was largely used for the manufacture of many articles, and was non-inflammable, always retained its colour and withstood heat to almost any extent. They had had to make considerable trials before definitely deciding upon the best form of alterations to the large rotary plant at the Papyroplast factory at Penig, in Germany, in which they had an interest. Two of his colleagues who had visited the factory were confident that the plant, when the improvements were complete,p

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would enable the manufacture of the containers to become a commercially profitable enterprise.

EVERLITE, LTD.—The Marquis of Winchester, presiding at the first annual meeting on April 16, said the amount due to associated companies—Metropole Industries, Metropole Developments and Metduro, Ltd.—was £7 541, and trade creditors and provision for accrued expenses amounted to £6 757. On the credit side, inventions, patents, plant, etc., amounted to £53 658. Their patents and trade marks were registered in over 70 countries. As they had not yet begun to trade, no profit and loss account was presented. Loan to director upon security and guarantee furnished by company, £30 000, had since been repaid. Their associated company, Metduro, Ltd., possessed a valuable factory at Waltham Abbey, and they had been able to take on lease from that company a self-contained factory on a repairing lease at a rental of £1 500 per annum. When, in dealing with the accounts, he referred to the amount spent on development, he had no doubt many of the shareholders might have thought that they ought to have been able to show trading results. It would be remembered that when the inventor, Prof. Schmid, gave his demonstration of the lamps in London in December, 1928, they appeared to have all the attractions worthy of the labours they had since expended upon it. The Everlite lamp was, they believed, the only hermetically sealed wet battery, but it had to compete against the dry cell battery which had been in common use for a number of years. It was necessary, therefore, that they should make a lamp that would compare favourably in quality and price with any other form of portable electric lamp. During the early part of 1929 they manufactured a certain number of lamps, but these were found to be too expensive to command a wide market, and they therefore deferred placing the lamp on the market until they could produce a more suitable one and at a competitive price. They could now offer the trade a lamp which could be utilised for many purposes by the addition of special fittings.

BRITISH THOMSON-HOUSTON CO., LTD.—Mr. Wm. Lusk, presiding at the meeting last week, said the profit for the past year was £458 381, compared with £422 729 for the previous year, and the amount brought forward £203 066, made the total to be dealt with £661 447. Deducting interest on debentures and loans, depreciations and directors' fees, there was a balance of £369 262. Out of this a dividend on the preference shares at 7% per annum had been paid, and the directors recommended a dividend on the ordinary shares at the rate of 5% per annum, less tax, compared with 4% for the previous year, leaving £205 262 to be carried forward. Their manufacturing plants had, as usual, been maintained in good condition. The number of their employees at the end of the year, not including employees of their subsidiary companies, was over 13 000. Both the orders received and the shipments from their factories during the year were greater than for the previous year, but the continuation of excessive competition at home and abroad resulted in an unreasonably low level of prices. Co-operation with the other companies of the Associated Electrical Industries Group had been pursued during the year, and that policy would be steadily followed and extended. The Chairman then referred to a number of important contracts carried out or being executed by the company, including a 30 000 kW turbo-alternator for the Ford Motor Co.'s Dagenham works, and two turbo-alternators each of 67 200 kW which are being made by the company and the Metropolitan-Vickers Co., for the London Power Co.'s Battersea station.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.

Previous Records Broken—Development of New Areas—Second Section of Barking Power House Running Satisfactorily.

THE thirty-sixth ordinary general meeting of the County of London Electric Supply Co., Ltd., was held at River Plate House, Finsbury Circus, London, E.C.2, on Wednesday, April 16, 1930, Sir Bernard E. Greenwell, Bart., presiding in the unavoidable absence of the chairman and managing director, Sir. Harry Renwick, Bart., K.B.E.

The manager and secretary, Mr. John C. Dalton, having read the notice convening the meeting and the auditors' report, Sir Bernard Greenwell read the speech prepared by Sir Harry Renwick as follows :—

Ladies and gentlemen,—You are no doubt aware that the ideal electric supply undertaking is one that can show the greatest diversity over the widest area, and I venture to claim that virtue for your company, seeing that we have an area of approximately 1 500 square miles.

If we include the areas of our associated companies to whom we give bulk supplies, the total area over which your company has supply rights is upwards of 3 200 square miles. There is an increase of 51 448 147 in the units sold for the year, making a total for all purposes of 374 910 784 units. There is an increase of over 46 000 kW in the new business secured, as compared with some 40 000 kW for last year, making a total of over 333 000 kW connected, while there is an increase of over 40 000 in the number of new consumers obtained during the year, as compared with an increase of 20 000 consumers for the preceding year.

The net revenue is satisfactory, seeing that we are proposing to pay an increase of 1% in the dividend, and that the carry forward is some £80 000 in excess of last year's figure. The revenue from sale of current, after making provision for bad and doubtful debts, is £1 678 522, while the receipts from other sources amount to £195 526, being a considerable increase over last year's figure, with the result that we get an increase of £14 889 in the total revenue. To the reserve account for taxation we are placing the sum of £10 000, and to the reserve for investments we are placing the sum of £15 000, while the reserves for depreciation and sinking funds under the 1925 Act absorb the sum of £284 953. This leaves a balance for appropriation of £1 003 058, out of which the interim and final dividends on the preference shares, amounting to £199 291, have been paid, and the interim dividend on the ordinary shares, and we are proposing to pay a further 8% on the ordinary share capital of the company, making 11% for the year on the capital as and when issued and paid up, thus leaving a balance to be carried forward of £445 036 10s.

I agree that our consumers should share in our prosperity. The reductions made during the past year both in our flat rate and two-part tariff charges amounted approximately to no less than £265 000.

As to the technical and engineering side of your undertaking, the Barking power house is, as you know, the heart and pulse of your business, around which most of the problems we have to deal with revolve, either directly or indirectly. The second section of the power house was not in full commercial use before the close of the year, but I am able to record now that it has since been practically completed, and is to-day running satisfactorily. In connection with distribution, I may add that a considerable amount of work has been done in our Essex area during the year, and supplies have been established at a number of points. We have acquired control of the Folkestone undertaking. We have also purchased the Wickford undertaking, and have obtained a Special Order for Burnham-on-Crouch and district, while, under a friendly arrangement with the Barking Urban District Council, we have taken a transfer from that Council of part of their area of supply.

Turning again to the figures of our own company, you will see that we show an increase for 1929 over 1928, as regards units sold for all purposes, of 16%. This compares with the national increase of 13%.

You will see on the fringe of London small places which were, at the end of the War, just mere villages or small settlements. To-day Coulsdon and Purley, Sanderstead, Morden, Buckhurst Hill, Romford, Woodford, and similar places in our areas of supply are highly urbanised, and they have a large share of the 123 000 new houses which have been built since 1926, and a correspondingly large share of the new population of over 600 000 people who have settled on the outskirts of London and in our areas of supply.

As to the progress for the current year, I am still optimistic, and in spite of the extraordinarily mild winter which has been experienced, I find that, as a matter of fact, for the first three months of this year, ended March 31, there is an increase of 20% in the units sold over the corresponding period last year, and an increase of 10 051 in kilowatts of new connections, while the number of new consumers has increased by 4 447.

The report and accounts were adopted

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

EALING MOTOR CO., Plant House, Ealing, electrical engineer. £16 17s. 7d. March 4.

TAYLOR, Mr. H., 24, The Arcade, Waterfoot, wireless dealer. £29 14s. 7d. February 7.

WYCHERLEY, Percy Wilson, 52, Cork Street, Leicester (trading as HIGHFIELDS ELECTRIC CO.), electrician. £11 1s. 11d. March 5.

Bills of Sale.

BENNETT, Albert Richard, 4, Norfolk Street, Blackfriars Road, S.E., electrician. Dated April 7, filed April 14. £100.

BIGGS, Charles Cooper, 1, White's Avenue, Newbury Park, electrical engineer. Dated April 9, filed April 10. £185 7s. 11d.

Deeds of Arrangement.

HOULT, John Reginald, 9, Peru Street, Higher Broughton, and CONNOR, John, 44, George Street, Cheetham Hill, Manchester, trading at 396/8, Cheetham Hill Road, Cheetham Hill, Manchester, as STATIC ELECTRIC CO., wireless and electrical dealer. Dated April 5, filed April 11. Trustee, H. Sharp, 30, Brown Street, Manchester. Liabilities unsecured, £516; assets, less secured claims, £176.

MITCHENHALL, Reginald Arthur, trading as MITCHENHALL BROS., 187, Trafalgar Road, Greenwich, and residing at 23, Lenham Road, Lee, electrical engineer and wireless contractor. Dated April 9, filed April 15. Trustee, W. Porter, 17, Soho Square, W. Liabilities unsecured, £430; assets, less secured claims, £70.

SHAW, Thomas Ronald, trading as CESTRIAN ELECTRICAL CO., 138, Northgate Street, Chester, late trading as SHAW, FLETCHER AND CO., King Street, Wrexham, electrical engineer. Dated April 2, filed April 9. Trustee, J. Davies, 1, Bank Street, Wrexham. Secured creditors, £605; liabilities unsecured, £1 815; assets, less secured claims, £1 205.

Receiverships.

ALLITE, LTD.—J. W. Rochester, of 5, Dysart Street, E.C.3, was appointed receiver on March 25, 1930, under powers contained in debentures dated March 15, 1929.

BRITISH ELECTRICAL INSTRUMENTS, LTD.—J. W. Shepherd, incorporated accountant, of 78, King Street, Manchester, was appointed receiver on April 4, 1930, under powers contained in debenture dated August 30, 1929.

ESSANESS RADIO AND ELECTRICAL CO., LTD. R. H. Hopkins, C.A., 418, Strand, W.C.2, was appointed receiver and manager on March 31, 1930, under powers contained in debentures dated February 16, 1928.

HENDERSON (W. J.) AND CO., LTD.—A.C. Lucas, of 167, Strand, W.C.2, was appointed receiver and manager on April 7, 1930, under powers contained in debenture dated November 12, 1929.

MERRITONE, LTD.—H. Nickson, of Lea House, Ponders End, was appointed receiver and manager on March 31, 1930, under powers contained in debenture dated December 20, 1929.

VOLTRON CO., LTD.—F. T. Smith, chartered accountant, of Premier House, Southampton Row, W.C.1, was appointed receiver and manager on April 3, 1930, under powers contained in debenture dated March 14, 1929, and second debenture dated March 26, 1930.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ADELAIDE ELECTRIC SUPPLY CO., LTD., London, E.C.—Registered April 4, acknowledgement of indebtedness (supplemental to trust deeds dated June 11, 1918, etc.), securing £150 000 debenture stock; general charge (excluding dividend equalisation fund and uncalled capital). *£1 535 191. December 5, 1929.

ARMORDUCT CABLE CO., LTD. (late ANGLO ELECTRIC CO., LTD., AND MAGIC APPLIANCES, LTD.), London, S.E.—Registered April 7, £4 000 debentures, inclusive of £3 000 already registered; general charge. *£3 000. July 12, 1929.

BARNETT (C.), LTD., London, W.C., wireless accessory dealers.—Registered March 27, £600 debentures part of £2 000; general charge. *£1 940. December 31, 1929.

London Gazette, etc.

Company Winding-up.

BOWYER-LOWE CO. (THE), LTD. Winding-up Order, April 14.

Companies Winding-up Voluntarily.

BORDER ELECTRICAL FACTORING CO., LTD. Statutory meeting of creditors, 14, Lowther Street, Carlisle, Thursday, April 24.

CARRARA-VERSILIA ELECTRIC RAILWAY AND POWER CO., LTD.—Meeting of creditors, Queen's House, 28, Kingsway, London, W.C.2, on May 6, at 12.15 p.m.

ELECTRICAL NAME AND NUMERICAL SIGN CO., LTD. By reason of its liabilities, April 15. E. G. F. Cartwright, 4, Heathcote Street, London, W.C.1, chartered accountant, appointed as liquidator.

MORTLOCK (C.), LTD.—By reason of its liabilities, April 8. C. E. Smith, 29-30, King Street, Cheapside, London, E.C.2, chartered accountant, appointed as liquidator.

SHAW, FLETCHER AND CO., LTD.—Meeting of creditors at the offices of John Davies, incorporated accountant, 1, Bank Street, Wrexham, April 23.

WALL'S (NORTH WALES), LTD. By reason of its liabilities, April 10. H. Smith, accountant, High Street, Prestatyn, appointed as liquidator.

Bankruptcy Information.

DOBBING, Anthony Chapman, and ROTHERY, Arnold Lloyd, trading as THE RIPON ELECTRICAL CO., 39, Kirkgate, Ripon, Yorks, electrical engineers. Receiving order, April 10. Debtor's petition.

DOUDNEY, Edward, 93, East Street, Chichester, and 40, South Street, Chichester, Sussex, wireless wholesale and retail salesman. Receiving order, April 11. Debtor's petition.

HEMBER, Lionel Edwin, Pepper Street, Lymm, Chester, electrical engineer. Receiving order, April 11. Debtor's petition.

SHEPHERD, Cyril, 69, Micklegate, York, radio engineer and dealer in wireless accessories. Receiving order, April 10. Debtor's petition.

Notices of Intended Dividends.

DEAN, Joseph Holcombe, Bryn Road, Aberystwyth, Cardigan, electrician. Last day for receiving proofs, April 29. Trustee, H. W. Thomas, 4, Queen Street, Carmarthen.

THORNTON, William Haigh, 25, Bridge Street, Burnley, electrical and wireless engineer. Last day for receiving proofs, May 6. Trustee, J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

Bankruptcy Proceedings.

M.E.D.A.S., LTD., electrical engineers and contractors, 185, Hammersmith Road, London. Under a winding-up order made against this company on March 10, on the petition of a creditor, the statutory meetings were held last week at the Board of Trade Offices, Carey Street. The Official Receiver said that the company was registered on January 11 of last year and was formed to acquire as a going concern the business of electrical engineers and contractors previously carried on by A. L. C. Covell and D. J. Quenzer at the above address. The nominal capital was £3 150. Covell and Quenzer were appointed the managing directors at a remuneration of £208 per annum each. They had conducted the business in partnership for about a year, and it was decided to form the company to raise capital subscriptions for which had been promised. The purchase consideration was the allotment of £970 in shares to the vendors and an undertaking to pay the debts of the business as at October 1, 1928. The shares in question comprised the whole of the issued capital and the company's working fund chiefly consisted of moneys advanced on loan account to the amount of £785. The trading had resulted in a net loss owing to unremunerative contracts and heavy expenses in connection with an agency which proved unsuccessful. The failure of the company was attributed to losses on contracts, particularly one with the Hammersmith Borough Council for the wiring of dwelling houses. The statement of affairs showed unsecured debts £1 094, debenture loans £1 714, preferential claims £52, assets £840, and a total deficiency of £2 991 with reference to the shareholders. A resolution was passed for the appointment of Mr. O. G. Sunderland, 15, Eastcheap, City, as liquidator.

NEW DISTRIBUTORS OF EDISON STORAGE BATTERIES, LTD., Victoria House, Southampton Row, London, W.C.1, will be pleased to receive inquiries for their general catalogue describing the Edison steel-alkaline battery. They ask us to remind our readers that it is only from them that the Edison battery which has been used so successfully in this country for the past fifteen to twenty years can be obtained. The catalogue is a handsome brochure of forty pages describing the battery in detail and outlining its many applications to commerce and industry.

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ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

HERCULES.—503 135. Class 13. Axles and axle caps for carriages; balls for ball bearings; bells and gongs; bolts, nuts, locking bolts, locks and latches; brackets, wire brushes, bushes, burners (lamp and stove), chains and chain rollers, clamps; cotter pins and linch pins; crow bars, dies without a cutting edge, electric lighting fittings; hinges, keys, key blanks, key rings, labels, letters, name plates, numerals and signs; lamps (ordinary), lantern reflector shades, levers, lubricators, oil cans, match boxes, ratchets, rims for wheels, rivets, bicycle saddle frames; screws, shackles, spokes, staples, and hasps; steel toys, swivels, badges, trouser clips, turnscrews; washers and wedges; all being goods of ordinary metal. The Hercules Cycle and Motor Co., Ltd., Britannia Works, Rocky Lane, Aston, Birmingham; manufacturers. May 29, 1929. To be associated with No. 459 738 (2 474) and others.

TENALAN.—496 658. Class 50. Electrical insulating materials and insulating parts of electrical apparatus made from such material. Allgemeine Elektricitäts-Gessellschaft, 2-4, Freidrich Karl-Ufer, Berlin, N.W.40; manufacturers. November 3, 1928.

PHILIPS.—B494 880. Class 8. Rectifiers, rectifying tubes and resistance tubes, battery chargers for accumulators and battery eliminators, all being goods for use in wireless telegraphy and telephony. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, 1A, Emmasingel, Eindhoven, Noord-Brabant, Holland; manufacturers. September 10, 1928. User claimed from March 24, 1925, in respect of rectifiers, rectifying tubes and resistance tubes; battery chargers for accumulators; and from June 19, 1925, in respect of battery eliminators for wireless. The applicants undertake that this Mark when registered, and the Mark No. B424 535 (2 368) xiii shall be assigned or transmitted only as a whole and not separately.

PHILIFLOOD.—509 637. Class 18. Electric lighting installations for flood-lighting and for projection purposes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, 13D, Emmasingel, Noord-Brabant, Eindhoven; manufacturers. January 20, 1930. (Date claimed under International Convention, November 15, 1929.) To be associated with No. 509 636 (2 714) xiii.

METDURO.—500 759. Class 50. Electrical insulating materials and picture frames, all made of synthetic resin; and combs for the hair, and brushes (except artists' brushes and brushes of metal). Metropole Developments, Ltd., Metropole House, Finsbury Square, London, E.C.2; manufacturers. March 7, 1929. To be associated with No. 500 750 (2 668) i and others.

NORTHLIGHT. (Sign.) 506 832. Class 8. Electrical cells and batteries (not for medical purposes). George M. Ilhagga, trading as The Northlight Razor Blade Co., 180, North Street, Belfast; merchant. October 11th, 1929.

HYPERNIK. 510 462. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex; manufacturers.—February 18, 1930.

L.E.C. (Sign.) 505 074. Class 13. Electric switches (ordinary), service fuse boxes, electric irons and electric conduits, all made wholly or mainly of ordinary metal. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. August 6, 1929. To be associated with No. 472 163 (2 536) and others. (By consent.) Registration of this trade mark shall give no right to the exclusive use of the letters "L.E.C."

TENACIT. 496 226. Class 50. Electrical insulating materials and insulating parts of electrical apparatus made from such materials. Allgemeine Elektricitats-Gesellschaft, 2-4, Friedrich Karl-Ufer, Berlin, N.W.40; manufacturers.—October 22, 1928.

SINGER.—500 779. Class 6. Sewing machines and parts of sewing machines; embroidering machines and parts of embroidering machines; electric motors and parts thereof (for use with sewing and the like machines, and not being parts of or accessories for motor vehicles and cycles); electric fans and parts thereof; power benches for sewing machines, and parts thereof; machines for skiving, taping, making binding, strap-pressing, pounding and beading, thread-drawing and kilting and parts thereof; all being goods included in Class 6. The Singer Manufacturing Co., 149, Broadway, New York; manufacturers and dealers. March 8, 1929. To be associated with No. 154 051 (682) and others. Advertised before acceptance, the applicants alleging distinctiveness.

METAL AND CHEMICAL PRICES.

TUESDAY, April 22.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£62 10 0	—	£11 5s. 0d.
Electro Wirebars	,,	£66 0 0	—	£17 10s. 0d.
H.C. Wire, basis	per lb.	9⅞d.	—	2d.
Sheet	,,	9¼d.	—	1 11/16d.
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0⅛d.	—	2d.
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅛d.	—	—
Wire ,,	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£20 0 0	—	—
Foreign or Colonial	,,	£18 10 0	—	2s. 6d.
Tin—				
Ingot	per ton	£164 10 0	—	£3 2s. 6d.
Wire, basis	per lb.	2s. 3d.	—	½d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£18 0 0	—	2s. 6d.
Mercury	per bottle	£22 15 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £30 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2¾d

Sodium Bichromate—Per lb., 3¾d.

Rubber—Para fine, 8¾d.; plantation, 1st latex, 7¾d.

*** The metal prices are supplied by British Insulated Cables, Ltd.

GOVERNMENT PUBLICATIONS.

The following publications have been issued and can be obtained at H.M. Stationery Office, London, etc. (The titles of the publications are given in the order in which they were issued):

General Post Office (Engineering Department).—Technical Instructions: XXV. Automatic Telephone Exchange Systems: Part 6A, The Director System. Exchanges installed by Automatic Telephone Manufacturing Co., Ltd. (System H). Letterpress. 6d.

Admiralty.—Electrical Manual, Naval, Vol. I: Addendum No. 2, B.R.183(2).

Scientific and Industrial Research Department.—Water Pollution Research: Summary of Current Literature; Vol. III, No. 4, April, 1930—Abstracts Nos. 369-485. 1s. 3d.

General Post Office (Engineering Department).—Technical Instructions: XXV. Automatic Telephone Exchange Systems, Part 6A, The Director System; Exchanges Installed by Messrs. Automatic Telephone Manufacturing Co., Ltd. (System H), Diagrams. 6d.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

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304 789 M. DE WRANGELL. Combined electric and mechanical motor control for phonographs. (27/1/28.)
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305 640 SOC. D'ELECTRO-CHEMIE D'ELECTRO-METALLURGIE ET DES ACIERES ELECTRIQUES D'UGINE. Manufacture of aluminium silicon alloys. (8/2/28.)
307 060 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Aerial systems. (3/3/28.
306 146 BRITISH THOMSON-HOUSTON CO., LTD. Heat-dissipating devices for immersed electrical apparatus. (17/2/28.)
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315 391 GENERAL ELECTRIC CO., LTD. Luminous electric discharge tubes. (14/7/28).
309 152 L. M. TELEFONAKTIEBOLAGET ERICSSON. Intercommunication telephone apparatus. (5/4/28.)
310 329 WESTINGHOUSE LAMP CO. Cathode-ray and like tubes. (23/4/28.)
323 699 M. B. FIELD. Magnetic compasses. (20/4/29.)
311 272 I.G. FARBENINDUSTRIE AKT.-GES. Efficiency of galvanic battery depolarising-compositions comprising manganese dioxide and graphite. (8/5/28.)
311 818 WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Vacuum electric tube devices. (17/5/28.)
313 519 BRITISH THOMSON-HOUSTON CO., LTD. Condenser microphones. (13/6/28.)
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323 514 I. E. MCCABE. Thermally-operated electric switches of the fluid-pressure type. (3/9/28.)
323 549 B. C. VON PLATEN and L. A. G. REILAND. Dynamo-electric machines. (3/7/28.)
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323 714 L. MARTI-SCHLAEFLI. Electrical terminal. (5/7/28.)
302 643 NEON LIGHTS, Inc., C. Electric discharge devices. (19/12/27.)
323 718 S. G. S. DICKER (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN). Method of preparing alkali metals and alkaline earth metals. (3/8/28.)
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323 823 S. G. S. DICKER (N.V. PHILIPS' GLOEILAMPENFABRIEKEN). Arrangements for amplifying electrical oscillations. (18/10/28.)
323 826 A. PREEN. Thermionic valves of the screened-grid type. (18/10/28.)
299 704 N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Electric discharge tubes. (29/10/27.)
323 837 C. RUSS. Method of winding and constructing electrical heating-elements. (27/10/28.)
323 849 C. S. FRANKLIN. Thermionic valves. (2/11/28.)
323 853 C. S. FRANKLIN. Frequency-control devices suitable for radio and the like transmitters. (6/11/28.)
323 854 J. A. CRABTREE. Electrical plug-and-socket couplings. (7/11/28.)

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302 311 Akt.-Ges. Der Maschinenfabriken Escher, Wyss, et Cie. Temperature-actuated electric switching-device. (15/12/27.)
323 857 Electrolux, Ltd. (Inventia Patent-Verwertungs-Ges.). Brushes for small electric motors. (12/11/28.)
323 862 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Means for nullifying voltage fluctuations in electrical circuits. (15/11/28.)
300 915 British Thomson-Houston Co., Ltd. Electrically-wound clocks. (18/11/27.)
323 870 W. P. Grafton and W. Grafton and Son, Ltd. Adjustable arms for supporting telephones, electric lights, and similar objects. (22/11/28.)
323 873 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric transformers. (26/11/28.)
323 875 L. Miller, R. Brooks, and Associated Electrical Industries, Ltd. Electric motor control systems. (27/11/28.)
301 828 Siemens and Halske Akt.-Ges. Circuit arrangement for connection-lines in signalling systems, and particularly in telephone systems. (6/12/27.)
304 681 Landis and Gyr Soc. Anon. Device for use on motor-meters for indicating instantaneous values of the energy, current, or related quantities. (24/1/28.)
323 887 Siemens Bros. and Co., Ltd., and F. Baker. Electrical contacts and contact arrangements. (6/12/28.)
301 917 Associated Electrical Industries, Ltd. Electric circuit interrupters. (9/12/27.)
302 234 P. Viry. Electric apparatus for heating articles by induction. (12/12/27.)
323 888 E. Y. Robinson, E. J. E. Hubbard, and Associated Electrical Industries, Ltd. Vacuum electric tube devices. (8/12/28.)
323 890 J. Sousedik. Electric drive arrangements for motor vehicles. (13/12/28.)
323 892 Siemens Bros. and Co., Ltd., E. A. Petithory, and E. A. Forceville. Selecting-switches, such as used in automatic telephone systems. (14/12/28.)
323 893 Siemens Bros. and Co., Ltd., E. A. Petithory, and E. A. Forceville. Selecting-switches, such as used in automatic telephone systems. (14/12/28.)
315 297 Siemens and Halske Akt.-Ges. Circuit arrangement for connection-lines in signalling systems and particularly in telephone systems. (11/7/28.)
323 907 General Electric Co., Ltd., R. Orsettich, and M. Kahn. Electric supply systems. (31/12/28.)
306 418 Telefunken Ges. für Drahtlose Telegraphie. Radio-receiving aerial systems. (18/2/28.)

Applications for Patents.

December 10th.

37 917 Automatic Telephone Manufacturing Co. Ltd., and J. Smith. Telephone transmission systems.
37 787 H. E. M. Barlow. Thermionic valves.
37 927 G. H. and H. H. Berry. Electric fires, etc.
37 862 Bratt, Colbran and Co., Heaped Fire Co., Ltd., and L. A. Bratt. Electric radiators.
37 853 British Electric and Allied Industries Research Association. Reinforced concrete poles, etc.
37 854 British Thomson-Houston Co., Ltd. Current rectifiers.
37 855 British Thomson-Houston Co., Ltd., J. C. Read and F. P. Whitaker. Arc rectifiers.
37 857 British Thomson-Houston Co., Ltd. Totalising systems, etc. (26/1/29, U.S.)
37 914 S. G. Brown. Wireless tuning circuits.
37 929 S. G. Brown. Recording, etc., sound.
37 891 W. M. Cranston and General Electric Co., Ltd. Electrical means for driving apparatus of constant speed.
37 837 Electrolux, Ltd. Vacuum cleaners. (10/12/28, Germany.)
37 838 Elektriska Aktiebolaget Volta. Vacuum cleaners. (10/12/28, Germany.)
37 918 W. E. Evans (Vitrefax Corporation). Electric torch furnace.
37 871 Federal Telegraph Co. and G. G. Kruesi. Radio systems.
37 919 F. W. V. Fitzgerald. Manufacture of accumulators.
37 856 International General Electric Co., Inc. Electric switching arrangements. (22/12/28, Germany.)
37 931 K. G. Johnson, A. Rosa and Telefonaktiebolaget L. M. Ericsson. Automatic telephone systems, etc.
37 846 H. H. Kalber. Electric motors.
37 884 C. Lorenz Akt.-Ges. Electronic tubes. (8/1/29, Germany.)
37 907 A. Mendel. Caps for carbon electrodes.
37 920, 37 921, 37 923 J. Robinson. Wireless receiving apparatus.
37 922 J. Robinson. Piezo-electric devices.
37 822 L. E. Ryall. Alternating current signalling systems.
37 933 Siemens-Schuckertwerke Akt.-Ges. Bars for commutator windings. (21/12/28, Germany.)
37 930 Siemens-Schuckertwerke Akt.-Ges. Telephone systems. (11/12/28, Germany.)
37 851 A. Wörner. Commutators.

December 11th.

38 035 R. H. Barbour, Electrical Apparatus Co., Ltd., and J. R. Walton. Contactor starters for electric motors.
38 028 British Thomson-Houston Co., Ltd. Electric condensers. (18/12/28, U.S.)
38 029 British Thomson-Houston Co., Ltd. Thermionic apparatus. (24/12/28, U.S.)
38 030 British Thomson-Houston Co., Ltd. Electric regulating systems. (24/12/28, U.S.)
38 031 British Thomson-Houston Co., Ltd. Lightning arresters. (27/12/28, U.S.)
38 032 British Thomson-Houston Co., Ltd., and A. J. Johnston. Totalisators.
38 049 S. G. Brown. Wireless receivers.
38 050 S. G. Brown. Recording sound.
37 956 Chesterton, Jones and Co., Ltd. Electric heaters.
38 033 Electrical Research Products, Inc. Signalling cables. (20/4/29, U.S.)
37 983 C. L. Elliott. Electrical condenser.
38 026 General Electric Co., Ltd. Heating apparatus for water, etc.
38 013 Kolster-Brandes, Ltd. (Federal Telegraph Co.). Transmission systems.
38 012 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Vacuum tube circuits.
38 037 C. Lorenz Akt.-Ges. Devices for relieving load on switching contacts. (21/12/28, Germany.)
38 041 Marconi's Wireless Telegraph Co., Ltd. Radio receiving systems. (11/12/28, U.S.)
38 011 W. B. Medlam. Radio telephony receiving circuits.
38 034 N. V. Philips' Gloeilampenfabrieken. Electron discharge tubes, etc. (18/5/29, Holland.)
37 990 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic, etc., telephone exchange systems.
37 973 Swailes, Ltd., and A. Taylor. Reels for electric conductors, etc.
38 042 Telefunken Ges. für Drahtlose Telegraphie. Direction finding aerial arrangements. (16/1/29, Germany.)
38 051 W. Weekes. Control of transformers.

December 12th.

38 152 Associated Electrical Industries, Ltd., and B. L. Goodlet. Apparatus for generation of electric impulses.
38 153 Associated Electrical Industries, Ltd. Ball bearings, etc.
38 154 Associated Electrical Industries, Ltd., and J. Collinson. Welded butt joints.
38 085 W. W. Buck. Tuners for wireless receiving sets.
38 150 A. G. Bullen and E. L. Lee. Method for testing insulation of electrical apparatus.
38 128 Callenders' Cable and Construction Co., Ltd. Apparatus for twisting wires together.
38 100, 38 101 S. Gilchrist. Electric cut-out for internal combustion engines.
38 165 H. A. Hankey and J. Robinson. Wireless direction finding systems.
38 090 W. Leckey. Apparatus for sealing fractures in telephone cable, etc.
38 160 Marconi's Wireless Telegraph Co., Ltd., and F. Woods. Directional aerial systems.
38 169, 38 170, 38 171 B. C. von Platen and L. A. G. Reiland. Electrical machines. (3/7/28.)
38 099 H. J. J. M. de Regnauld de Bellescize. Electric relays. (12/12/28, France.)
38 145 Rheinische Metallwaaren und Maschinenfabrik. Charging device for electric fuses. (6/6/29, Germany.)
38 166 J. Robinson. High frequency apparatus.
38 132 J. Sinclair-Ross and J. Zetsche. Speed regulation of electric motors.
38 164 Soc. Anon Brevetti Italiani Esteri S.A.B.I.E. Telegraphic transmission systems. (14/12/28, Italy.)
38 104 C. P. Uhlig. Electrolytes for accumulators.

December 13th.

38 181 R. J. Aiken. Device for controlling electric circuit.
38 295 British Thomson-Houston Co., Ltd. Rotors for electrical machines. (22/12/28, U.S.)
38 297 British Thomson-Houston Co., Ltd., and G. S. C. Lucas. Thermionic valve amplifying systems.
38 198 A. C. Catherall and Darwins, Ltd. Permanent magnets.
38 258 Chubbs Automatic Manufacturing Co., Ltd., and J. H. A. Spaink. Electric switches.
38 194 F. H. Cobb. Electric lamp.
38 188 C. W. Cox. Fusible elements for electric fuses.
38 228 Creed and Co., Ltd., and R. D. Salmon. Keyboard telegraph transmitters.
32 229 Creed and Co., Ltd., and R. D. Salmon. Mechanical relay.
38 189 V. Hope. Electric switches.
38 273 W. H. Middle. Electric air-heating appliances.
38 260 C. Berrage-Moulton. Combined thermionic relay and record sound reproducing apparatus.
38 277 E. Savill. Holders for flexible conductors.
38 282 Siemens and Halske Akt.-Ges. Coupling contrivance for high-frequency amplifiers. (14/12/28, Germany.)
38 290 Telehor Akt.-Ges. Synchronisation of television receiving apparatus. (13/12/28, Germany.)
38 291 Telehor Akt.-Ges. Apparatus for production of alternating currents for driving synchronous motors for television, etc. (13/12/28, Germany.)
38 193 B. Walters. Transmission gear for magnetos.
38 206 T. L. Watkins. Protective boxes for electric cables.

December 14th.

38 393 R. Baker and C. W. Parsons. Electric switches.
38 386 British Thomson-Houston Co., Ltd. Electroresponsive control apparatus. (14/12/28, U.S.)
38 387 British Thomson-Houston Co., Ltd. Control of induction machines. (14/12/28, U.S.)
38 372 W. A. Burns. Thermionic valves, etc.
38 319 J. R. Chambers. Electric cables.
38 361 W. L. Colassi. Electrical sound reproducing apparatus.
38 358 C. J. Cracker. Wireless apparatus.
38 350 G. Fischer. Pantograph current-collecting apparatus.
38 397 E. Fries. Variable resistances, etc.
38 314 A. Graham and Co., Ltd., and C. H. Vaughan. Electric signalling devices for ships.
38 389 J. Lightfoot. Electric heating apparatus.
38 369 J. S. Lyall, E. K. Sandeman, Standard Telephones and Cables, Ltd., and A. H. Reeves. Thermionic valve circuits.
38 396 A. H. Midgley. Thermionic valve amplifying systems, etc.
38 364 N. V. Philips' Gloeilampenfabrieken. Toroidal coils. (15/12/28, Holland.)
38 388 Siemens and Halske Akt.-Ges. Circuit arrangements for alarm installations. (15/12/28, Germany.)
38 381 W. Warnier. Circuit breakers, etc.

COMING EVENTS.

Friday, April 25 (To-day).

Institution of Electrical Engineers (West Wales Sub-Centre).—Swansea. Paper by Messrs. S. W. Melson, A. N. Arman and W. Bibby on "Surge Investigations on Overhead Line and Cable Systems."

Faraday Society.—Rooms of the Chemical Society, Burlington House, Piccadilly, London. Annual general meeting. 2.15 *p.m.*

National Register of Electrical Installation Contractors.—Institution of Electrical Engineers, Victoria Embankment, London. Annual general meeting. 2.30 *p.m.*

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. General meeting. Paper by Mr. F. Carnegie on "The Economical Production and Distribution of Steam in Large Factories." 6 *p.m.*

Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Paper by Mr. J. W. Donovan on "Some Aspects of American Low Tension Control Practice." 7 *p.m.*

Monday, April 28.

Institution of Electrical Engineers (South Midland Students' Section).—Joint meeting, at Rugby, with the Rugby Engineering Society. Paper by Mr. N. F. T. Saunders on "The Speed Torque Curve of the Squirrel Cage Induction Motor."

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Wednesday, April 30.

Electrical Contractors' Association (West of London Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—Ordinary meeting.

Thursday, May 1.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Twenty-first Kelvin Lecture, by Mr. R. H. Fowler, F.R.S., on "Some Recent Advances in the Electron Theory of Metals." 6 *p.m.*

Iron and Steel Institute.—Institution of Civil Engineers, Great George Street, Westminster. Annual meeting. 10 *a.m.*; annual dinner in the Grand Hall, Connaught Rooms, Great Queen Street, London, W.C. 7 for 7.30 *p.m.*

Friday, May 2.

Iron and Steel Institute.—Institution of Civil Engineers, Great George Street, Westminster. Annual meeting. 10 *a.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Institution, Savoy Place, Victoria Embankment, London. Lecture by Mr. C. W. Marshall on "The Metering Arrangements for the 'Grid' Transmission System in Great Britain." (To be followed by a discussion.) 7 *p.m.*

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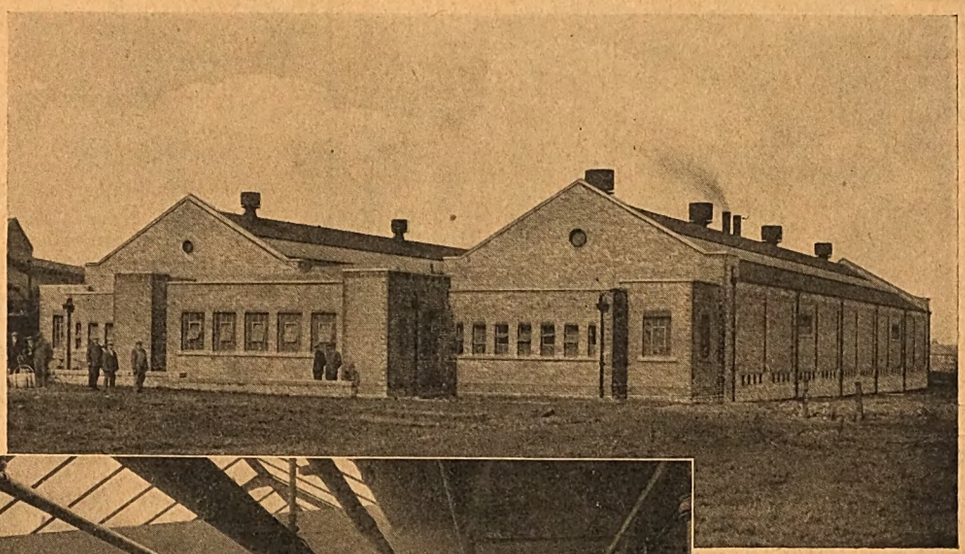

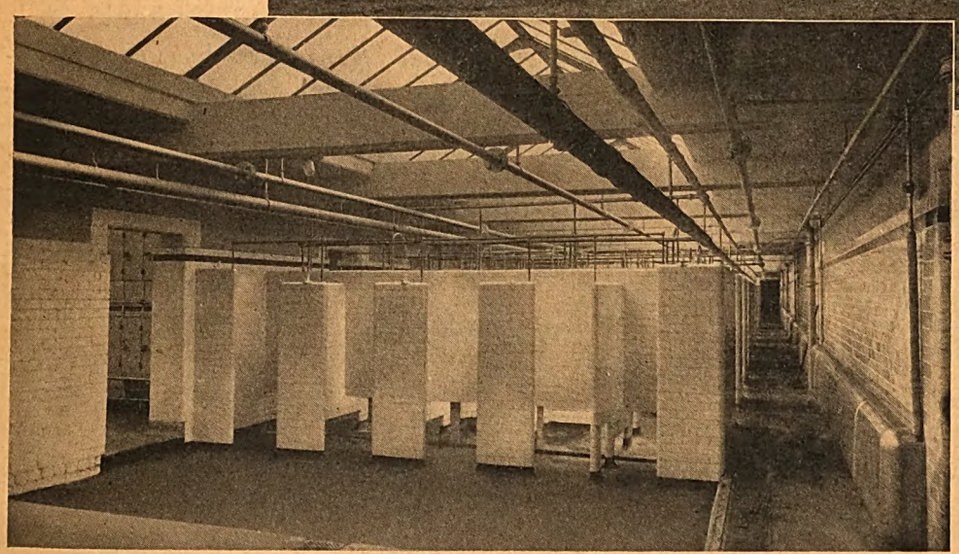

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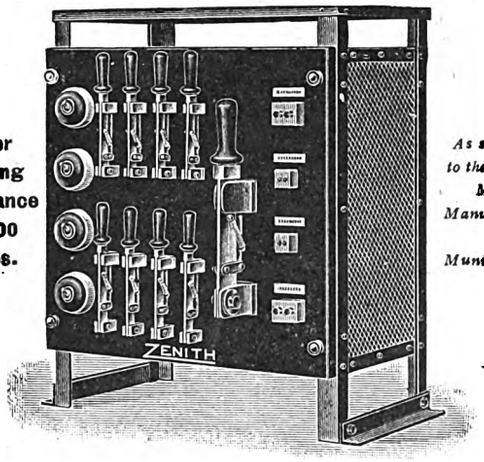

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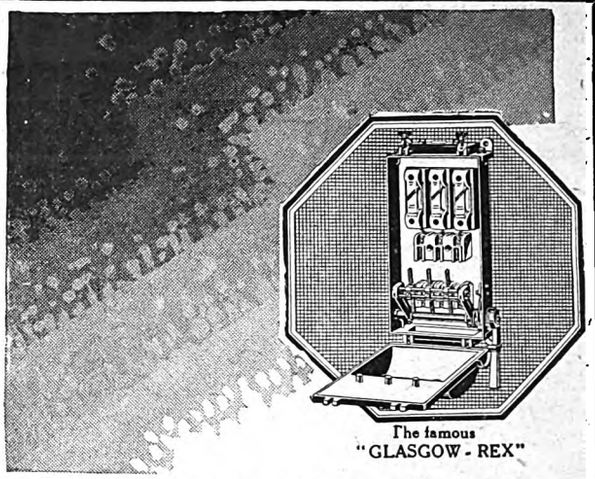

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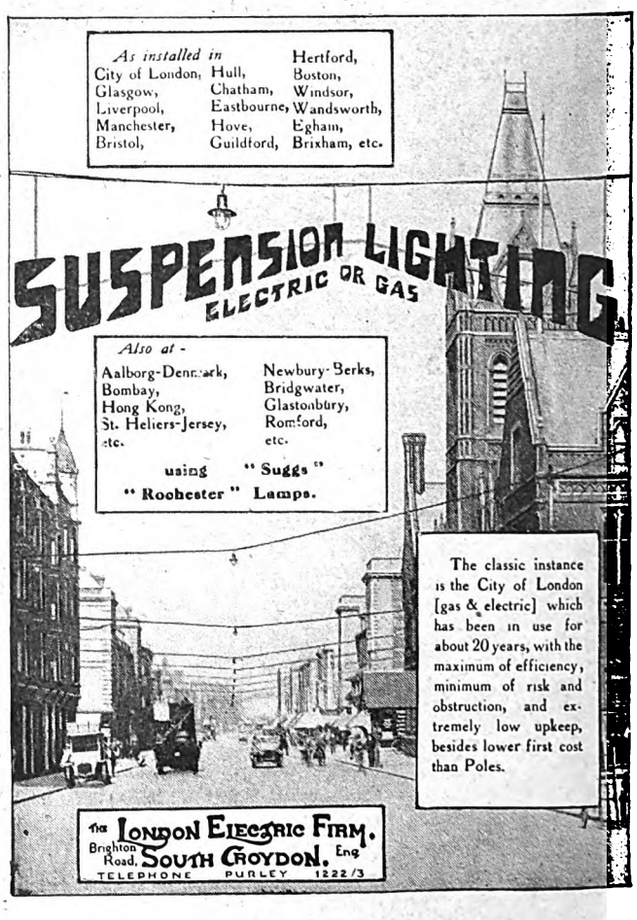

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Hydro-Electric Power in Africa.

ALTHOUGH Africa is by no means deficient in waterfalls and contains one which ranks with Niagara both as a spectacle and a potential source of energy, most of the African cataracts, including the great Victoria Falls of the Zambezi, are remote from any large centres of population or industrial activity. For this reason hydro-electric development in Africa has not yet attained much importance. Here and there small installations exist; there is one at the Howick Falls, in Natal, in connection with a factory; the township of Zomba, in Nyasaland, is lighted by a neighbouring fall; the Belgians have utilised water power in Katanga to supply current for the copper mines; there is an important development at Mulungushi, also in connection with copper mining in Northern Rhodesia, and there are installations in French North Africa and West Africa. Adding all the existing hydro-electric plants in Africa together, however, would hardly give a total output equal to that of a single first-class installation, and the day when water-generated electricity will play a large part in African development is still a long way ahead. Apart from the lack of demand for power in the vicinity of the possible sites for hydro-electric stations, there is also a serious difficulty in the form of great seasonal and year-to-year variations in the flow of streams, so that extensive and costly storage works are required; the high evaporation is also a serious factor to be considered.

Yet another reason which has held back the utilisation of water power in South Africa, where the greatest industrial development has taken place, is the existence of plentiful supplies of cheap and easily worked coal. The Witwatersrand goldfield has one of the best coalfields in Africa practically next door. In East Africa, on the other hand, there is no local coal or oil yet being worked, and the growing scarcity and cost of wood fuel makes it very desirable that, whenever possible, such water power as is capable of economic development should be turned to account. The only East African project of immediate importance is the Pangani Falls scheme in Tanganyika Territory, which was described in THE ELECTRICIAN of January 3. These falls are in a district where there are a number of sisal estates which require an appreciable amount of power for operating their decorticating mills, and there are also prospective loads to be secured from the ports of Tanga, Dar-es-Salaam and Mombasa, and points on the Central Railway between the coast and Kilosa.

Commenting on the plans of the Power Securities Corporation for the harnessing of the Pangani Falls, we expressed the opinion that it would be unwise of the Tanganyika Government to seek to restrict the area in which power from Pangani could be distributed to the district served by the Tanga-Arusha railway. At that time it appeared to be the official intention to extend the ramshackle generating station which was erected by Indian Sappers and Miners at Dar-es-Salaam after the capture of the port by the British. This would have been an uneconomic policy, since the fuel used at Dar-es-Salaam must be carried long distances by sea, and the restriction of the market for the water-developed electricity from the Pangani river would have increased the cost per unit supplied to consumers in the area served by that development. It is, therefore, satisfactory to learn that negotiations have been successfully completed between the Tanganyika Government and Major C. L. WALSH, representing the Power Securities Corporation, for the development of the Pangani Falls on a basis which will permit the supply of electricity to the entire area of Tanganyika Territory between the Indian Ocean and the Great Lakes. This will greatly enhance the economic value of the Pangani Falls scheme as a means of stimulating agricultural and industrial development in the northern half of the Territory, and we congratulate the Tanganyika administration on the good sense which it has displayed in coming to terms with the company concerned, instead of pursuing the ill-advised course which it had originally adopted.

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Current Topics.

Law-created Unemployment.

THIS week we print the first instalment of a series of articles by Sir ERNEST BENN entitled "Unemployment and Work," which will, we believe, both interest and stimulate thought. Since unemployment became an issue out of which party capital could be extracted, the subject has been confused with clamour and cant to such an extent that other nations such as Germany and the United States, which have at least as large a proportion of their populations out of work, must wonder what has become of the traditional character of the Englishman. Parenthetically it must in fairness be remarked that most of the outcry about unemployment comes from Wales and Scotland—Lancashire, Yorkshire and the North-East Coast are much less vocal on the subject. In his first article Sir ERNEST BENN calls attention to the effects of legislation and trade restrictions in creating difficulties for the man or woman who is really anxious to find work. He points out that in his lifetime 5 000 Acts of Parliament, each restricting the activities of somebody or some trade, have received the Royal Assent, and asks whether we cannot have an inquiry into obstructive and obsolete legislation.

G.E.C. Journal.

WE extend a hearty welcome to the "G.E.C. Journal," the first number of which makes its appearance this week. It is to be issued quarterly, and the appearance of the initial issue warrants the expectation that it will prove a useful addition to the growing list of similar periodicals produced by large industrial enterprises in this country and abroad. The first (May) number of the "G.E.C. Journal" (obtainable from Magnet House, Kingsway, price 1s.), contains a foreword by Sir HUGO HIRST, who, we are delighted to learn, is again actively at work, a review of electrical progress in 1929, and technical articles on High Temperature Resistance Alloys, Materials Handling Equipment for Modern Coke Ovens, Diesel-electric Locomotives for the Indian State Railways and Balanced Protection of High Tension Parallel Interconnectors. In his foreword Sir HUGO HIRST declares his opinion that "modern business should be systematically articulate about its activities, technical as well as commercial," a policy which has always been acted upon by the G.E.C. We feel sure his hope that the new journal will be welcomed in technical schools and universities will be realised.

Telephone Charges.

COMPARATIVE figures relating to telephone charges, tabulated by the Engineering Department of the Post Office, indicate that London enjoys a substantial advantage over New York. In the inner area of New York the business rate is £14 7s. 6d. per annum for any number of calls up to 900. In London the corresponding charge ranges from £8 15s., for 180 calls, to £11 15s. for 900 calls. For 1 800 calls the New York charge is £22 16s. 3d., against £15 10s. in London. The residence rate in the outer area of New York is £10 10s. for any number of calls up to 792. Comparable rates in London are £6 5s. for 180 calls and £8 16s. for 792 calls. For larger numbers of calls London's advantage is much greater, the respective rates for 1 692 calls being £18 10s. 9d. and £12 1s. It is stated that in the opinion of good judges the quality of the local service is very similar in both cities.

Trend of Business in America.

ACCORDING to figures received each week by the Statistical Research Department of N.E.L.A., electric power output is running somewhat below last year's levels throughout the Middle West, New England, up-state New York, a large part of the Rocky Mountain region, and in the South. The largest losses continue to be registered in the areas serving the automotive and mining industries. The outlook for the next few months indicates that the total production of electric power may continue to run somewhat below last year's figures for the United States as a whole. This is hardly to be considered as a reflection of subnormal industrial activity at the present time, but rather as an after effect of the extraordinary and unusually expanded conditions at this time last year.

Our Electrified Neighbours.

IN Belgium 2 470 out of a total of 2 677 communes are now served with electric distribution networks and it is anticipated that with a few exceptions, all will be so served within the next two or three years. The Belgian Government is considering methods of assisting by grants the electrification of isolated hamlets and farms. In France on January 31, 1929, it was estimated that 73 per cent. of the communes were provided with distribution networks, 86 per cent. (36 000 000) of the population of the country being able to obtain a supply of current. The average number of inhabitants in the French Communes which are not yet electrified is 300; in Belgium the corresponding figures are 900 to 1 000, so that the problem in the latter country is much less difficult. According to "Eclairage et Force Motrice," if the Moyersoen law, which expired on December 31 last, were re-enacted, the complete electrification of Belgium would be very rapidly achieved without any financial aid from the State. This law provided for the revision and prolongation of concession agreements, subject to stipulations assuring important advantages to consumers, but it was allowed to lapse because it was held that it unduly favoured the concessionaires.

Price Movements.

SOME interesting figures relating to wholesale price movements are given in the "Board of Trade Journal" of April 24. These indicate that the violent downward plunge which carried the aggregate index number from 81·9 in October last to 74·9 in March has lost its momentum in the past few weeks. In the case of industrial materials there was little change between the second half of March and the first half of April. The tendency towards stabilisation, if maintained, should assist a recovery in business activity. One of the chief courses of the decline in consuming power all over the world is the excessive spread between wholesale and retail prices. This is partly due to high taxation and partly to the ever increasing cost of selling goods. The effect is to reduce purchasing power and so to contract demand. The cost of living to the average householder has certainly not fallen to anything like the extent of the decline in commodity prices. Consequently manufacturers and primary producers are faced with the problem of how to make ends meet with a smaller output and a lower unit price while their overhead and working expenses remain practically unchanged.

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CENTRAL SCOTLAND GRID OPENED.

Wednesday's Dual Ceremony in Edinburgh—Extensions to Portobello Power Station—234 Route Miles of 132 kV Overhead Transmission Line—Silver Pylon Presented to Minister of Transport.

ON Wednesday Edinburgh was the scene of an important dual ceremony marking a milestone in the electrical history of Great Britain. The inauguration of the Central Scotland grid was officially celebrated in conjunction with the opening of large extensions to the Edinburgh Corporation's generating station at Portobello, one of the selected stations for feeding the grid.

At 11.15 a.m. Lieut.-Col. the Right Hon. Wilfrid Ashley, M.P., ex-Minister of Transport, who was introduced by Councillor Couston, Convener of the Edinburgh Corporation Electricity Committee, and presented with a souvenir of the occasion, formally opened the new plant at the Portobello station, which was then inspected by the assembled company. An hour later, at the Central Electricity Board's sub-station across the street, Sir Andrew Duncan introduced Mr. Herbert Morrison, M.P., Minister of Transport, who inaugurated the Central Scotland Electricity Scheme by closing a 132 000 V oil break switch, which energised the transmission lines from Portobello station. Mr. Morrison was also presented with a souvenir. After inspecting the sub-station the party were entertained to luncheon at the North British Hotel by the Lord Provost, Magistrates and Council of the City of Edinburgh, and the Central Electricity Board.

As Mr. Morrison closed the switch which energised the grid, a large disc rotated until the words "Grid alive at 132 000 Volts" were displayed. The Lords Provosts of Edinburgh and Glasgow then shook hands. The souvenir presented to Mr. Herbert Morrison was a silver model of a pylon, and in acknowledging the gift Mr. Morrison humorously referred to the trouble he had experienced in connection with pylons on the Sussex Downs. The guests at the luncheon which was held subsequently included the Lady Provost, Lord Polwarth, the Solicitor-General, Sir Alex. M. Kennedy, Sir W. L. Sleigh, the Lords Provosts of Glasgow and Dundee, Lord Elgin, Alderman Huntsman, Mr. W. B. Woodhouse, Mr. Frank Hodges, Lord Barnby, Sir Archibald Page, Sir John Brooke, Sir Reginald Blomfield, Sir Duncan Watson, Sir James Devonshire, Sir W. E. Whyte, Sir Robert Stewart, Sir Alex. Stevenson, Sir Hudson Beare, Sir Frederick Henderson, Sir Frederick Gardiner, and Alderman Walker.

Lord Provost of Edinburgh, the Right Hon. Thomas B. Whitson, who presided, proposed the toast of "Electricity." He said that in some ways electricity was the greatest socialising medium of our time, and when the Central Electricity Board had linked up the whole country a great uplift in the social conditions of the people would have been effected. They looked forward to smokeless cities, and Edinburgh would be healthier and Princes Street more beautiful if the awful smoke from the railway engines could be abolished. He pressed upon the Minister of Transport the need of railway electrification. What they had done to-day made this more possible and brought the eventful day nearer. The health of citizens would be improved, better transport would cheapen commodities, and thus raise real wages. Electricity had so developed as to be completely out of the most optimistic vision of fifty years ago, and might not the same be true of the future? Edinburgh was proud of the fact that its power station had been selected as one of the grid stations.

Mr. Herbert Morrison, replying, said, old conditions involved tragic and needless waste of power over the greater part of the 24 hours. The completion of the work under the Act of 1926 would still occupy some time, although he could congratulate the Electricity Commissioners and the Central Electricity Board on the rapidity of the work. Generation was not the only problem to be faced. There were economies to be effected in distribution, and he believed that in due time the establishment of bigger distributing units would be found advantageous. The national grid was involving considerable capital expenditure, as well as necessitating economy in the use of existing capital. It had been incurred in the belief that average electrical consumption per head would advance from 176 units to 500 units in 10 or 12 years' time. It was necessary that the

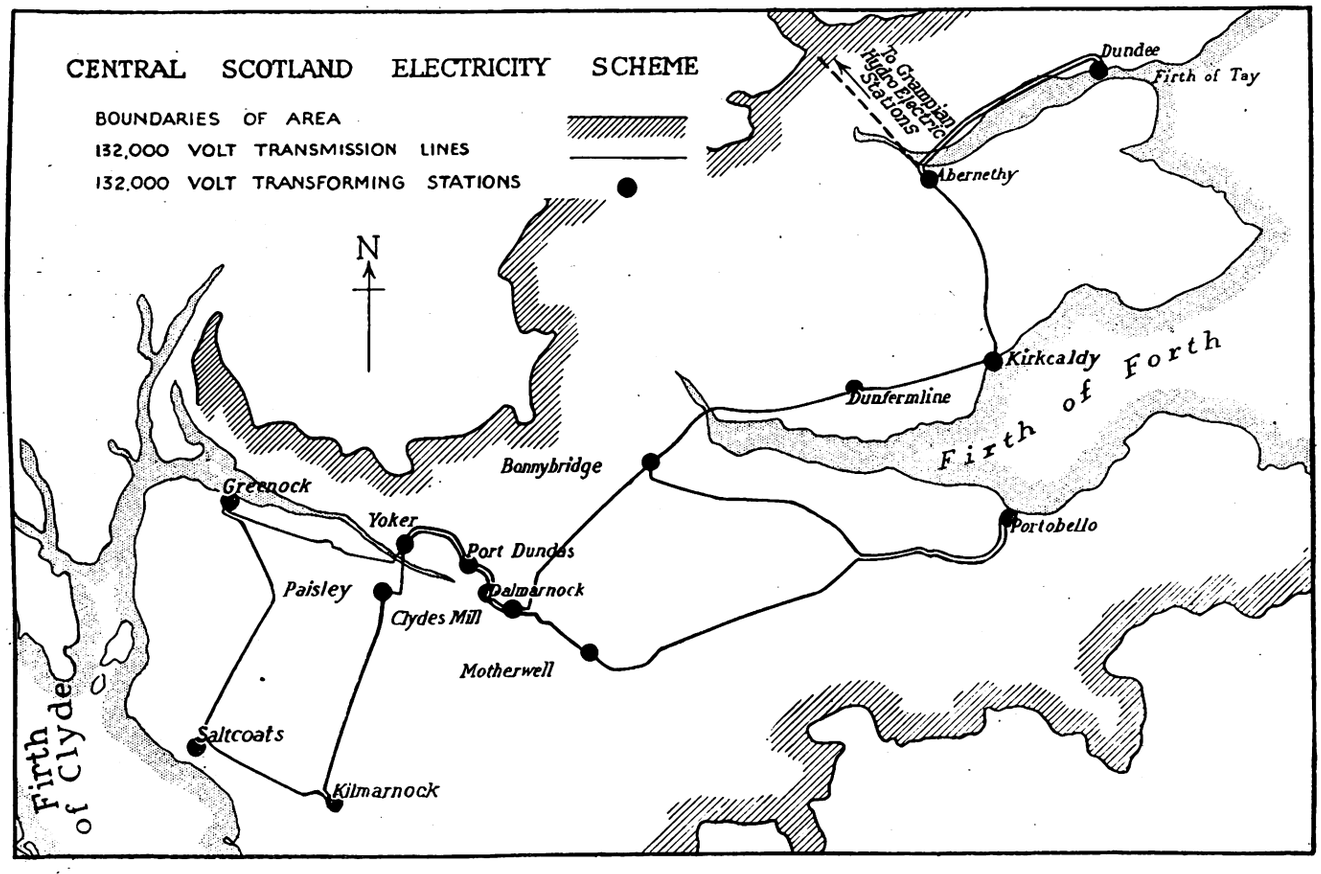

Fig. 1.—The 132 kV transmission system of the Central Scotland grid.

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public demand should grow with much greater rapidity than even the present remarkable figures indicated. Local authorities and landowners in Scotland had been very helpful in furthering the progress of the national scheme. So far as he was concerned, he stood for the rapid, and, wherever advantageous, universal electrification of industry. He was a believer in the electrification of frequent suburban railway services. He appealed to the whole electrical industry

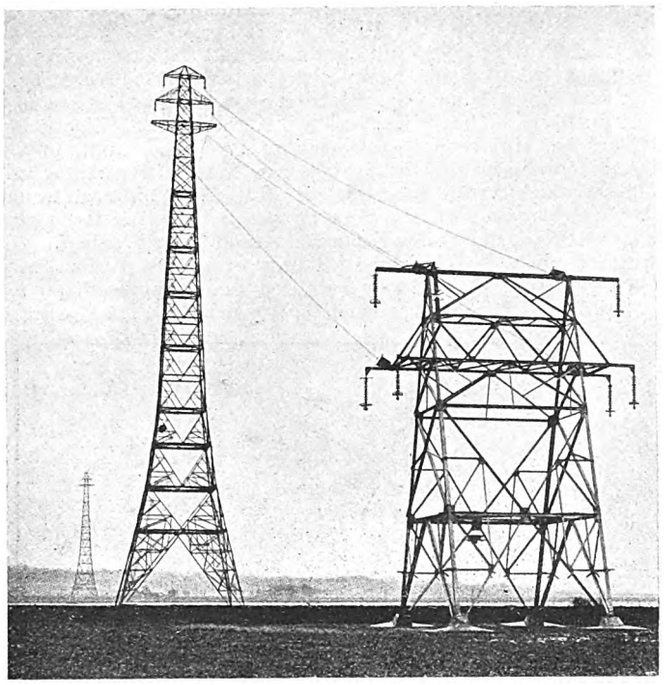

Fig. 2.—The Forth crossing, showing anchor tower.

to unite in a big publicity push for the wider use of this wonderful power and to supply undertakings to take the greatest pains in cultivating industrial and domestic demand, acting as consulting engineer to all and sundry who were faced with power problems. In considering electricity supply we should act on the basis that individual unrelated generating units were uneconomic. Electric power was of such vast importance to the nation that they could not allow the industry to be carried on haphazard or recklessly for individual gain or profit. It must be organised for the nation and by the nation in the interests of all classes and all types of industry and transport. He paid a tribute to the work of Sir John Snell and Sir Andrew Duncan.

Lieut.-Col. Wilfred Ashley proposed the toast of "The Central Scotland Area," and said that the Central Electricity Board was the most harmonious board that ever existed. They, and the Electricity Commissioners who prepared the schemes, deserved the greatest credit while the late Government could also take credit for having displayed foresight in connection with the national scheme. Speaking of the grid towers, he said that he was all for amenities, but they had to consider the practical aspect as well. He looked forward to the time when instead of the 338 ft. towers of the Forth crossing they would have 500 ft. towers carrying the grid across the estuary of the Thames. In the past ten years Edinburgh had increased its output of electricity by the remarkable figure of 350 per cent. In regard to propaganda, the electrical industry could learn a lot from the gas industry, in that they must interest the housewife. There need be no antagonism between gas and electricity. He begged both to realise that co-operation was the secret of success. He was most anxious that electricity should be extended as rapidly as possible into rural areas. In Ireland the Shannon scheme was going to be a great success by developing rural load. If the Bedford scheme proved successful, as he believed it would, the Government would be able to say to other districts, "Go and do likewise."

Councillor Couston, replying, said electricity and transport were matters which should be outside party politics. He thanked Sir John Snell and Sir Archibald Page for the help they had given in planning the Edinburgh scheme, which was a miniature of the Central Scotland scheme. Dean of Guild Robertson, a director of the Clyde Valley Electrical Power Co., also replied.

Sir James Lithgow proposed the toast of "The Guests," to which Sir John Snell and Mr. Thomas Kelly, Lord Provost of Glasgow, replied.

Sir John Snell referred to the progress of hydro-electric schemes in the past ten years, and said he was confident that many other sources of water power could be used for the benefit of the county without destroying its beauty. Electricity was rapidly becoming indispensable for domestic uses. He looked forward to the time when our railways would gain a new lease of life from intensive electrification.

Sir Andrew Duncan proposed the toast of "The Chairman."

Lord Weir wrote to Sir Andrew, regretting his inability to be present, and drew attention to the fact that completion of the grid would place Great Britain in the position of having the largest and most perfect system of generating high-tension energy of any country where the capacity of supplying energy at a lower cost than the average of any other country even where hydro-electric energy predominated. The day of the private generator ought soon to pass. If electricity were offered at a cheap rate all would use it, costs would come down and margins go up. The great lesson in world progress in electricity supply was to have faith in the country's absorptive ability of cheap energy.

The contract for the erection of the overhead lines of the Central Scotland grid is the largest contract for electrical transmission ever carried out in Great Britain. The overhead work, consisting of 246·6 route miles of 132 kV line carried on steel towers, has been carried out by British Insulated Cables Ltd., Prescot, who supplied the material. Field surveys were begun in March, 1928, the first towers being erected near Edinburgh in June last. Four standard types of tower are used for the circuit lines—straight line, small angle, medium angle and semi-strain. For double circuit lines there are three types—straight line, medium angle and semi-strain. Each type has three standard extensions, 10 ft., 17 ft. 6 in. and 25 ft., to meet ground irregularities. Many special high towers and a 90° double circuit angle tower have had to be designed. Approximately 5 000 tons of steelwork, 1 200 miles of stranded conductor and 70 000 porcelain disc insulators were required. The steel structures were designed by Milliken Bros., London, the steel was rolled by William Beardmore, Glasgow, and the structures were fabricated by William Bain and Co., Coatbridge. Bullers, Ltd., and the Canadian Porcelain Company supplied the insulators. Aluminium for the conductors was supplied by the British Aluminium Co., Ltd., and steel wire for cores by Rylands Bros., Ltd., Warrington. The line con-

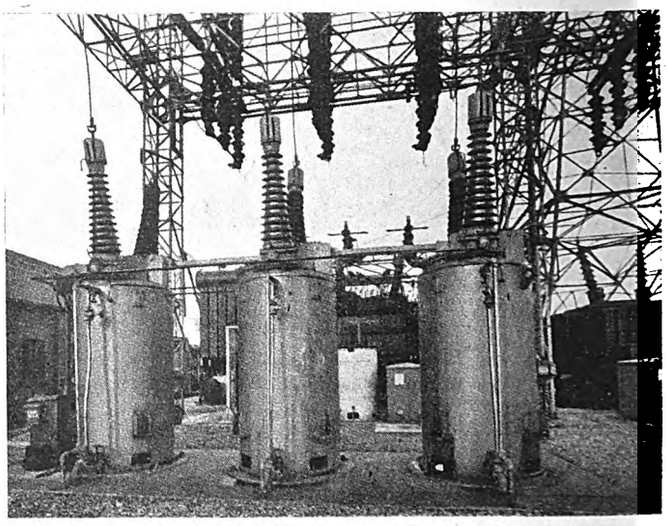

Fig. 3.—View of 132 kV circuit breakers—rupturing capacity 1 500 000 kVA.

ductors, which have a sectional area equivalent to ·175 sq. in. copper, are of steel cored aluminium, consisting of 30/·110 in. aluminium wires and 7/·110 in. galvanised steel wires, in accordance with B.E.S.A. specification No. 215–1925. A conductor of this section is generally understood to have a carrying capacity of 50 000 kW, corresponding to 219 amperes, but, where considerations of pressure drop on short distance transmission do not enter, the transmission capacity is very much greater than this figure. The critical corona voltage does not appear until a pressure of 184 000 V has been reached. Pairard type joints made under strain are used. A continuous

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longitudinal steel-cored aluminium earth wire, made up of 12/·110 in. aluminium wires over a 7/·110 in. compounded and galvanised steel core, is run above the conductors. Suspension insulators having nine 10 in. diameter discs in series, fitted with arcing horns at the earth end and an elliptical guard ring at the conductor end of the string, are used on all straight line towers and on single circuit towers where the angle does not exceed 10° change of direction. Double strings are used at larger angles on single lines and at all angles on double circuit lines. The minimum flash-over under worst unit conditions for which the tension insulators are designed is 280 kV.

The Central Scotland scheme covers an area of about 4 980 sq. miles with a population of 3¾ million. It contains almost the whole of the industrial belt of Scotland. The main transmission lines connect the following power stations: —Carolina Port (Dundee Corporation); Kirkcaldy (Kirkcaldy Corporation); Townhill, Dunfermline (Fife E.P. Co.); Bonnybridge, (Scottish Central E.P. Co.); Portobello (Edinburgh Corporation); Motherwell, Clyde's Mill and Yoker (Clyde Valley E.P. Co.); Stonebyres and Bonnington (Lanarkshire Hydro-Electric Co.); Dalmarnock and Port Dundas (Glasgow Corporation); Blackhall (Paisley Corporation); Kilmarnock (Ayrshire Electricity Board) and Dellingburn (Greenock Corporation). Grid points have also been established at Saltcoats and Abernethy, the former to give a supply to the Ayrshire Electricity Board and the latter for receiving a bulk supply from the Rannoch hydro-electric station of the Grampian Power Company. The eight selected stations in the scheme are Carolina Port, Townhill, Bonnybridge, Portobello, Clyde's Mill and Yoker, Dalmarnock, Kilmarnock, Stonebyres and Bonnington. Two new power stations, one in the east and the other in the west of the area, are contemplated.

The contracts for transmission lines, transformers, switchgear, cabling, etc., amounted to £1 434 979. The Metropolitan Vickers Electrical Co., Ltd., and the British Thomson-Houston Co., Ltd., supplied the switchgear. The central control station will be located near the Board's Dalmarnock sub-station in Glasgow. This will be in telephonic communication with every power station and sub-station in the area. The transformers used range in size from 10 000 kVA to 60 000 kVA, and have been designed for pressures of 132 000/3 300 V, 132 000/6 600 V, 132 000/11 000 V, 132 000/20 000 V, and 132 000/22 000 V. All transformers having a 6 600 V secondary pressure have the secondary winding in two sections, which can be paralleled to give a secondary pressure of 3 300 V if required. Transformers wound for 22 000 V can be similarly arranged for 11 000 V. At Portobello, with a busbar pressure of 6 600 V and transformers each of 45 000 kVA capacity, the low pressure grid connection has to carry 4 000 amperes. Two switches have been installed at this point for each transformer bank, as it was thought inadvisable to handle all this current on one 6 600 V circuit breaker. All transformer banks up to 30 000 kVA are of three-phase type. Larger capacity banks are made up of three single-phase units. It is an indication of the advance made since orders were placed for the Central Scotland scheme that British firms are now prepared to build three-phase units up to 75 000 kVA, and of sizes which can be carried by rail. By adopting a solidly grounded neutral point for the high pressure winding or all transformers the first cost was reduced, and it has been made possible to employ potential regulating apparatus operating directly on taps brought out from the neutral point end of the main 132 kV winding. The equipment at undertakers' stations provides for a plus or minus boost of 10% on the standard pressure of 132 kV. Natural air cooling is used with transformers of 10 000 kVA, and on 15 000 kVA transformers natural oil circulation and forced air blast are employed. On the larger sizes oil circulation and forced air blast are used in combination. The transformers were supplied by Ferranti, Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and the English Electric Co., Ltd.

Until standardisation of frequency in the areas of the Glasgow Corporation and the Clyde Valley E.P. Co. (the two largest authorised undertakers in Central Scotland) is completed the full benefits of interconnection will not be realised. The ultimate cost of standardisation is estimated at £3 000 000, and by accelerating the programme it is hoped to have a uniform frequency established in two years' time. On March 31 last 37 600 H.P. of consumers' motors and 40 500 kW of rotary convertor plant had been changed over to 50 cycles periodicity. The actual 50-cycle demand corresponding to this horse-power of changed-over plant was 26 800 kW.

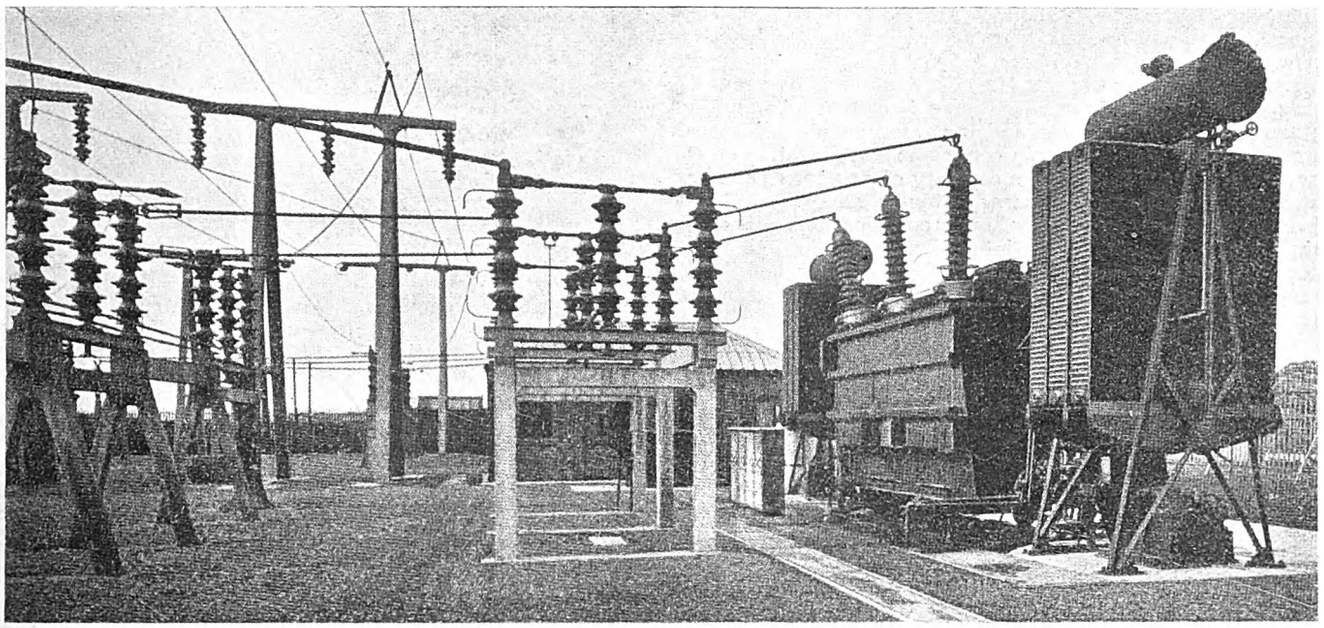

Fig. 4.—20 000 kVA transformer with cooling equipment and isolating switchgear, Bonnybridge sub-station.

New Plant at Portobello.

Although the site of the Portobello generating station was purchased in 1914, the plans prepared for the erection of the power-house work could not be begun until the war-time embargo on such activities was raised in the spring of 1919. After due consideration the Edinburgh Corporation decided to revise the original plans and construct a station on a much larger scale, capable of supplying a wide area. The Electricity Commissioners determined that the area of supply should include the City and Royal Burgh of Edinburgh and the counties of East Lothian and Midlothian, the whole being known as the Edinburgh and Lothians Electricity District. Outside the Edinburgh Corporation's area of supply, distribution is in the hands of the National Electrical Construction Company through the Lothians Electric Power Company, which takes a supply in bulk from the Edinburgh Corporation's station at Portobello.

On July 11, 1923, the first section of the Portobello station, comprising three 12 500 kW. M.C.R., three-phase, 50-period, 6 600 V, 1 500 r.p.m. turbo-alternator sets, was officially

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opened by the King. These generating sets are fed by six tri-drum water tube boilers designed for a maximum continuous capacity of 80 000 lb. of steam per hour at 300 lb. per sq. in., and a total temperature of 700 deg. F. The coal is discharged from the railway wagons by rotary tipplers and conveyed from the underground hoppers by a belt conveyor, 720 ft. long, passing under two roads and a railway. A short cross conveyor and two gravity bucket elevators carry the coal to the boiler house bunkers.

Owing to the rapid growth of the load, a fourth 12 500 kW turbo-generator was installed in 1925, with its complement of boilers and switchgear, and in the same year a 5 000 kW set was reconditioned and transferred to Portobello from the McDonald Road station, raising the total capacity at Portobello to 55 000 kW and completing the equipment of the first section.

After it had become apparent that a further generating unit would be required by 1928 the Portobello station was selected as one of the feeding stations for the Central Scotland grid. In close co-operation with the Electricity Commissioners and the Central Electricity Board, the Corporation decided to instal two 31 250 kW turbo-generators with the necessary complement of boilers, switchgear and auxiliary plant. This involved large building extensions covering two-thirds of the remaining land available. It was decided to construct a foundation raft for the station in its final form in one operation and confine the building and structural work to that required by the present extensions of plant. To augment the existing facilities for handling sea water a fourth sea tunnel 1 625 ft. long has been driven for discharge purposes. Two new circulating pumps each of 30 000 gallons capacity, driven by 625 B.H.P. 6 600 V motors, have been installed. The coal sidings have been extended by an additional 1 800 yds. of single track, and it is now possible to unload 1 000 tons a day. The main conveyors and elevators on the new handling system have a capacity of 100 tons per hour, and the sub-conveyors can carry 60 tons per hour.

Each of the two new boiler houses contains four units of the tin-drum type, fitted with integral superheaters, tin-drum economisers and air heaters. Four of the new boilers are designed for 80 000 lb. and four for 90 000 lb. of steam per hour. The steam conditions are the same as those of the previously installed plant.

The new 31 250 kW turbo-alternators, supplied by the British Brown Boveri Co., are of three-cylinder type with double exhaust and two separate condensers per set. Each is equipped with two steam charts. The alternator windings are three-phase star connected with normal terminal voltage of 6 600 V between phases, the neutral point being earthed through a remote electrically controlled oil switch and a 4·5 Ω limiting

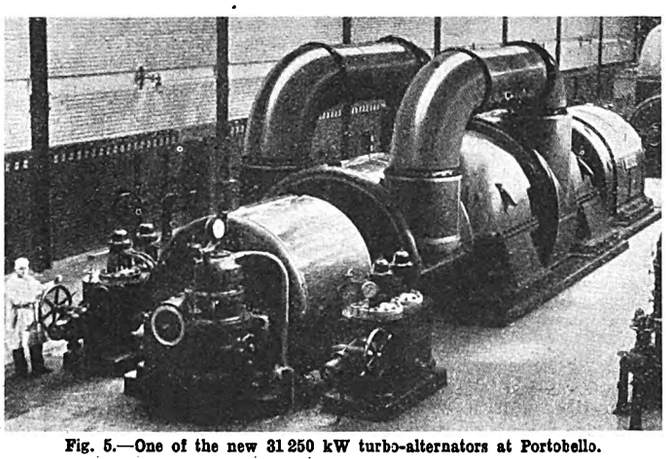

Fig. 5.—One of the new 31 250 kW turbo-alternators at Portobello.

resistance. Stator windings are equipped with Merz Price circulating current protection and an automatic field suppression switch.

The main switchgear is of the metal clad compound filled type with duplicate busbars. Complete phase separation has been maintained by assembling each phase busbar in a separate metal enclosing trunk and providing independent tanks on each phase of the main oil circuit breaker, the busbar selectors and cable isolating switches. There are 12 tanks per three-phase unit requiring 980 gallons of oil in all. The main tanks are cylindrical in section constructed of welded steel plate ¾ in. thick, secured by eight 2 in. diameter bolts. The rupturing capacity of each circuit breaker is 1 500 000 kVA. There is a very complete system of interlocking. The main generator switches are designed to carry 3 500 A continuously, and the weight of each three-phase unit complete with oil is 31 tons. As the Edinburgh system will eventually be divided into two sections, each supplied from one set of busbars, a set of 2 000 A reactors has been installed as busbar couplers to enable effective coupling between the two sets to be effected. These reactors can be isolated or short circuited when desired.

The new work at Portobello, which has cost £827 849, bringing the total cost of the station to £2 090 400, has been

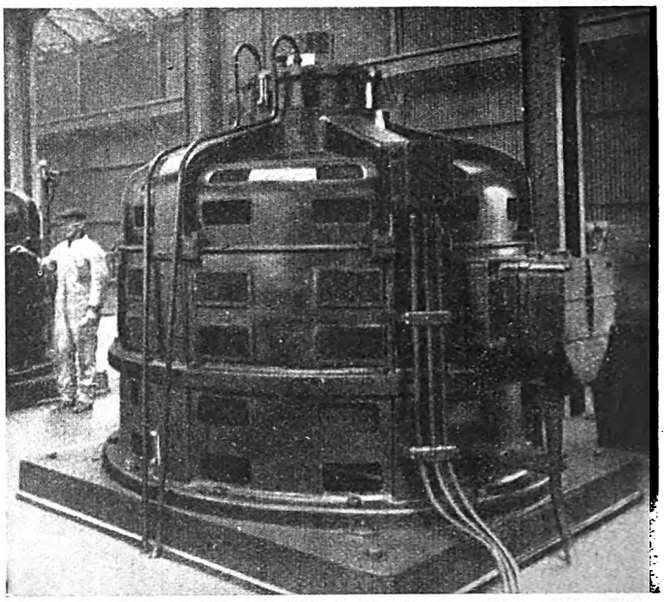

Fig. 6.—One of the two 625 h.p. 6 600 V circulating pump motors, Portobello.

carried out to plans prepared by Mr. Edwin Seddon, M.I.E.E., M.I.Mech.E., the engineer and manager. Mr. E. J. MacRae, A.R.I.B.A., the City Architect, designed the foundations and buildings in co-operation with Messrs. Macdonald and Partners and Mr. George Fraser, M.Inst.C.E. The sea tunnels and shafts were designed by Messrs. J. and A. Leslie and Reid, and the sidings were constructed to plans prepared by Mr. W. A. Macartney, Burgh Engineer.

The principal contractors were :—Raft, buildings, culverts and coal sidings, John Angus and Sons ; reinforced concrete work in boilerhouse, Stuart's Granolithic Co., Ltd. ; structural steelwork, Redpath, Brown and Co., Ltd. ; sea work, John Best (Edinburgh), Ltd. ; circulating water pumping plant, W. H. Allen Sons and Co., Ltd. ; coaling plant, Babcock and Wilcox, Ltd., and Ritchie-Atlas Engineering Co. ; electric capstans, James A. Liddle ; boilerhouse coal bunkers, Caledon Shipbuilding and Engineering Co. ; boilers and economisers, Stirling Boiler Co., Ltd. ; chain grate stokers, Babcock and Wilcox, Ltd., and Underfeed Stoker Co., Ltd.; air heaters, Carrier Engineering Co., Ltd., Babcock and Wilcox, Ltd., and Underfeed Stoker Co., Ltd. ; grit arresters and fans, Davidson and Co., Ltd. ; flue dust extraction plant, Pneumatic Conveyance and Extraction (1929), Ltd. ; ash telphers, General Electric Co., Ltd. ; boiler feed pumps, Mather and Platt, Ltd., and Harland Engineering Co., Ltd. ; steam and water pipework, Aiton and Co., Ltd., John Spencer, Ltd., Brightside Foundry and Engineering Co., Ltd. ; steam valves, Dewrance and Co. ; water valves, Glenfield and Kennedy, Ltd.. and J. Blakeborough and Sons, Ltd. ; de-ærating plant, W. H. Allen Sons and Co., Ltd., and Mirrlees-Watson Co., Ltd. ; turbo-alternators, British Brown-Boveri, Ltd. ; condensers and air pumps, W. H. Allen Sons and Co., Ltd. ; main and auxiliary switchgear, Metropolitan-Vickers Electrical Co., Ltd. ; auxiliary motors, Bruce Peebles and Co., Ltd., English Electric Co., Ltd., and British Thomson-Houston Co., Ltd.

The total capacity of the generating plant at Portobello is now 117 500 kW. In 1928–29 the number of units generated by the Edinburgh undertaking was 138 470 575, of which 112 722 006 units were sold. The load was distributed as follows :—Private lighting, 24 917 932 ; power, 60 410 148 ; traction, 16 400 746 ; bulk supply, 8 636 928 ; public lighting, 2 296 252. The revenue of the undertaking in 1928–29 was £616 778, against £556 887 in the previous year.

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MODERN BOILER HOUSE PRACTICE—III (a).*

Pulverised Fuel in Power Houses—Burners—Types of Burners—Furnace Design—Grid-iron Water Screens.

By F. JOHNSTONE TAYLOR.

THERE is every indication that pulverised fuel will be adopted in the majority of the large steam stations in the near future. As a means of burning coal, and especially the cheaper grades of coal, its superior efficiency over other methods is definitely proved, and it enables boilers to be constructed of a size which would otherwise be limited by the practical exigencies of mechanical stokers. Pulverised fuel is an important subject which can be barely touched upon in a short

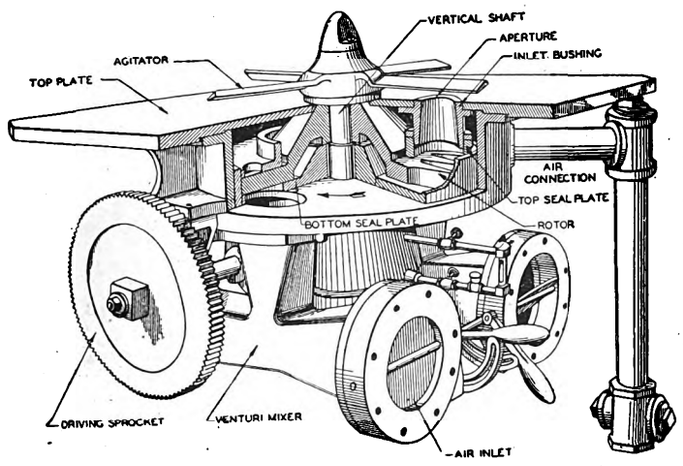

Fig. 1.—Lopulco "R" type feeder.

article, and the system itself is quite new, so that present-day methods, while eminently satisfactory, are no doubt capable of considerable improvement.

Briefly, it amounts to this. The powdering of the fuel and combining it in the burner with highly-heated air, which incidently is so much waste heat abstracted from the flue gases, enable the coal to issue from the burner in the form of a controllable gas flame and it burns as nearly as possible as a gas flame does, and partakes of all the advantages of blast furnace gas or oil as a boiler fuel. A properly constructed boiler can be kept perfectly clean externally, so much so in fact that there is no real need for a separate boiler house. In the Peterborough station turbines and boilers are housed in the same building, an arrangement which facilitates supervision.

The mechanical equipment of a pulverised fuel boiler plant comprises in the main the pulverisers, bins, feeders, etc., and the boilers themselves, which for all practical purposes can be regarded as entirely independent; that is to say, the type of boiler installed does not indicate the class of equipment used for powdering the coal. The latter in the main falls into two categories, the central in which the pulverisers feed the powdered coal into storage bins, and the unit in which the coal is fed direct to the burners. The use of storage bins renders the whole system more flexible, and is in general better suited to large boilers; on the other hand, the unit system, being simple and cheap, is perhaps better suited to boilers of moderate output, even though the cost of pulverisation may be somewhat higher. In fact, the recent improvements made in the various types of pulveriser or mill now on the market have been to some extent dictated by the necessity for reducing this cost, which at one time was apt to be high.

Coal Differences.

Then again, local conditions have to be considered, and while American methods are of considerable interest, the successful application of pulverised fuel firing in Great Britain calls for essentially different methods from those usually associated with American practice. British coals, for instance, are generally harder and contain a higher percentage of ash than other coals, and frequently contain considerable amounts of pyrites. The question of pulverising equipment maintenance, therefore, is of prime importance, and the proper consideration of this point is reflected in the success of the Fuller Bonnot slow speed mill with British coals.

As the initial moisture, too, in British coals is relatively high, the drying of stored coal is necessary, and in this connection the absorption of moisture from the atmosphere by the stored coal is apt to be troublesome. Hence the tendency towards the adoption of direct fired systems, amongst which may be mentioned the recent installation at the Lister Drive Power Station, Liverpool, by Babcock and Wilcox, each comprising four C.T.M. units rated at 125 000 lb. hour, and each having four mills.

Methods of Pulverisation.

Some mills break up the coal by means of a series of beaters, as in the case of Clarke Chapmans' "Resolutor" pulveriser and Herbert's "Atritor," and one type made by Simon Carves. The general action of this type of machine lies in a number of hammers or beaters which catch the incoming coal and break it up by impact. The principal alternative type of machine is the ball mill, which is a cylinder lined as a rule with manganese steel. It functions on the "tumbler" principle, being charged with hard steel balls and rotated slowly, so as to break up the coal in an obvious manner. One could hardly say at the present moment that one system had any material advantages over the other. The same remarks apply to feeders which are necessary when the powdered coal is stored in bins to which it must be propelled by some form of mechanical feed. Of these again, there are two representative types, one working on the screw conveyor system, and the other through the medium of a star or paddle wheel.

Fig. 1 shows the Lopulco "R" type feeder as arranged, with two outlets, which may supply two burners independently or may be joined to supply one large burner. Either of these outlets may be closed by means of small easily-operated hand gates which shear the coal in place of compressing it. The

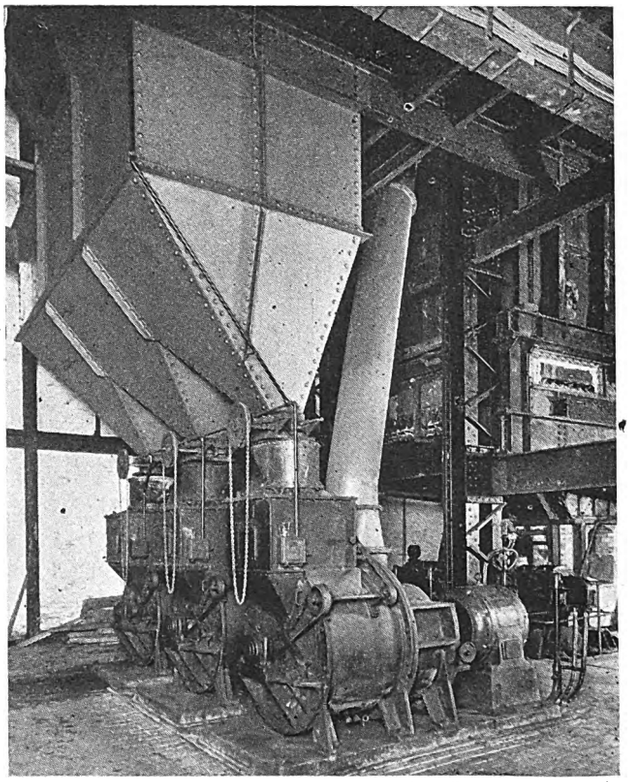

Fig. 2.—Pulverisers and part of boiler plant at Wallasey erected by Simon Carves.

closing of one gate does not interfere with the other, so that one burner may be entirely shut off if required. Steady feed is ensured by having a small reserve of coal between the agitator and the measuring rotor. Packing of the coal is

* Previous articles of this series appeared in THE ELECTRICIAN of March 7 and April 4, and the second part of this article will appear in our issue to be dated June 6.

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prevented by thorough agitation and clogging of the feeder is eliminated by blowing air through the rotor which is of heavy cast steel and turns slowly.

None of this equipment, which includes dryers when necessary and other minor accessories, has any appreciable effect on the performance of the boiler, the more important business beginning when, combined with the secondary air, the fuel issues from the burner and combustion commences.

A typical lay-out of a central pulverised fuel system was instanced by Mr. Chattock in a paper read before the I.E.E. on April 18, 1929: In the unit system, which dispenses with driers, bunkers, storage bins, etc., the coal is fed straight to the burners, as Fig. 2 shows, this being a view of the pulverisers and part of the boiler plant erected by Simon Carves at Wallasey.

Of burners there must be a score or more in general use apart from probably an equal number being experimented with. A good burner must fulfil a number of conditions. It should:

Deliver to the furnace coal uniformly distributed throughout the primary or propulsion air.

The secondary air streams should impinge against each other on entering the furnace so that the coal is further distributed uniformly throughout all of the air for combustion.

The velocities and directions of the different streams of air should be such that the resultant flame will be broken up into eddies and unequal jets to induce turbulence and mixing without excessive flame velocity.

It will be seen from the illustrations in part two of this article that many burners are disposed vertically or nearly

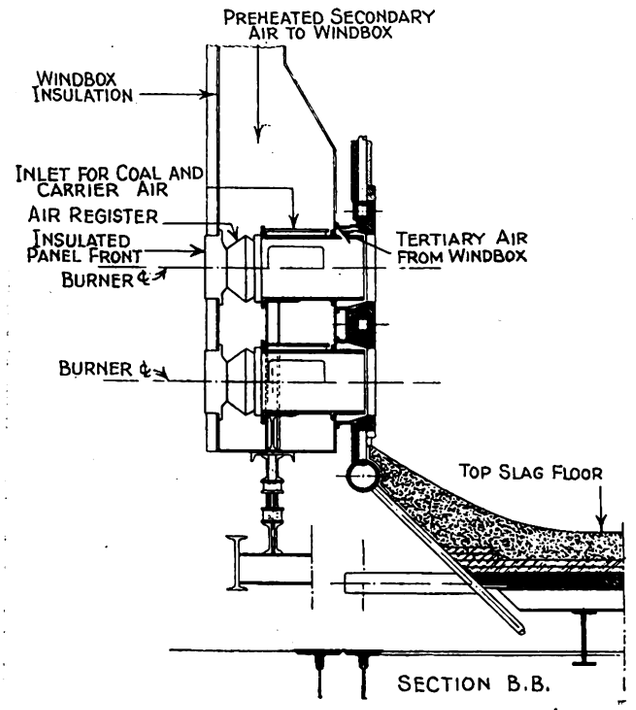

Fig. 3.—Arrangement of Peabody burners.

so. In fact, it might be said that the first important step in burner development, apart from those which have lately been devised for internally fired boilers of the Lancashire and Scotch marine type, came when its location was changed, so that the coal was fed vertically downwards into the furnace. Then the round nozzle was more or less discarded in favour of a flat one, to give a wide coal stream which effected more rapid ignition and better mixture of the coal and air in the furnace. To give further turbulence, rifled nozzles came into being, combined with a higher value for the primary air pressure, turbulence being an important matter, especially in the case of horizontal burners and more particularly still when they are used with small furnaces.

In fact, horizontally disposed short-flame burners fall into the general category of turbulent burners in which an intimate mixing of the pulverised fuel and the combustion air and the rapid spreading of the flame throughout the mixture after it is ignited is brought about by inducing a turbulent condition in the fuel and air in its passage through the burner or at its mouth, which is continued after the mixture has entered the furnace.

In the vertical type of burner, the primary air carrying the powdered coal injects it into the furnace through a long

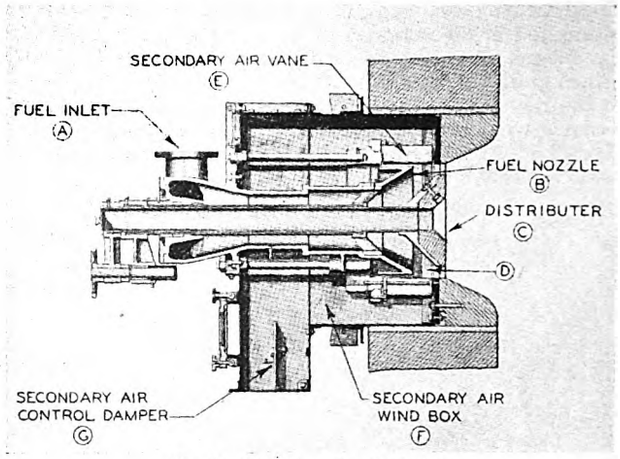

Fig. 4.—Couch type Lopulco burner.

narrow vertical slot between the water cooling tubes, though the amount of primary air is only a percentage of the total volume required for combustion. The secondary air enters through ports arranged on either side of the primary fuel slot, and they are so disposed that the secondary air comes into contact with the primary fuel and air mixture at an angle while refractory faced plates separate the air ports, of which there are several on each side.

A concern which appears to have devoted a considerable amount of experiment to the evolution of the perfect burner is the Peabody Engineering Co., of New York. The principal point of interest in their most recent developmnt consists of: (*a*) An increase in the capacity of the individual unit; (*b*) the application to the coal burner of the insulated panel front register for highly pre-heated air and (*c*) the introduction of a stream of so-called tertiary air. The arrangement of these burners in the front wall of a furnace is shown in Fig. 3. It will be noted that the tertiary air stream for providing additional control of the flame is admitted from the windbox and impinges on the stream of coal and air leaving the burner barrel. The volume of tertiary air is controlled by a damper at the point where the air from the windbox is admitted to the tertiary air burner.

The arrangement shown in Fig. 4 is that of the Couch type Lopulco burner as adapted for use where forced draft is available, and it is also of the horizontal type. The pressure and flow of the secondary air to the burner casing is controlled by a damper. The secondary air vanes which impart a whirling motion to the air as it leaves the burner are adjustable, while the primary air nozzle and distributor can be moved forward or backward either individually or together. This combined with variation of the opening between the secondary vanes enables the closest possible adjustment of the flame to be effected, in fact the underlying principle of the

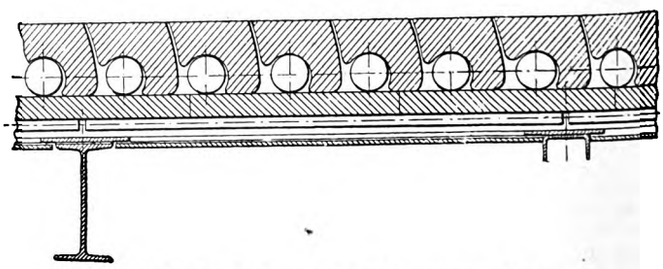

Fig. 5.—Section of furnace wall, Wallasey (Simon Carves).

design of all burners is to enable close adjustment to be made while keeping the construction as simple as possible.

In this respect the Hay burner as developed by Fraser and Chalmers is of interest. It incorporates a Venturi contraction between the pipe and the splayed casting forming the upper part of the burner. The mouth is formed of a casting lined

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with fire-brick, and it is embedded in the brickwork of the combustion chamber arch. Inside are two hinged cast-iron flaps covered with fire brick on the back, and these flaps are adjustable by independent levers. This enables them so to be set while the boiler is in operation as to regulate the width of the opening and to determine the direction of the flame. The latter facility is claimed to be an advantage in affording protection to the combustion chamber walls from slag accumulations.

An all important feature of a water tube boiler fired with pulverised fuel is the matter of furnace design. Important as slagging and erosion are in furnaces fired by the more usual methods these difficulties are greatly enhanced in the case of pulverised fuel. A large furnace volume is required because pulverised fuel is burned in suspension in the combustion air necessitating a sufficient length of flame path to ensure complete combustion of the solid carbon and volatile hydrocarbons prior to the gases coming into contact with the boiler heating surface. Apart from this the amount of excess air required is much less than with stoker firing which leads to a very high furnace temperature, while as pulverised fuel can be produced from very inferior coal its ash content is high and may reach 30% or more. Present day furnaces, therefore, are the result of practical experiment to design types which will avoid the ever troublesome slagging, and with the early solid wall furnaces the rapid erosion was a serious matter unless it was kept down by too much excess air. The cavity wall furnace, which is kept cool by its functioning as an air heater, is successful except in respect of the bottom, where the slag still often had to be removed by a pick. It is such conditions that have brought into being the now generally used water cooled furnace wall in the form of a gridiron type of water screen, and in one form or another this arrangement may well be said to have made possible the modern pulverised fuel boiler of the types to be now described.

A further development and one incorporated in the Wallasey plant previously mentioned is that shown in Fig. 5, where it will be observed that the tubes themselves are not directly exposed to the fire, the inner face of the wall being covered with a refractory material fitted round the tubes and keyed to them while the joints between the blocks are inclined to the plane of the wall and curved as shown. This enables expansion and contraction to take place without undue stress coming on either the blocks or the tubes and at the same time it eliminates any tendency to bulging. The thickness of the material so arranged must be such that the cooling effect of the tubes will be sufficient to prevent overheating and spalling while at the same time facilitating the absorption of the radiant heat and there must be a steady red heat on the inner surface of the walls so as to ensure good combustion with the minimum of excess air. *(To be continued.)*

AUSTRALIAN TELEPHONE SERVICE.

Public Service Inaugurated by the Premiers of the United Kingdom and Australia.

THE public wireless telephone service between England and Australia was inaugurated on Wednesday morning, when Mr. Ramsay MacDonald, in London carried on a conversation with Mr. J. H. Scullin, the prime minister of the Australian Commonwealth at Canberra. Conversation was perfectly audible in both directions.

For the present the service will be available on weekdays only from 7 a.m. to 10.30 a.m., and, with the exception of Saturdays, 4.30 p.m. to 10 p.m. The charge for a call from any place in Great Britain to Melbourne or Sydney will be £2 a minute, with a minimum of £6. The report charge, where applicable, will be 12s. Subscribers wishing to book a call to Australia should ask their local operator for "Australian Service" (subscribers on an automatic exchange should dial "trunks" and then ask for "Australian Service"). In other respects the procedure will be same as in the trans-atlantic telephone service to North America. The period allowed on any individual call will be limited to 12 minutes, when other callers are waiting to use the service. Callers, particularly those desiring conversation at a particular time, are advised to book their calls as early as possible on the day on which they are required, or preferably on the previous day. Every effort will be made to connect a call at the time required, where this is specified, but no guarantee can be given that a call will mature at a given hour. Calls may be booked at any hour of the day or night. Further information may be obtained by asking for "Australian Service Inquiry."

NOTES FROM ITALY.

Hydro-electric Developments—Imports of Electrical Goods.

(FROM AN ITALIAN CORRESPONDENT.)

TO the two hydro-electric stations of the Coghinas River and Tirso River another large hydro-electric plant is to be added in Sardinia. It will utilise the northern part of the Flumendosa River near the large village of Villagrande Strisalli in the province of Nuoro. This new plant includes a large lock which will create a hydro-electric reservoir of about 50 000 000 cu. m. of water. The water retained by this large reservoir, which will have the character of a lake, will be diverted from its natural course and brought through a tunnel 6 km. long on the eastern side above Tortoli, producing with a fall of about 800 m., 140 000 000 kW. The dam will be 55 m. high.

In Julian Venetia a plant is to be built near Trieste to utilise the Timavo River; a development of 120 000 H.P. being contemplated.

The Italian hydro-electric industry is progressing. Consumption of electricity had increased to 775 296 000 kWh in December, 1929, against 766 443 000 kWh in December, 1928, and 654 627 000 kWh in December, 1927. The index number of quotations of shares of Italian electric enterprises has reached 155·76 (1922 = 100) and it is understood that American interests are still showing interest in the possibility of making further investments in Italian industry.

Imports of electric machinery and apparatus have not shown much change recently, as can be seen from the following figures :—

IMPORTS OF ELECTRICAL GOODS.

	Generators.		Transformers.		Apparatus.	
	1929.	1928.	1929.	1928.	1929	1928.
			(Centals.)			
Austria	569	478	66	107	364	171
Czechoslovakia	97	2 128	—	—	—	—
France	2 391	3 512	193	577	1 476	3 350
Germany ..	8 293	6 593	2 484	861	7 922	7 898
,, (*a*) ..	438	1 947	103	1	19	612
Great Britain ..	570	338	—	—	6 597	5 081
Sweden	1 746	2 931	9	708	302	1 307
Switzerland ..	2 426	1 943	641	240	1 424	1 278
Hungary ..	1 262	3 109	317	191	82	132
U.S.A.	1 162	827	351	59	2 416	1 449
Other countries	500	743	109	281	601	1 171
	19 459	24 549	4 275	3 205	21 203	22 448

Germany maintains a very important position in the Italian market. Although the total imports of generators have shown a decrease, imports from Germany have risen, so that Germany has captured part of the share of other countries. The reason for this predominance is that the Germans have had their own branch offices established in Italy since before the war. Swiss manufacturers have their own erecting shops in several Italian centres. Other manufacturers have simply entrusted their representation to individuals or firms in the trade without exhibition or even samples.

Italian industries are protected by the recommendation of the Government to use as far as possible Italian goods, but many foreign manufacturers have overcome this difficulty by establishing assembling shops for motors, factories for electric lamps, and so forth. The existence of local branch offices has enabled many German manufacturers of stoves, electric water heating apparatus, and domestic electric appliances in general, to sell them by monthly instalments, but the fact that many Italian industries have tried to imitate this method has caused great competition and lowered prices so that there are stocks of unsold material. The Government has acquired a certain number of electric vacuum cleaners, which are used at the railway stations to clean passenger cars. There has been an effort from Germany to sell electric steering gear and similar ship's appliances but it does not appear to have met with much success.

In connection with electricity in shipbuilding it may be noted that the Lloyd Sabaudo has sent technical experts to New York to study the question of electric propulsion, and that Italian firms have built the electric propelling machinery for the Royal Italian Navy training ships "Cristoforo Colombo" and "Amerigo Vespucci." These ships have two electric motors of 800 H.P. each, built by Marelli and Co., coupled to two Tosi Diesel engines.

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UNEMPLOYMENT AND WORK—I.

The Plight of the Unemployed.

By SIR ERNEST J. P. BENN.

IF there were a rule which made it necessary to define one's terms before opening a discussion, a large proportion of discussion itself would automatically disappear. It happens all too often that parties to a debate are talking all the time about totally different things, and then they wonder at their failure to arrive at a common conclusion. The word Unemployment as it is used to-day, has two distinct and very different meanings. I propose to discuss the term in both its senses, but I shall try to exercise care to discriminate between them. In its older sense, the word denotes the condition of a man or woman for whom no work exists, but its later meaning covers the case of a person who by any one of numerous ways has contrived to get his or her name entered upon the register of a Labour Exchange. There is a vast difference between the two, and inside these extremes there are numerous smaller grades of difference.

When Sentiment is Dangerous.

It is hard to imagine a more terrible plight than that of the man with a wife and family, who, being able and willing to work, through no fault of his own is yet unable to find any sort of remunerative employment. Most of us are completely unable to realise the frightfulness of such a position, and nothing that I shall say must be taken to indicate a lack of appreciation of its inhuman horrors. On the other hand, to approach the problem except in a critical and scientific spirit is to do it less than justice. Sentiment is dangerous stuff when the need is for a surgical operation. In so far as there is a real absence of work, it is a grave public scandal and one which the Government may very properly be asked to remove. But note the terms of our definition and see how seriously they reduce the area of discussion. "Able and willing," "no fault of his own" "unable to find any sort of employment." No statistics are available, but I should be surprised to know that there were 200 000 men and women who, on a strict interpretation of this definition, could be properly described as Unemployed.

It is a comparatively simple matter for the nation with all its resources to deal with a problem affecting 200 000 persons, but we have now made the matter anything but simple by adding seven times as many other people who are without work for other reasons and treating them all alike as if they were all unemployed in the old sense of the term. If we go on as at present we shall presently have to face the problem of two million people (five per cent. of the whole population), who, because they happen to be standing in the same queue outside the Labour Exchange, are assumed, quite wrongly, to be of the same class and to be suffering from the same trouble. Parliament is pursuing two very different objects at the same time. The first is to help the man for whom no work exists, and the second to multiply benefits for all those who are not considered to be well enough off.

The awful plight of the real unemployed man is intensified by this confusion. Many people who are genuinely anxious to help him are prevented because they cannot approve of the wholesale distribution of new benefits which the nation cannot, at present, afford. Let me give an illustration—a very extreme one. The other day a young woman, who had worked for six months in a small business, asked her employer to sack her and to take in her place a younger sister who was helping mother at home. The girl explained that her sister did not care for housework, while she herself was tired of factory work. A change over would suit them both, and have the additional advantage of insurance benefit to the new domestic help.

The employer obliged. It was probably very wrong of him to do so, but he argued that since he always arranged his own affairs to get what benefits he could from the technicalities of taxation, the girl was equally entitled to arrange her affairs with a view to enjoying benefits offered by the State. In this way one more person was added to what are called the unemployed.

We shall never be able to do justice to any of these people until we sort them out into categories. Meanwhile, the piling up of the figures by reducing ages, extending benefits, shortening periods and other similar devices, is pushing further and further into the background the unfortunate people on whose backs and in whose name all these new beneficiaries are getting themselves entered on the public payroll.

It is very necessary that we should in so grave a matter take only such steps as are founded upon sound principles or reliable experience. In particular, every new proposal should be carefully examined to see whether it arises from a genuine interest in the unemployed or from a desire to promote some political interest. For example. Some people look forward to what they regard as an ideal when the State shall be the only employer of labour. Every name entered upon an unemployment register and every dole handed out by the Minister of Labour brings us a little nearer to that position. It may be observed, without throwing accusations at anybody, that people who hold these views are subject to the disturbing mental play of two opposing loyalties. If they reduce the unemployed and push people back into private service, they are delaying the arrival of their particular millennium. Unless, therefore, we also believe in the idea of universal State employment we are doing no service to the unemployed by leaving their interests in the hands of this sort of thinker. The same sort of argument can be used with justice not only against Socialists, but against every political party.

Unemployment as a party asset is one of the most disgusting of the many degrading features of modern politics. There are grounds for the hope that we have touched bottom in this beastly business. Every political party has its unemployment policy, and now even the unemployed are beginning to see the worthlessness of all these plans. When that truth dawns, then the first big step will have been taken towards better things and better times. But the plight of the unemployed will not be altogether ended when politicians have found something else to do. We shall then have to get rid of the helpless political mentality represented by the phrase "through no fault of his own." In modern politics, no seeker after suffrages ever tells any electors that there is anything wrong with them. The fault is always with somebody else, some other class, and must be remedied at the expense of those others. This universal pose will not appeal to our sensible people when we pass out of the present post-war slough of political despondency.

There will arise a new class of politician making an appeal to our better selves and flattering us by an honest emphasis on our shortcomings. When we begin to get it into our heads that it is possible for a man to be out of work from his own fault, then another big step towards the end of our plight will have been taken. Then, as a further step towards economic health, we may begin to look round to find whether we are putting any unnecessary obstacles in the way of employment. We shall begin to see that the removal of obstacles is better than the provision of new forms of relief.

Very few of us realise how difficult we have made it for a man to secure "permission" to work. There are numerous occasions when an unemployed man is willing to work, a customer is waiting for something to be done, and somebody else steps in and says "No." Many of these arrangements may be very wise, others may be merely unnecessary, and others again may be simply foolish. But all of them must be gall and wormwood to the able-bodied man anxious and willing to work and condemned by them to the degradation of the dole. It should never be forgotten that so long as there is a want in the world, there is work to be done, and that unemployment is an unnatural disease due to unnatural conditions.

Too Many Laws.

If I want a box of chocolates for my children after the legal hour, the law says "No." In that way a certain amount of unemployment is created among chocolate makers. I do not desire to discuss the merits or demerits of this particular sample of modern grandmotherly legislation, but let us understand quite clearly that we are reaping the benefits, whatever they are, of this particular Act of Parliament at the expense of some unfortunate unemployed person.

The Statute Book is bulging with this sort of thing. Parliament has passed an average of two Acts a week—a hundred a year—ever since the century opened, and, in my lifetime, 5 000 Acts have received the Royal Assent, each of them

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restricting the activities of somebody or some trade, making its quota of unemployment and thus keeping down the general level of wages.

Most of the building work of the moment is delayed weeks and months by the new formalities of the Town Planning Acts. Delay is definite and permanent loss to a man seeking work. Again, I am not arguing the case for or against town planning, but I question whether those who advocate this further development of bureaucratic supervision have given adequate consideration to its effect upon the employment question. A political party that would undertake to repeal a thousand Acts of Parliament which have been proved to be merely useless obstructions, would solve unemployment and restore the nation's prosperity. Committees of inquiry are the fashion. Can we not have an inquiry into obstructive and obsolete legislation ?

The subject of barriers to employment leads us on to all those trade union arrangements, which, while they may bring temporary benefit to those actually in work, bar the prospects of the man in search of employment. If, as is undoubtedly sometimes the case, these union rules and regulations enhance the cost of goods and limit the demand for them, then a further section of our unemployment is explained. There is, in addition, a vast quantity of rules and regulations contrived by employers' and merchants' federations having in them, no doubt, some benefit for those inside the ring, but, in so far as they limit markets, they are also responsible for some part of our problem.

We are living in an era when the practice of restraining trade has become a fine art. Anyone who would understand from personal experience how far this sort of thing has gone can easily make a practical experiment for himself. Let him make the endeavour to buy and sell a ton of coal, a hundredweight of seed potatoes, a gallon of milk, or twenty-five copies of a popular novel. The barriers that stand in his way may give him a fresh understanding of some of the difficulties of the unemployed.

BOOK REVIEWS.

Raddrizzatori a Vapore di Mercurio. By D. C. PRINCE and F. B. VOGDES. (Milan : Ulrico Hoepli.) 243 pp. Lire 30.

This is the first Italian edition of the important work by Messrs Prince and Vogdes, of the American G.E.C.'s Research Laboratories on the theory and circuits of mercury arc rectifiers. It contains a preface by Professor of Engineering Angelo Barbagelata.

Commercial A.C. Measurements. By G. W. STUBBINGS. (London : Chapman and Hall.) Pp. 320. 15s. net.

This work is very welcome, Mr. Stubbings being an acknowledged expert on a.c. measurements. It is divided into ten chapters, the first of which deals with the principles of alternating currents. From the generation of voltage, the student is conducted to three-phase systems ; here, vectors, power factor and harmonic quantities are dealt with in a comprehensive manner. The second chapter may be said to be confined to the measurement of power in three-phase circuits. Two and three watt meters are shown and numerical examples are given. The diagrams and vectors in this chapter are very clear. In chapter 3 the measurement of current and voltage are dealt with. The construction and characteristics of various types of instruments form the basis of the subject-matter in this chapter. The fourth chapter deals exclusively with the measurement of power. This is an important section ; correct and incorrect vectors are given. The fifth chapter discusses that important subject, instrument transformers—the circuit diagrams and calculations are valuable. The sixth chapter is confined to the measurement of energy ; an important section of this chapter discusses the errors to which induction meters are subject. The seventh chapter deals with the measurement of power factor, a subject with which Mr. Stubbings is specially familiar. The section dealing with the testing of power factor meters is particularly instructive. The eighth chapter discusses the measurement of reactive power ; in this chapter is included a section dealing with reactive meters for four-wire, three-phase circuits. The ninth chapter is confined to kVA measurements, and the last chapter deals, very rightly, with test room equipment. The appendix is not a collection of matter which has been forgotten in the previous chapters. It deals with the trigonometry of a.c. theory. It might, with advantage, have been placed before the first chapter, to enable students to digest it before beginning the subject-matter proper. The book is sure to find favour among central station and mains engineers, and should also become a favourite among students in technical schools and colleges.

CYRIL SYLVESTER.

Vorschriftenbuch des Verbandes Deutsches Electrotechniker, 17th edition, 1930. (Berlin : Verband Deutscher Elektrotechniker). Pp. xviii+1153. 18 marks.

In Germany, the work corresponding to that done by the British Engineering Standards Association is carried out, so far as electrical engineering is concerned, by the V.D.E. (Verband Deutscher Elektrotechniker, or Association of German Electrical Engineers). Though this association has not the standing of the Institution of Electrical Engineers as regards professional qualifications, it has, since its formation in 1893, been steadily engaged on the formulation and publication of rules, regulations and specifications relating to electrical engineering practice. The reports, etc., now number 107, and many of them have been revised several times. They are first published in the periodical of the V.D.E., the Elektrotechnische Zeitschrift (E.T.Z.), which enables the views of those outside the respective committees to be put forward and considered. The complete set of rules, etc., is periodically collected and published in book form. It is the seventeenth edition of these collected rules which is now under review, the sixteenth edition having appeared in 1929. In this way the members of the V.D.E. are kept up to date with all revisions and new reports. Furthermore, the rules are officially accepted by the police and other authorities in Germany. Probably it would be helpful if our own B.S. Specifications were also broadcast and given wider official recognition.

The German reports fall into different classes. In addition to rules and standards, certain reports contain guiding principles and recommendations. Thus Report No. 9, on recommendations for the protection of electrical installations against excess voltages, contains information on the origin and behaviour of excess voltages and the prevention of disturbances from such voltages. Report No. 58 illustrates beetles and the ravages caused by them to wood poles. Fire extinguishers first aid, electric toys, safety first (including " thou shalt not " commandments for children), Christmas-tree illumination, etc., are rightly deemed worthy of consideration. Communication, broadcast, X-ray, and other electro-medical installations also come under the rules and regulations of the V.D.E. Nor are the technical education and practical training of electrical engineers and artisans overlooked.

From this brief account, the reader will see that the activities of the several committees are not confined to specifications of plant, etc., but cover a very wide field of interest to electrical engineers. Yet there still seems to be one great gap to be filled. With the spreading use of electricity, an authoritative body should issue a small pamphlet for layfolk, telling them the few important facts concerning electrical appliances in simple language—for example, telling them why electric applicances in the bathrooms and kitchens should be earthed, to switch off before connecting or disconnecting appliances, to keep flexibles in good repair and so on. If with such simple advice 90 % of the accidents were avoided, not much would be heard of the remaining 10 %.

S. PARKER SMITH.

Motor Repair and Overhauling. Edited by GEORGE T. CLARKE, 7th and 8th Parts. (London : George Newnes.) 1s. each part.

The volumes under review are two parts of a series of twenty-four parts published weekly. The first portion of the seventh part is purely mechanical ; the second portion deals with wiring and lighting faults. Examples are given for fault testing, and this includes a particular test for starter earth connection. A complete circuit wiring diagram is given, and this is supplemented by a pictorial diagram ; the latter is useful. Ignition and accumulators are included in this section. Part eight begins with a continuation of the section on accumulators from a treatment point of view. This is followed by small generator sets suitable for use in motor garages. The section concludes with hints on car wiring. The last portion of this volume deals with the automatic cut-out. The volumes are well worth their cost.

CYRIL SYLVESTER.

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MARINE ELECTRICITY.

The Electric Propulsion Situation Clarified—Flexibility or Economy, or Both?—Electric Equipment of a Modern Motor Cargo Liner.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types.")

MARINE electrical interest at the present moment seems, perhaps naturally, to be centring very much round the application of propulsion motors to large passenger liners. Just how much attention the shipping world is giving to this question was well shown by the extremely spirited discussion which followed the paper read by Mr. Belsey of the British Thomson-Houston Co., before the Institution of Naval Architects, at their recent annual meeting. It is to be regretted that there was not a greater following to the discussion on Mr. Belsey's paper from the electrical industry itself, because here, one feels, would have been such an opportunity for the various electrical interests to present in a clear and concise form their case for the electric ship to shipowners, and, above all, to their superintendents, who were so largely represented at the meeting. For there is no doubt that at the present moment the marine world is waiting for a clearer-cut case as to the economics of the electric ship than it has yet seen. Those of us who are interested in electrical propulsion development know that in the electric ship we have something which for certain purposes and for special duties has an enormous future; but as yet the economics of such ships in actual tons of fuel per twenty-four hours are so subtle that it is a little difficult to explain them with the same clarity, for example, as that with which we can explain the economics of the Diesel-engined ship. The answer to the question, however, is without a doubt expressed in the fact that electric ships are on the increase.

Electric Ships Increasing.

Three major passenger liners de-luxe, with turbo-electric propulsion, are under construction in this country at the present time. A fast cross-Channel ship fitted with the same type of propulsion is about to be ordered. A Diesel-electric ship of similar, though somewhat slower, characteristics is, it is rumoured, being considered by an Australian shipowner. Tank ships with Diesel-electric propulsion are building, and also the extent to which electricity is being applied to vessels whose main machinery is direct connected and not electric is an indication of the very general appreciation of the flexibility combined with economy that it offers. One says advisedly "flexibility combined with economy," because it would appear that in certain ship types electricity is creating a sharp definition between the two, and while intrinsically each is inseparable from the other, yet at the same time in certain cases it is flexibility of machinery which sways the balance in favour of electricity, and in others it is economy of operation.

To explain this further, we may consider that the large turbo-electric liner has, as its principal appeal to the shipowner the essential economy of its power plant on a long voyage, different "legs" of which are run at different speeds. The economy in this case is not at the moment directly traceable to tons of fuel per twenty-four hours, although this, depending upon the technique of boiler and turbine practice adopted, is naturally in proportion to the application of modern ideas along this line. On the other hand, the economy in this connection comes from the fact that, because of the varying speeds on the varying "legs" of the voyage, only one half of the generating plant need be used, and in proportion part of the boiler plant also. If such a ship cruises, then the whole of the cruising can probably take place on one-half of the machinery. All of this tends to give a net longer life to the machinery, and if necessary makes it possible to arrange for minor routine overhauls at sea to the other half, thus cutting down materially the time which the ship requires to spend in port. Particularly is this useful on cruise work where, for example, sometimes as little as twenty-four hours is allowed for a complete turn-around at the home end.

Turbo-electric propulsion is being adopted widely in certain countries for passenger liners engaged on services such as these, although it is a little difficult, thinking along the same lines, to justify its fitting to ships which have a long ocean voyage to run at a constant speed or to ships which have a shorter ocean voyage to run, and which are, therefore, of packet-boat type. Assuming such vessels to have a high auxiliary load, such as with refrigeration plant, it seems perfectly reasonable that electric propulsion should be fitted whatever the length of voyage; but in this case it is conceivable that Diesel-electric drive would be better, because of its inherent flexibitity. The only other justification for Diesel-electric propulsion for passenger liners would appear to be on mammoth vessels of the largest transatlantic type.

It is, as Mr. Belsey very well expressed in his paper, to the smaller type of craft, other than those with a high auxiliary load which we have mentioned above, that Diesel-electric drive has its peculiar application, and here the reason for fitting would be our second requirement, namely, Flexibity; and by flexibility one does not mean flexibility of service, but flexibility of operation. The tug, for example, manœuvres so quickly and so rapidly that she becomes virtually a shunting locomotive. Particularly is this so in some of the world's harbours, such as New York, but it has a close parallel in the London river and in other parts of the world. In this connection it is interesting to note that a large steamship company which has hitherto used Diesel engines only for stand-by generating power in its steam-engine rooms is now reported to be considering the placing of orders for Diesel-electric ships for towing purposes. The same, too, applies to ferry boats.

What is the Future?

Questions of first cost, of course, must necessarily enter in, and for some time may disturb the shipowner not a little, but electrical companies should remember that their marine future, if such they desire as far as propulsion is concerned, lies essentially in offering to the shipowner an attractive proposition. This means that they may have to sacrifice considerably in price in the immediate future in the hope of obtaining substantial rewards in the later future.

It is the auxiliary electrical equipment of shipping which is going to give to the electrical contractor his biggest work in the next few years.

As an example of a recent ship fitted extensively with electrical equipment, we may consider the twin-screw, 9 000 H.P. motor meat-carrying ship "Tuscan Star," now on her maiden voyage to South America, which, it is claimed, has the largest refrigerated capacity of any vessel afloat. She has on board nearly sixty motors in all, in addition, of course, to the main generators and switchboards, cooking equipment, switches, wall plugs, sockets, cargo connection boxes, etc., electric fans and cabin heaters. Most of this material was supplied by one firm, the General Electric Co., and even a brief outline of some of the details of the total order gives an idea of what the auxiliary electrification of a ship means to a contracting firm. The main current is d.c., 220 V, and comes from four 320 kW Diesel-driven generators. The generators themselves are of standard compound-wound open type. The very fact of their being standard indicates also why auxiliary electrical equipment is so popular with electric firms, because it enables stock motors and stock generators to be placed on board. The main generators run at 250 r.p.m., and in addition there is a 15 kW emergency generator of compound-wound, enclosed ventilated type, operating at 500 r.p.m. All the motors for driving pumps, compressors, etc., are d.c. machines of enclosed ventilated, drip-proof marine type.

The modern ship, even though she be not an electrically-propelled ship, is in herself a small power station. Realise further that all this development and technique has come about virtually in the last ten or twelve years. Consider, also, that it has by no means yet reached its zenith, and then imagine further what marine electricity is going to hold out to the manufacturer in another ten or twelve years, for not only is the motor vessel which has been responsible for this development initially going to increase numerically, but also the electrically-propelled ship is going to occupy a position of increasing importance.

Wigton U.D.C. has withdrawn its opposition to the application of the Old Silkstone Collieries, Ltd., for a Special Order to supply electricity in the Council's area, as part of a scheme for West Cumberland. The promoters guarantee that mains shall be laid underground and the scheduled prices have been reduced from 8d. to 7d. per kWh for lighting, and from 3d. to 2d. for domestic and industrial purposes.

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SHIP AND SHORE TELEPHONY.*

The Rugby Transmitter—How Accurate Maintenance of Transmitted Frequency is Secured—Modulation—Connection to Land Lines.

By COL. SIR THOMAS F. PURVES, President of the Institution of Electrical Engineers.

THE land transmitter installed at the P.O. Radio Station at Rugby was manufactured by Standard Telephones and Cables Co., Ltd., and is adapted for working on several frequencies. These frequencies are generated by a piezo-electric quartz oscillator, provided with interchangeable crystals to the frequency in use by changing the tuning coils and re-setting the tuning condensers.

In short-wave working it is necessary to adjust and maintain the transmitted frequency within very accurate limits—of the order of one part in 10 000. It is also essential, in the case of a telephone transmitter, that "frequency modulation" shall not occur, which means that the transmitter carrier frequency must not vary during modulation. In the case of long-distance short-wave radio telephony, the transmitted signal does not travel directly over the surface of the earth, but reaches the receiver after reflection from the upper regions of the atmosphere. Since the ionised layer causing this reflection is very far from being a uniform plane surface, it is possible to have two or more radiation paths between the transmitter and receiver. These paths will, in general, have slightly different lengths, and consequently the signals by the various paths will arrive at the receiver in different phase relationships, with more or less mutual cancellation. The number and distances of these paths may be constantly varying, and the resulting phenomenon of "fading" has become all too well known. If, at the same time, frequency modulation of the transmitter is present, it is possible to have two or more carrier

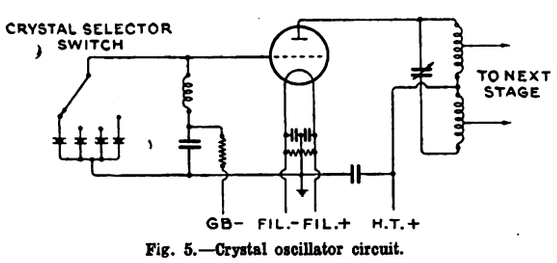

Fig. 5.—Crystal oscillator circuit.

waves of slightly different frequencies arriving simultaneously at the receiver. This will result in serious distortion of the received signals, since beats will be set up between the carriers, producing what may be called "spurious" modulation.

The most suitable means, at the moment, of ensuring the necessary stability of transmitted frequency is to use, as generator, a valve which has a quartz crystal connected between the grid and filament, and a tuned circuit between the anode and filament.

The piezo-electric quartz crystal, due to its peculiar properties, is equivalent to an electrical resonant circuit of exceedingly low decrement. If the anode circuit is adjusted to the natural resonant frequency of the crystal the valve will oscillate, and the *range* of the resulting frequency will be determined by the sharpness of the resonant curve of the crystal. Since the decrement is very low, this curve is very sharp, and any possible variation in frequency is, therefore, of a very small order.

Owing to the change in the Modulus of Elasticity for the material, the natural frequency of a crystal varies with change in temperature. To avoid this variation the crystals in the transmitter are enclosed in an oven, the temperature of which is automatically regulated within very fine limits by thermostatic control.

Fig. 5 shows the actual crystal circuit used, and indicates how the selection of the required crystal is effected. The anode d.c. input to the crystal valve is about 12 W. The natural frequency of a crystal is inversely proportional to its thickness. In the case of a crystal having a natural frequency of 3 000 kilo-cycles (100 metres) the thickness of the crystal is approximately 0·95 mm. It is not practical to reduce the thickness of a crystal much below this value without making it very fragile and liable to fracture when in use. Hence, if a frequency higher than 3 000 kilo-cycles is required, instead of cutting a crystal to generate this directly, a crystal having a lower natural frequency is used; and the frequency is multiplied in later stages of the transmitter. Thus, in the case of a frequency of 12 000 kilo-cycles, a crystal having a natural frequency of one-fourth—3 000 kilo-cycles—is used.

Fig. 6 shows a frequency-multiplying, or "harmonic-generating," circuit. A high-frequency voltage from the

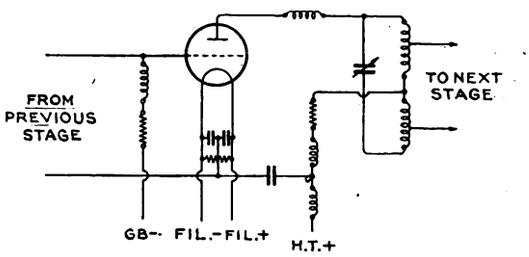

Fig. 6.—Harmonic generator circuit.

previous stage is impressed across the grid and filament of the valve, and, by applying a very high negative bias to the grid, a distorted, kicking wave-form, containing harmonics of large amplitude, is produced in the anode circuit. A considerable quantity of oscillatory energy, at one of these harmonic frequencies, will be generated if the anode circuit is tuned to the harmonic frequency. In practice the amount of energy is small if a high order of harmonic is selected, and usually only the second or third harmonic is used. The anode input to one of these stages is of the order of 150 W.

After the actual transmitted frequency has been produced by means of the harmonic generating stages, the output is stepped-up by a balanced amplifier. This amplifier operates on the well-known push-pull principle, and self-oscillation, due to the inter-electrode capacities of the valves, is prevented by cross-connecting the anodes and the grids of the two valves through variable neutralising condensers. Both grid and anode circuits are tuned to the frequency in use. The anode input to this stage is about 100 W, and the anode voltage is *modulated* at speech frequency. This is performed by means of the equipment shown in Fig. 7, modulation being effected by transformer coupling between the anode supplies to the low-frequency and high-frequency valves. The modulating

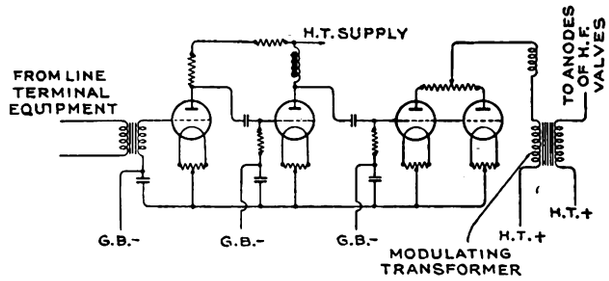

Fig. 7.—Modulating equipment.

equipment is quite straightforward, and embodies usual audio-frequency amplifier practice as used for broadcast reception, but on a larger scale. The final two valves, in parallel, handle an anode power of about 200 W.

The modulated output is then passed through two further balanced push-pull amplifying stages. These are similar to that already described, and the general arrangement is shown in Fig. 8. Both stages employ two water-cooled valves, the first taking an input of about 0·8 A at 4 500 V, and the final high-power stage an input of about 1·7 A at 8 500 V. It is noteworthy that the anode coils of these two stages are water cooled.

In order to reduce inter-action between the various stages, and also to give greater accessibility to the various components, the latter two amplifiers are each housed in independent screen cubicles, and are separated from the low-

* Abstract of the presidential address to the Students' and Graduates' Section of the I.E.E., delivered on April 11. The first part of this abstract appeared in THE ELECTRICIAN of April 25.

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power apparatus. Coupling between adjacent cubicles is carried out by open two-wire balanced transmission lines, and the output from the final stage is connected directly to the aerial feeder lines. The transmitter is capable of giving a high frequency carrier output to the aerial of 3½-5 kW, and under these conditions a low-frequency modulation of 90 % can be applied without distortion.

The high-tension d.c. supply for the anode of the final amplifying valves is obtained from 50 cycles alternating current, which is transformed up, rectified by three water-cooled valves, and suitably smoothed. All other supplies, including the direct current used for heating the filaments of all valves, are obtained from motor generators. This transmitter is connected to the land lines through an equipment

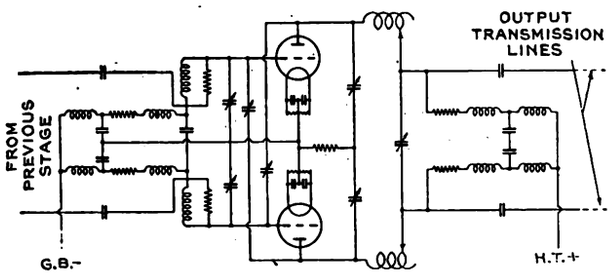

Fig. 8.—Amplifying stage.

which includes a volume indicator, an amplifier, the gain of which can be varied, and a variable attenuator, so that the transmitter can be lined up to be fully modulated by the normal line currents.

The remaining problem is that of connecting the service to the land lines of the country. The circuit is the equivalent of a four-wire circuit, that is, separate paths are used for the transmitted and for the received speech, as distinct from the ordinary two-wire circuit which exists between a subscriber's telephone and the exchange. The connection from the Rugby transmitting station to London is by 85 miles of underground cable. The receiver at Baldock is connected by over 30 miles of underground cable to London.

The special requirements of the wire-radio channel necessitate the provision of special technical control points equipped with control and testing apparatus, both at London and on the ship, at which are stationed skilled technical operators who continually observe the circuit while in commercial service. It is at this point in London that the two sides of the four-wire circuit are combined into a two-wire channel which can be connected to the ordinary telephone system of the country. On the ship separate pairs of wires are used for the two sides of the circuit, and these are connected directly to the telephone instrument in the special call box, one pair to the transmitter and one pair to the receiver. The terminal

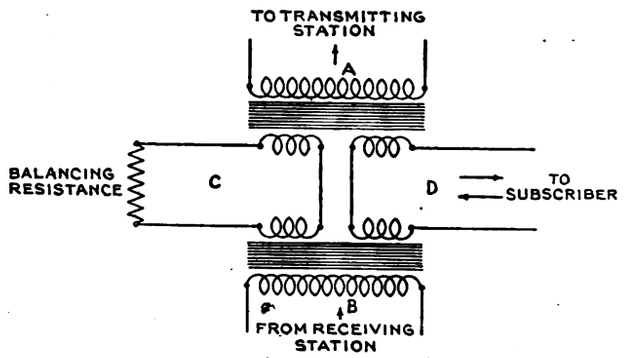

Fig. 9.—Hybrid coil.

equipment apparatus at London is grouped on two racks; the one comprising all the panels which require adjustment is known as the technical operator's position; and the other apparatus, known as the "voice operated device," is mounted on a special rack and forms a complete unit apart from the main equipment.

One of the most important duties of the technical operator is to see that the volume of speech sent to the transmitting station is constant and is such that the transmitter is always fully modulated. This ensures that the audio signal received by the ship is a maximum at all times, and that there is, therefore, a maximum ratio of signal to noise. The volume is controlled by means of a potentiometer device on the input to an amplifier, or repeater, having a gain of 40 Decibels—*i.e.*, a voltage step up of one hundred times.

The need for a voice operated controlling device arises as follows:—The ordinary four-wire telephone circuit has a multiple transformer at each end which is known as a "hybrid coil." This performs the function of combining the two sides of the four wire circuit into a two wire channel, which can be connected to the ordinary telephone system of the country. This coil has four windings, and is shown in Fig. 9. The coils "A" and "B" are connected to the transmitting and receiving lines respectively; the coil "C" is connected to a system of resistances known as the balancing network, and "D" is joined to the subscriber's line. With a coil of this type, if the impedance of the network is equal to the impedance looking towards the subscriber's telephone, there is no transmission from the receiving side to the transmitting side, although transmission is possible from "B" to "D" and from "D" to "A" with little attenuation. In practice, however, the impedance of the subscriber's circuit will differ from that of the resistance balance, and the condition of balance will not be accurately fulfilled. A certain amount of speech will therefore pass from the "receive" leg to the "transmit" leg—*i.e.*, from "B" to "A."

Assuming, for the moment, that this simple type of termination were used alone for a radio circuit, the general radio noise, picked up by the receiver from the ether, would pass to the transmitter and be re-radiated along with the speech of the land subscriber, with a degrading effect upon reception at the ship. Speech from the ship would also be radiated and would have the undesirable effect of allowing an eavesdropper to hear both sides of the conversation, as he would only need to tune to the frequency of one transmitter.

The Post Office Engineering Department has perfected a "voice operated device" which, in conjunction with the hybrid coil, prevents this defect. It consists, essentially, of a

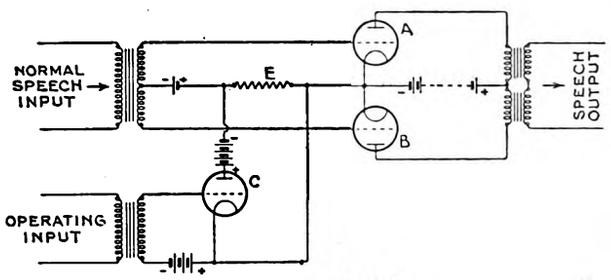

Fig. 10.—Valve relay device.

number of thermionic valve relays. Fig. 10 shows a very simple type of valve relay adapted to this purpose. Valves "A" and "B" are in a push-pull circuit and are biased normally to the mid point of their characteristics by the battery "D," when no current is flowing through the resistance "E." Valve "C" is an anode bend rectifier which, with zero input, allows no current to flow through its anode resistance "E." On the arrival of speech or tone at its grid, however, the anode current rises, a voltage being thus developed across "E" which makes the grids of the push-pull valves "A" and "B" very negative. The amplifier therefore becomes inoperative, and the passage of speech through it is prevented. The change-over operation occurs in less than three milliseconds.

A dial for remote control of the received sensitivity of the voice-operated device (dependent upon radio conditions), and a switch for varying the time hang-over of the voice-operated device for various line echoes and transmission irregularities associated with the local subscriber's connection are also included on the technical operator's position. A telegraph key is provided for use in conjunction with an oscillator to key Morse signals when lining up the circuits.

The gain control for both repeaters is in the form of a variable attenuator specially constructed in twelve steps of 2·5 dbs. from zero to 30 dbs. It may reduce the overall gain of the repeater unit by 5 dbs. for a strong talker, or increase it by 25 dbs. for a weak one. The control is varied in conjunction with the volume indicator and enables the technical operator to load the radio transmitter fully by maintaining a constant level of speech at this point in the system.

Adequate monitoring facilities are supplied to the traffic and technical operators ar various points in the four-wire

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links in order to check the satisfactory operation of the terminal equipment.

The terminal equipment in London plays, therefore, a highly important part in providing radio telephony services, because of its special functions in combining the receiving and transmitting radio links, together with important equipment and operations associated with long distance lines, which, in some services, often pass through two or three Continental countries.

The remaining apparatus necessary for completing a ship-to-shore telephone conversation follows fairly standard telephone practice. Since, however, it is a " person to person " service the traffic operation is more elaborate, and a special operator concentrates her attention entirely on one channel instead of looking after about six channels, as in the case of the ordinary trunk system.

The transmitter and receiver equipments on board ship are very similar to those described for the land stations, although in the case of the transmitter one stage less of power amplification is utilised, the output being of the order of 2 kW.

One of the problems met with on board ship is the noise introduced into the receiver by the effect of the transmitter carrier. The probable explanation of this trouble is that the various mast and funnel guys are energised by the transmitter.

If they do not make good contact with the main portion of the ship minute sparks will occur across the insulating film which will excite the system at its own particular natural period. Since such oscillations will be highly damped they will cause interference over wide bands of wave lengths, including those to which the receiver is tuned. The cure is carefully to bond to the main ship structure all such elements of potential interference.

The choice of wave-lengths for this service must be a matter of careful consideration. The short wave telegraph services and the closeness of transmitter and receiver aerials render the problem of greater difficulty than is the case with services between fixed points.

CANADIAN ELECTRICAL INDUSTRY.

Advances in Design of Equipment—High Speed Turbines—Movable Blade Propeller Runners —Automatic and Remote Control.

(FROM A CANADIAN CORRESPONDENT.)

DURING the past year many advances have been made in Canada, not only in the volume of new hydro-electric power development, but in the design of the equipment used in the various power plants which have been brought into operation. Turbine designers, for instance, have paid special attention to the development of turbines with high specific speeds, and in consequence there have been progressive increases in size and head of high specific speed or propeller turbines. An outstanding example is that of the Seven Sisters Falls plant on the Winnipeg River, where propeller runners of 37 500 H.P. will be installed to operate under a head of 66 ft. at 138·5 r.p.m.

A very interesting installation was made at the plant of the Montreal Island Power Co. on the Back River (or Rivière des Prairies) a few miles from the centre of the city. Here, owing to wide variations of head and river flow, movable blade propeller runners were used to overcome the disadvantages of part gate efficiencies inherent in the propeller runner with fixed blades. There are three Canadian Allis-Chalmers Co.'s (four bladed) and three Dominion Engineering Co.'s (six bladed) turbines, each rated 12 000 H.P. maximum rating at 26 ft. head, 8 800 H.P. best effective at 26 ft. head, and 7 150 H.P. at 18 ft. head.

In the field of Francis turbines, the largest were the four units for the Chute à Caron development of the Alcoa Power Co. on the Saguenay River. These units, built by the S. Morgan Smith-Inglis Co., will each develop 75 600 H.P. at 120 r.p.m. under 165 ft. effective head. The turbines are of the single runner vertical shaft type set in 17 ft. inlet diameter plate steel spiral castings. A special feature of the casting was the heavy butt strap joint construction. The units discharge through concrete elbow type draught tubes. The runners are annealed steel cast in one piece and weigh approximately 45 tons each. Renewable steel wearing rings are provided on the curb and crown plates. The main guide bearings are of the babbitted oil lubricated type, with a bore of 33 in.

In the field of high speed axial flow turbines there has been considerable activity during the past year. One of the most important steps made in recent years in the hydraulic turbine field has been the introduction of the Kaplan automatically-adjustable blade turbine by the S. Morgan Smith-Inglis Co. This turbine has been widely used in Europe for a number of years, but the first installation in Canada, that of the Nova Scotia Power Commission at their Tusket River plant, was not made until 1929. Here three turbines operate under from 18 to 27 ft. head, and are rated at 1 050 H.P. each, at 225 r.p.m. under 20 ft. head. The runner blades, four per runner, are controlled by the turbine governor, and are so regulated that they are always held in the position for the turbine wicket gates. Lignum vitæ water-lubricated type bearings have been mostly used, but babbitted guide bearings have been gaining popularity and the recent improvements in rubber bearings have resulted in a growing use of this type with water cooling.

In the design of water wheel driven generators there is a tendency to use structural steel instead of cast parts. In form, also, the umbrella type is gaining in favour, the most notable installation last year being the 12-sided welded steel plate, 10 000 kVA units in the Montreal Island Power Co.'s new plant. Among the economic advantages of these modifications are lower first cost of the machine, reduction in head room required for handling moving parts, consequent saving in superstructure costs, and reduction in delivery time.

A great deal of attention has been given to problems of generator lubrication, the general tendency being toward unit systems, unless there are more than five units in a plant, in which case a central lubricating system is usual. Self-enclosed generators are growing in favour on account of the decreased dust accumulation therein, and because this type lends itself readily to carbon dioxide fire protection systems. Such fire protection systems have been installed in a number of large stations.

Owing to the increased cost of labour in stations of standard design it is imperative, in many instances, especially in smaller stations, to design them for complete automatic or for remote or for supervisory control from adjacent plants, while at the same time the method of control must be of as simple a nature as possible. Some of the earlier plants with supervisory control have given considerable trouble, and have not fulfilled the expectations of their designers. It is a recognised fact that there must be some attendants at a hydro electric station, and, consequently, remote or supervisory control can be very much simplified.

Self-cooled transformers are being increasingly installed, as the high cost of maintenance of a water cooling system offsets the decreased cost of the water-cooled units, especially where extremely cold weather is experienced for months at a time. In addition the ratings of the self-cooled units may be increased by the addition of blowers. Outdoor transformer stations are becoming more common at large stations. The use of outdoor switching is also increasing, and is practically universal from 100 kV upwards. There is a general tendency toward the simplification of diagrams of connections, especially with the higher voltages of the 110 and 220 kV systems.

In the design of systems for the distribution of power there appears to be a number of definite trends. Sub-stations are being built with larger capacities, and on the whole are much superior in design and protection than formerly. Transformers are, wherever possible, placed outdoors, and open bus-work is being replaced by underground cables. Distribution centres feed smaller areas with the resulting smaller losses and stresses. Municipalities are installing underground cables for primary feeders and for economic reasons are changing over from 2 300 V three-wire delta to 4 000 V four-wire star grounded. The question of rates and the practice of allowing " high peak " customers to penalise systems continues to receive attention.

It is proposed to instal at the Shropshire, Worcestershire and Staffordshire Electric Power Co.'s Stourport generating station an additional 37 500 kW turbo-alternator, which will bring the total plant installed up to 112 500 kW. Thirty miles of condenser tubes will be required.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Safety in Domestic Electrification.

[To the Editor.]

Sir,—I have read with great interest the above article by Mr. T. C. Gilbert which recently appeared in your columns. It may surprise your contributor to know that I am thoroughly in agreement with the views he has put forward on this subject. I regret that he considers I am a "well-known complete earthing advocate." I presume he gathered this impression from an article of mine, entitled "The Earthing of Domestic Portable Appliances," printed in the "Electrical Review" on February 11, 1927. I have always felt that we were on the wrong track in installing all metal-clad portable equipment in the home. In support of my contention I recently championed the cause of insulation by opening a debate entitled "To Earth or Insulate?" at the Birmingham Electric Club, Mr. R. Grierson being my opponent. If my memory serves me correctly, the majority of the members present held Mr. Gilbert's views on this question. The whole matter appears to turn on the point that the manufacturers are prepared to put forward the type of apparatus to which he refers, but the contracting and supply sections of the industry must create the demand to justify its manufacture. Co-operation and agreement are, therefore, needed in all branches of the industry dealing with domestic electrification before any headway can be made in this desirable direction of all-insulated apparatus.

The position in this matter of earthing or insulating, in the domestic sphere, appears to me to be as follows: We enclose electrical apparatus by metal which is liable to become alive, and then proceed to eliminate this danger by earthing. Surely, the common sense procedure is to enclose such appliances, fittings, etc., by material which inherently cannot become alive, that is, an insulating material should be used. The difficulty in the past appears to have been that there was no material of a practical nature which would be utilised. Manufacturers are now rising to the occasion and it is up to the other interests to create the necessary demand.—Yours faithfully,

Reg. H. Rawll, A.M.I.E.E., A.M.I.Mech.E.

Birmingham, April 14.

[To the Editor.]

Sir,—Mr. H. W. Clothier lodges a complaint against Mr. Gilbert for incomplete quotation of his remarks. I also can complain, because a brief mention, as given, may lead to misunderstanding.

From the electric shock viewpoint, Mr. Gilbert cannot deny that the safest place for anyone is on (or as close as possible to) the point protected by earthing.

The danger of accident may be carried from the e.h.t. supply through the transformations down to the l.t. domestic services and, where there is no earth circuit, or where there is considerable impedance or resistance between the supply-end earth and the domestic service installation, the danger can generally be taken as relatively greater, as also continuity for the insulated system or circuit relatively less reliable, than a system or circuit earthed in accordance with the writer's recommendations, i.e., earthed to offer the best security and a low and evenly distributed resistance.

In the writers' proposed installation, illustrated and explained in the book, "Electricity Supply Transformer Systems and their Operation," only one insulated wire and terminal are required. One insulated wire and one insulated terminal for plug, socket, holder, etc., are cheaper and more reliable than two; for equal dimensions of plug, socket, etc., the insulated circuit is much more reliable and the safety of the domestic electrification is materially increased. The metal or outer parts of wire, plug, holder, etc.—for greatest safety—are solidly earthed at one point *only*, i.e., on the water main.

The long disputed question among engineers is the manner of earthing the circuit and/or the exposed metal and/or semi-insulated parts of the installation fittings. The writer "takes the bull by the horns" by using only one insulated wire and having all exposed metal parts and/or the return wire and/or metal conduit and installation fittings form part of the earth-return circuit connected in multiple on each domestic electrification, thus offering the best help to each other from the safety standpoint for the least cost of installation. A domestic electrification of this kind offers the highest insulation for equal dimensions, etc., for the insulated circuit, the maximum safety and the least costly installation. As regards existing regulations, the writer is fully aware of their scope.—Yours faithfully,

William T. Taylor.

London, N.2., April 17.

Dark Flashes on Lightning Photographs.

Sir,—The photographs on page 368 in the March 21, 1930, issue of The Electrician, entitled "A Transvaal Thunderstorm," and particularly the explanation of the dark flashes on the first photograph as being probably due to "red flashes of low actinic power" have come to my attention.

I spent two years in the 2 000 000 V Ryan High Voltage Laboratory at Stanford University, during which time hundreds of photographs of discharges were taken, many of which showed the phenomenon of dark flashes, and was at first very puzzled. Some photographs showed flashes entirely dark; some showed the spark having a dark core; in others the spark had a dark outline, as one of the main flashes in your photograph has.

Subsequent investigation showed that such occurrences were the result of photographic reversal and re-reversal. One ordinarily thinks of the density of the photographic negative as increasing with the exposure time-intensity product. This is true up to a certain point where the density begins to decrease, reaches a minimum and then increases again. This cycle may be repeated two or more times.

Thus the branches of the main flash which were dark in the print had sufficient actinic power to cause the first reversal, and the main flash was bright enough to bring about a re-reversal except on the edges which are dark.—Yours faithfully,

Robert D. Boynton.

San Francisco, Cal., April 11.

FRENCH ELECTRICAL TRADE.

French imports of electrical goods in 1929 were valued at Fr. 629 475 000, against Fr. 422 651 000 in 1928 and Fr. 227 878 000 in 1927. Exports were valued at Fr. 453 311 000 in 1929, compared with Fr. 420 724 000 in 1928, and Fr. 374 941 000 in 1927. The adverse balance was, therefore, Fr. 176 164 000 in 1929 against Fr. 1 927 000 in 1928. In 1927 there was a favourable balance of Fr. 147 063 000.

The values of imports of the principal classes of electrical goods were :—

	In thousands of francs.		
	1929	1928	1927
Machinery and transformers	117 178	66 077	52 847
Apparatus	270 398	172 769	81 088
Lamps and valves	100 706	83 748	39 014
Cables, wires and flexibles ..	74 791	53 697	22 557
Accumulators, and parts ..	9 149	4 509	2 338

The values of exports of the same classes of goods during the same years were :—

	In thousands of francs.		
	1929	1928	1927
Machinery and transformers	85 664	108 226	86 898
Apparatus	147 411	136 960	140 865
Lamps and valves	31 363	25 414	24 920
Cables, wires and flexibles ..	65 329	46 832	31 414
Accumulators, and parts ..	31 875	18 565	20 919

LONG DISTANCE D.C. TRANSMISSION.

At a recent lecture in Berlin, reported in the "Electrotechnische Zeitschrift" of January 30, M. Réné Thury declared that the transmission of 60 000 kW over a distance of 600 miles at 300 000 V d.c. might prove simpler and more economical than by the a.c. system. Between Moutiers and Lyons d.c. transmission for 280 miles at 125 000 V at full load is actually in operation, 45 miles of the route being underground. Up to 300 miles a.c. is supreme but above that limit d.c. has attractions and M. Thury contends that the utilisation of very remote sources of water power will only be economically possible with d.c. transmission. To transmit 60 000 kW for 600 miles with two wires and earth return neutral, allowing for a voltage drop of 20 per cent. and 10 kV for commutators, nine generators, each with two commutators connected in series would be required, giving 400 A at a maximum potential of 180 000 V to earth. The diameter of the conductors would have to be ⅜ in., equivalent to 76 lb. per kW transmitted, but the cost could be reduced by the use of aluminium conductors.

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NEWS IN BRIEF.

French Police Radio Service—Talkies in Palestine—Wireless Telephone Communication with Canadian Trains—Appointments Vacant.

A WAR tank has been adapted as a transformer kiosk at Ashford, Kent.

The West Gloucestershire Power Co. requires an assistant consumers' engineer.

The 57th meeting of the American Electrochemical Society will be held at St. Louis, Miss., on Thursday, Friday and Saturday, May 29, 30, and 31.

Designers with experience in the design and construction of light precision mechanical or electrical machinery are required for an Admiralty establishment near London.

On April 24, members of the Birmingham and Midlands Branch of the Electrical Association for Women heard Mr. T. Catten give an interesting lecture on "Electric Lighting in the Home and School."

Stoke-on-Trent Cpn. is to instal a fire alarm call system at the mental hospital, at a cost of £140.

The employees of the Clyde Valley Electrical Power Co. have contributed £516 to charities during the year.

St. Pancras (London) B.C. has accepted a tender, amounting to £19 470, for the erection of an electricity sub-station in Arlington Road.

A recent experiment in radio telephonic communication between Geneva and the liner "Majestic" in the North Sea is said to have given satisfactory results.

The Standing Committee appointed by the Board of Trade will hold an inquiry, on a date not yet fixed, as to whether magnetos, batteries, and ignition plugs for motor vehicles should bear an indication of the country of origin.

The next meeting of the Physical Society will take place on May 9 at the Imperial College of Science, South Kensington. Amongst the papers to be read is one by Mr. E. J. Williams on "The Inductance of Electromotive Forces in a Moving Liquid by a Magnetic Field."

The short-wave wireless station on the Eiffel Tower, Paris, is to be used as the centre of a police radio service. Receiving stations will be established all over France and at boundary towns and seaports, and broadcasts will take place at intervals of an hour at a wavelength unknown to all except the police.

At the recent annual general meeting of the Batti Wallahs Society, a sum of five guineas was voted to the Royal National Lifeboat Institution. A proposal to create a Charity Fund was not adopted, but the meeting decided that half the sums obtained from new members in entrance fees shall be set aside for charity.

Applications for technology research scholarships, each of a value not exceeding £100, and tenable during the year 1930-31 at the Manchester Municipal School of Technology, must be sent in by June 27. A preference will be given to suitably qualified Manchester students. Forms of application and further information can be obtained from the Registrar.

The Canadian National Railways have put into operation a telephone system by means of which a traveller on the "International, Limited," which runs daily between Montreal and Chicago, can complete a call to his residence or place of business. Communication with the train can also be made from Montreal, Toronto and elsewhere. A conversation between Mr. C. J. Smith, in the London Offices, and Sir Henry Thornton, in the train, took place on April 27.

At a meeting of the British Institute of Radiology in the Reid-Knox Hall, 32, Welbeck Street, London, W.1, on May 15, following the annual general meeting, which takes place at 8.30 p.m., Mr. P. J. Kerley will read a paper on "The Pathology of Early Pulmonary Tuberculosis as revealed by X-Rays." The Institute is issuing to all hospital authorities in Great Britain and Ireland a Memorandum on Hospital Policy regarding Radiological Services.

A chief engineer and manager is required for Nottingham Corporation's electricity undertaking.

A graduate assistant in electrical engineering is required at Rutherford Technical College, Newcastle-upon-Tyne.

Dorchester Markets Committee has instructed the Town Clerk to obtain estimates for the adequate lighting of the Market House.

The next luncheon of the Batti Wallahs Society will be held at the Hotel Metropole, London, on May 22, when Sir Edward T. F. Crowe will be the chief guest.

The eighth general meeting of the Society of Radiographers will be held in the Reid-Knox Hall, 32, Welbeck Street, London, W.1, on May 14, at 7 p.m. Mr. C. H. Holbeach will read a paper on "The Planning of an X-Ray Department."

A cinema house in Jerusalem and two cinemas in Telaviv have completed arrangements with the Western Electric Co. for the installation of "talkie" apparatus.

An electrical engineer is required by the Government of Burma. Application forms can be obtained from the Secretary to the High Commissioner for India, India House, Aldwych, London, W.C.2.

The British Association for the Advancement of Science, of which Prof. F. O. Bower, F.R.S., has been elected president, will hold its meeting at Bristol this year, commencing on September 3.

The Chloride Electrical Storage Co., Ltd., announces that the Exide Service Convention Banquet will be held at the North British Hotel, Waverley Station, Edinburgh, on Wednesday, May 28.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of May 1, 1880, recorded a proposal to utilise the falls of the Genesse river at Rochester, N.Y., for the generation of electricity.*

A proposal to light Regent Street, London, by electricity at a cost of 2½d. per lamp per hour was rejected by the St. James's Vestry on the ground of cost.

A method of "seeing by telegraph," suggested by Mr. Middleton, was briefly outlined.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of May 5, 1905, Mr. J. H. Rider and other correspondents were advocating the use of larger generating units, Mr. R. L. Gamlin expressing the opinion that the small station in England should soon be a relic of the past.*

Eastbourne Corporation accepted the offer of a firm to equip one of the Stirling boilers at the electricity works with a mechanical stoker and a motor-driven fan for forced draught for a three months' trial free of cost.

At a recent meeting of the Institution of Naval Architects, Mr. J. Johnson remarked that the shipowner was becoming more and more interested in the possibilities of the turbo-electric drive, and Mr. A. D. Constable, of the Admiralty, said there was no doubt in his mind as to the superiority of turbo-electric drive for the projected new fast Atlantic liners, and British engineering firms could supply it.

A further step in the progress of automatic telephony was made when the eight exchanges serving Maidstone and the surrounding district of Barming, Boughton Mouchelsea, Bearsted, Otham, Aylesford, Wateringbury and Hunton were brought into operation last Saturday. These exchanges, which were manufactured and installed by Standard Telephones and Cables, Ltd., have been designed to accommodate 3 360 subscribers' lines initially, with an ultimate capacity of 9 150.

Eighteen fast electric lifts, capable of carrying two hundred and fifty passengers at a speed of four hundred feet a minute, are being installed in the new Thames House, next to the Imperial Chemical Industries Building, Westminster. The two large central lighting courts, approximately forty feet wide and over one hundred feet long, will be flood-lighted during dark and foggy weather. All corridors will be lighted continuously through large ceiling panels by electric light of daylight quality. The artificial light will lend an impression of sunlight throughout the building, even on the dullest days.

Lord Parmoor (Lord President of the Council), with other members of the Ministry, received, on April 10th, a deputation from the Science Advisory Committee of the Labour Party, who submitted suggestions for the development of industrial research. Lord Parmoor said the primary needs of man—food, fuel, habitation and clothing—were well covered by the laboratories of the Department of Scientific and Industrial Research, and the research associations; while the Forest Products Research Laboratory, the Mines Department and the Geological Survey provided research in regard to the use of wood and minerals.

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THE BATTI WALLAHS.

Should the Electrical Industry be Classed as A1?

A LUNCHEON of the Batti Wallahs' Society at the Hotel Metropole, London, on Wednesday, marked the initial meeting of Mr. W. McCelland, the newly elected President. The guest of honour was Mr. F. W. Purse, who chose as the subject of his remarks "Have We An A1 Industry?"

Mr. F. W. Purse, who was the chief guest at Wednesday's luncheon.

In opening his address, Mr. Purse, said that in his opinion the general conditions prevailing in the industry left much to be desired. He did not wish to imply that the going was not good, but we failed to remember that the going might be better. In fact, the existing conditions reminded him of that popular song "Give Yourself a Pat on the Back," etc. In the manufacturing world there were many cases where staffs of different companies were doing the same work, tackling the same problems and pursuing the same researches. There was a variety of electric cookers on the market and he could see no reason why some standard design could not serve as useful and better purpose. He quoted as an example of co-operative development the film manufacturing industry, where firms were closely co-operating to produce not a mutiplicity of films, but one film and one only. Mr. Purse also touched upon the publicity organisation of the electrical industry, comparing it with the tobacco industry, suggesting that a campaign as forceful and as national as the "Plus Two" cigarette campaign should be launched on behalf of electricity.

As far as he could see, each manufacturer and supply undertaking was lacking in that co-operative spirit necessary for the good of industry as a whole. Each and all were more concerned with gaining something over his competitor rather than with gaining something for the collective industry. It should be remembered that the fattest pig in the sty was not always the healthiest.

For good or for ill, the 1926 Act, like all other acts of Parliament, would not be rescinded until it had proved itself a failure, and so far as the 1926 Electricity Act was concerned, this need not fail unless we made it fail. If he were an electrical Mussolini, he would place a ban on all possible imports of goods which could be made in this country, and he would relegate the big men in the industry to those places appropriate to their specialist knowledge and abilities. Cable factories in the north would supply the requirements in the north, while those in the south would be met by southern factories. The fullest interchange of ideas and men would be encouraged, and so long as the industry as a whole acted in a co-operative spirit, it would receive its great reward.

Lt.-Col. W. A. Vignoles, in proposing a vote of thanks, said that he believed Mr. Purse's views were another aspect of rationalisation. There was no doubt that more would have to be done in the publicity effort required to sell electrical goods. A greater and wider use of publicity was needed for the successful selling of electrical service.

COUNTRY HOUSE LIGHTING.

The CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester, has issued a booklet entitled "Electric Light in Your Country House." This little publication reviews the problem of lighting country residences, both small and large, in a particularly entertaining and informative manner, is well produced and makes for easy reading. As its title suggests, the publication deals with self-contained generation plant for installation in houses where no public electricity supply is available. The booklet not only deals with the plant and battery problems but gives also approximate costs of the complete installation for houses of different sizes. The story, as told by the writer of this issue, opens with a noctural hunting adventure and compares the conditions under which the hunt may be pursued first by candle light and then by electric light. The publication is extremely well written and can justifiably claim to be something out of the ordinary.

PERSONAL.

SIR Edward Manville, who is in Roumania, will return to England in the middle of May.

Mr. W. T. Upton, electrical engineer, of Oxford, has been elected a life vice-president of the Oxford City cricket and bowls club.

Mr. Robert Traill, electricity engineer at Lossiemouth, has been granted an honorarium of £20 by the Town Council for extra duties.

Mr. W. G. Bedford, electrical engineer, Slough, has been elected a member of the Executive Committee of the Slough Chamber of Trade.

Mr. L. F. Fogarty, managing director of the Zenith Electric Co., Ltd., was recently elected to the Ruislip-Northwood Urban District Council.

Mr. Percy Wardle has been appointed engineer and manager to Cannock electric supply department. For ten years Mr. Wardle has been mains engineer to Walsall electricity department.

Mr. P. M. Rossdale and Mr. A. M. Sillar have been re-elected chairman and deputy chairman respectively, of the Electrical and Allied Trades' Section of the London Chamber of Commerce.

Bermondsey Borough Council has appointed as deputy engineer and manager of the electricity undertaking Mr. B. C. Ward, electricity distribution superintendent, Croydon Borough Council.

The marriage took place on April 19, at St. Luke's Church, Ramsgate, of Mr. Sydney R. H. Castle, who is on the staff at the depot of the Isle of Thanet Electric Supply Co., Ltd., and Miss L. M. Prior.

Mr. H. C. Penrose, electrical engineer, Redruth, was married recently, at Padiham Wesleyan Church, to Miss K. Isherwood. Mr. Penrose was formerly in the employ of the Lancashire Electric Power Co.

Following the retirement of Mrs. C. T. Allan from the chairmanship of the South Wales and Monmouthshire Branch of the Electrical Association for Women, Mrs. Morley New, her successor, presented Mrs. Allan on April 15 with a writing bureau.

Mr. John A. Sumner, assistant engineer to the Mid-Chester Electricity Supply Co., has been appointed distribution engineer to the West Midlands Joint Electricity Authority, which controls an area of 1 200 square miles in Shropshire and Staffordshire. See page 565.

Miss Ruth F. Kennedy, who joined the staff of Glasgow Electricity Department in 1915 as a demonstrator, and who founded the Glasgow and District Branch of the Electrical Association for Women, was the subject recently of an appreciative article in the Glasgow "Evening News."

Mr. A. R. Fyvie, superintendent of Dundee tramway works, has retired under the age limit. At a social gathering in the city he was presented with a writing desk by the employees and staff of the works. The presentation was made by Councillor George, convener of the Tramways Committee.

Mr. F. H. Howell has been appointed sales organiser to Domestic Electrification, Ltd. Mr. Howell was recently commercial assistant engineer to Battersea (London) B.C., and, had previously ,many years experience with the County of London Electric Supply Co., Falkirk Iron Co., and Hotpoint Electric Appliance Co. Mr. Howell's offices are at Townsend House, Greycoat Place, Westminster, S.W.1.

Mr. S. G. Davey, who has been tramways traffic superintendent, under the Exeter Corporation since 1924, has been appointed to a similar position under the Derby Corporation. Mr. Davey commenced his tramways career with the Rotherham Corporation in 1912. When demobilised in 1919, he resumed his post with the Rotherham Corporation, and in July of that year was appointed traffic inspector, continuing to hold the position until he went to Exeter.

Obituary.

MR. JOHN IRVINE FOSTER, on April 17, aged 23 years. Mr. Foster was studying electrical engineering at Rugby with the British Thomson-Houston Co., Ltd. His death was caused by a motor-cycling accident.

MR. OCCOLA JAMES COOPER, on April 17 at the age of 70 years. Mr. Cooper, a partner in the firm of Shiner and Cooper, electrical engineers, Winchester, had been in business in the city for over 40 years, and prior to entering into partnership with Mr. Shiner, was an electrical engineer with the late firm of Lloyd and Sons, of The Square.

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BUSINESS ITEMS.

THE Leeds branch of CRYSELCO, LTD., has been moved to 43, York Place.

Mr. JAMES MCKENZIE, electrical and radio dealer, has opened his new premises at 27 and 29, Grange Road West, Birkenhead.

Plans of a new workshop in Liverpool Road, Slough, for the ST. HELEN'S CABLE CO., have been passed by the Slough U.D.C.

Mr. P. T. KING, electrical engineer, Manchester Street, Luton, is reducing his stock by means of a sale owing to the expiration of the lease of his premises.

The WHOLESALE BATTERY CO., electrical and radio engineers, Luton, have removed their business to larger premises, with modern showrooms, in Manchester Square.

The telephone numbers of GEORGE H. SCHOLES AND CO., LTD., electrical engineers, Blantyre Street, Hulme, Manchester, have been changed to: Blackfriars 5294 and 5295.

Owing to the increased demand for Tungsram products in Italy, TUNGSRAM ELECTRIC LAMP WORKS (GT. BRITAIN), LTD., has opened a new factory at Milan. Further details can be obtained from the London offices.

The address of the ATLAS ELECTRIC AND GENERAL TRUST has been changed to Pinner's Hall, Great Winchester Street, London, E.C.2. Telephone: London Wall 9690. Telegraphic address: Hydrolipo, Stock, London.

At a trade exhibition which is being held at Hastings until to-morrow (May 3), four stands are occupied by Messrs. WEBBER AND HUDGELL, electrical and wireless engineers, Hastings and Rye. They are giving demonstrations with electric washing machines, ironers, cookers, etc.

At an Industrial Trades Exhibition which was opened at Whitby on April 23, Messrs. BARRATT BROS., of Baxtergate, Whitby, displayed electric heating, cooking, lighting and labour saving apparatus, and gave information to visitors regarding the Urban District Council's new hire-purchase installation system.

We are informed that a Norwegian fisherman who always carries a PHILIPS 2502 receiver on board was one day far out at sea with a number of other fishing boats when the weather began to look threatening. He was advised to heave to and ride it out, but having heard on his radio that no storm was expected, he decided to go back to harbour, and, arriving long before the others, disposed of his catch at high prices.

On and after May 8th, the London office and show room of WM. SANDERS AND CO., switchgear manufacturers, will be removed to more suitable premises at 78, Neal Street (off Shaftesbury Avenue), W.C.2. Larger stocks of standard running lines will be carried to meet urgent needs, in addition to those normally held by the firm's authorised wholesale stockists. Telephone: Temple Bar 8984; telegrams (as before): Sandecco, Westcent, London.

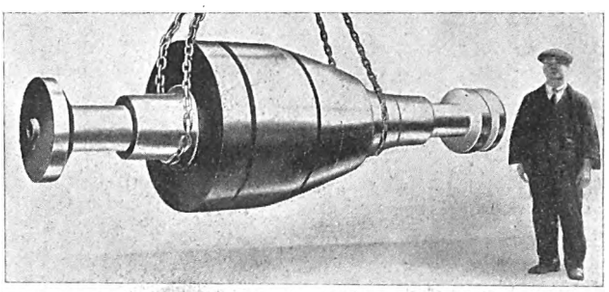
With reference to the ship-to-shore radio telephony service now in operation between this country and the White Star liners "Olympic" and "Majestic," the International Marine Radio Co., Ltd., advise us that this is now extended to France, Belgium and Holland. Arrangements are also completed for the facilities to be further extended in the course of a few days to Germany, Switzerland and Spain immediately the approval of the respective administrations is received. The same land line service is being employed as is used for the England-U.S.A. transatlantic service.

The contract for the electric lighting of Brighton's new super cinema and cafés, the Savoy, Junction Parade, for Associated British Cinemas, Ltd., has been placed with W. DRAPER AND CO., LTD., of Glasgow. The auditorium takes the form of a Japanese garden, and the lighting effects are arranged to give an even and diffused form of illumination. All the lighting will be controlled through specially designed switchboards with dimmers. The same firm recently completed the installation of the lighting scheme in the Ritz Cinema, Edinburgh, for the same company.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have called our attention to an appreciation by Pietro Mascagni, composer of Cavalleria Rusticana, of radio transmission of music. He said recently when attending to the amplification adjustment of a broadcast of his famous opera that it seemed to him as if he had created a new intermezzo entirely different from the old and familiar one. He believes that radio not only reproduces music, but even improves it and brings entirely new possibilities for its development. Accordingly he is giving the new 50 kW transmitter at Rome his full support.

LARGE ROTORS.

THE increasing size of turbo-alternator sets with one-piece rotors for the turbine or alternator is to a large extent governed by mechanical stresses permissible in the rotor. It is safe to say that in the development of such sets one of the severest handicaps to the designer is the lag which the steel manufacturer has not yet bridged—in other words, design can definitely be said to be dependent upon the resources of the metallurgist. It is only by advancing these resources that larger designs can safely be proceeded with.



A one-piece rotor in the rough machined condition as delivered to the turbine maker.

The manufacture of a large one-piece rotor forging is a difficult and, indeed, a hazardous operation. Even when every precaution which long experience of steel making, ingot casting, forging and heat-treatment can suggest has been taken, the resulting rotor is frequently not allowed by the forgemaster to go forward to his customer, and the great care and expense is found to be wasted. In such cases a second forging has to be made.

The various steps which are comprised in the manufacture of such forgings are therefore very carefully controlled. The ingot is cast from acid open-hearth steel made from selected, scrap pig-iron low in sulphur and phosphorous, with the necessary alloy (nickel and chrome) additions. It is cast in octagonal or dodecagonal ingot moulds with very liberal sinking heads. The shape of mould is chosen to minimise internal stresses in the ingot as the steel solidifies, and the very large sinking head localises segregation and piping in the upper portion of the ingot, which is afterwards discarded.

The heating of these large ingots (which weigh from two even to three times as much as the finished forging), the forging operations, and the subsequent heat treatment are all carried out with extreme care to avoid internal cracks or stresses which might lead to cracks. The rotor as delivered to the turbine maker should exhibit a high yield point, and test pieces taken from portions of the forging mutually at right angles (i.e., radially, longitudinally and tangentially) should show substantially identical results.

The photograph shows a large one-piece rotor in the rough machined condition as delivered to the turbine maker. This particular rotor was forged by Steel, Peech and Tozer, Ltd. (of The United Steel Companies, Ltd.), Sheffield, for the English Electric Co., Ltd.

It has a length of 11 ft. 5 in. and a maximum diameter of 3 ft. 3 in. The test results are as follows:—

Test Piece	Max. Tensile Stress	Elongation	Redn. of Area	Yield Point
Longitudinal ..	41·33 tons	27·5%	48·5%	24·1 tonss
Radial ..	40·26 ,,	24·0%	33·5%	23·2 ,,
Tangential ..	39·55 ,,	26·5%	37·8%	23·2 ,,

The physical properties of this large rotor forging are typical of present-day practice, and as such are noteworthy. The close agreement between the tests taken in the longitudinal, radial and tangential directions is exceptionally interesting.

MINES DEPARTMENT TESTING STATION.

The Secretary for Mines announces that, for reasons of administrative economy, and also with a view to securing closer collaboration between the staffs of the Mines Department Testing Station and the Safety in Mines Research Board, he has decided, in agreement with the Board, to transfer the testing station from the existing premises (at 42, Arundel Street, Sheffield), to a portion of the buildings occupied by the Board in Sheffield. The removal of the testing apparatus and plant will probably cause some slight delay in the official testing of safety lamps, electric bells and relays, telephones, etc., but every effort will be made to reduce such delay as much as possible.

The address of the new testing station is Mines Department Testing Station, St. Thomas Street, Sheffield.

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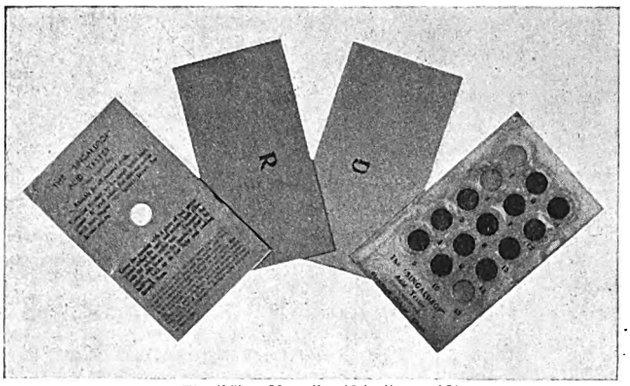
BATTERY TESTING.

WE have received from Mr. A. E. Bawtree particulars of two battery testing devices, together with samples. The first consists of a "battery blotter" which possesses the property of changing colour when brought in contact with



The "Signaldrop" acid testing outfit.

accumulator electrolyte. The blotter which in its unused condition is a greenish-grey colour, gives an indication of specific gravity by virtue of the fact that by placing on the blotter a small drop of acid by means of a match stick, the wetted surface will change its colour to orange, brown or green, according to whether the cell is fully charged, half charged or discharged, in the order given. The battery blotter is not, of course, as accurate in its indication as a hydrometer reading, but it does nevertheless serve as a useful guide with respect to the state of the battery. The only comment of a serious nature which we can make is that, in our opinion, the blotter should be supplied in a grease-proof wrapper thus protecting it to some extent from atmospheric action with consequent discolouration.

The second device is designed on the same principle but is more elaborate and gives opportunities for a greater number of "readings." Two small books of test paper are provided—one for strong acids (red) and the other (green) for dilute acids. The papers are used in conjunction with a waxed holder, pierced in the centre so that access is given to a small area of the test paper. On moistening with acid this exposed portion on both sides, the colour assumed by the paper is compared with a range of colours on a chart provided by holding both to a light source and looking through them. The chart is calibrated as to colour and specific gravity, similarity between the colour of the test paper and the standard giving, within limits, the s.g. of the solution.

The "Signaldrop" acid tester, as it is called, is intended to bridge the gulf between the rule-of-thumb worker and the laboratory-controlled process, enabling the ordinary worker who uses any form of mineral acid solution to determine whether such solution is within the limits of proper working strength. Readers desiring further information of the tester should communicate direct with Mr. Bawtree at 20, Manor Park Road, Sutton, Surrey.

LONDON CHAMBER OF COMMERCE.

Report on the Past Year's Work of the Electrical and Allied Trades' Section.

IN the annual report of the Electrical and Allied Trades Section of the London Chamber of Commerce it is stated that further consideration has been given to the suggestion that the Section should be reorganised to represent more effectively the electrical manufacturing industry. The list of members was examined and was found to comprise electrical interests of a miscellaneous character, including agents, trade associations, cable companies, engineers, electrical manufacturers, merchants and importers, supply companies and telephone services, and fulfilled a useful function in dealing with questions of a general character and of common interest, such as legislative measures. It is not considered necessary in these circumstances to pursue the proposal further. Under the Rating and Valuation (Apportionment) Act, 1928, in the case of premises used partly for purposes of storage or wholesale distributive business, the question of whether they are primarily industrial or distributive has to be settled according to the extent of the use of the premises for these different purposes, and difficulty has arisen in such cases.

POWER EQUIPMENT.

An Oscillation Limiter for Surge Protection of Transmission Lines.

TRANSMISSION engineers may be interested in the oscillation-limiter for surge protection, type B.L.R., manufactured by STANDARD SWITCHGEAR, LTD., of Albion House, 59, New Oxford Street, London, W.C.1. This surge protector is claimed to be an improvement over static condensers for use in dissipating surges of medium and low frequency such as are encountered in h.t. networks. It is not continually in operation like the condensers, but acts only at the moment when there occurs an over-voltage of sufficient magnitude. At the instant of the breakdown of an air-gap through over-voltage a damping resistance is automatically connected to the line to be protected, and it is stated the surge is dissipated within a fraction of a cycle of the normal line current. The chief component parts of this protector are therefore a suitable damping resistance and an adjustable spark gap which enables the amplitude of the critical surge (above which the device operates) to be predetermined. Though these two components determine the efficiency of the apparatus as far as its protective effect is concerned, the arc extinguishing device is also of interest, especially as it influences the design of other parts of the apparatus, such as damping resistance. The dimensions of the damping resistance are governed rather by the heat generated by the line current than by the energy to be dissipated. Thus a slow-acting arc extinguisher requires a large resistance, whereas a smaller resistance can be used with a rapid-acting extinguisher. The principle of the arc extinguisher here employed is patented, and consists of a multiple spark gap. The complete apparatus consequently consists of (*a*) an adjustable starting gap, (*b*) the damping resistance, and (*c*) the multiple spark gap.

The adjustable starting gap consists of a spark gap between two spherical electrodes contained in a glass tube and placed inside a glass bulb. It is normally set for a starting voltage of 1·5 times the composed line voltage. The damping resistance is formed of one or more quartzilite rods, which, by their quality of varying in ohmic value according to the voltage, provide a self-acting regulation of the discharge resistance and favourably influences the arc extinction. Automatic accommodation to the conditions of different networks is thus afforded. The minimum ohmic value of the resistance is approximately equal to the wave resistance of the overhead line; the resistance rods possess sufficient thermal capacity to avoid undue heating even after repeated operations in succession. The multiple spark gap consists of a large number of aluminium discs with ring-shaped concentric webs. The discs are insulated from one another and kept equidistant, while the passage of current takes place between the inner webs.

These oscillation limiters are built into porcelain cylinders and are suitable for either indoor or outdoor mounting; the joints between the individual porcelain sections are protected by rain shields for outdoor service. They are built for all voltages from 10 000 upwards.

The firm also specialises in the equipment of complete pole-mounted transformer stations for rural distribution. A typical terminal station is equipped with the following control apparatus:—Surge-protection by spark gaps with damping resistance and choke coils. Isolating link for disconnecting control cabin from line. Sheet steel cabin with lock and key to receive oil-immersed circuit breaker with direct acting overload time limit trips. Provision for manual operation by operating mechanism fixed to the pole at a convenient height. Secondary cabin for l.t. fuses for distribution circuits.

Those concerned with line connectors may be glad to learn that the "Maxim" junction clamps are being marketed by The ELECTRICAL EQUIPMENT AND CARBON CO., LTD., of Bank Buildings, 107/111, New Oxford Street, London, W.C.1. These clamps are capable of connecting two conductors of the same or different diameters; efficient contact is claimed, even when the conductors vary considerably. The lower jaw is threaded. Another speciality of the company is the cone tube and nut binder. These binders are supplied for all usual sizes of wires and cables, and by their use two conductors of either the same or different sizes may be connected; the overall diameter of the conductors should be stated when ordering. It is stated that the breaking strain of the binder is 50% greater than that of the wire or cable. The whole strain is taken up by the tube and conical liners and not by the locking nuts.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

GOLBORN URBAN DISTRICT COUNCIL, May 3.—Electric light installation in 54 houses on Edge Green Lane site. Tender forms from the clerk, Mr. H. Eckersley.

LANARK COUNTY COUNCIL, MIDDLE WARD COMMITTEE, May 3.—Electric light installation work in connection with erection of 72 houses at Netherton, near Wishaw. Applications for schedules, etc., must be sent to Mr. P. C. Smith, District Offices, Hamilton, by May 3.

WALTHAMSTOW CORPORATION, May 3.—Supply and erection of 2 500 kW motor-convertor. Specification, etc., from Mr. G. R. Spurr, Electricity Works, Exeter Road, London, E.17; deposit £1.

CENTRAL ELECTRICITY BOARD, May 5.—Supply and erection of 33 kV transmission line crossing of the river Witham, Boston, under Mid-East England scheme. Specification (No. M.E.E.-S.L. 3) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

MANCHESTER CORPORATION, May 5.—Twelve months' supply of 125, 250, 500, 750 and 1 000 kVA static transformers. Specification (No. 278) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, May 5.—Supplies of l.t. and e.h.t. underground cables for 12 months. Tender form, etc., from the Chief Electrical Engineer, Town Hall, St. Marylebone, London, W.1.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, May 6.—Supply and erection of induction voltage regulator. Specification from Mr. R. W. Willis, 35, High Street, Cheadle; deposit £2 2s.

LOUGHBOROUGH CORPORATION, May 6.—Electric wiring of new fire station, and four firemen's cottages, etc. Specifications from Mr. W. Grainger, borough surveyor; deposit £1 1s.

TYNE IMPROVEMENT COMMISSION, May 6.—Supply of five 3-ton electric, hand travelling, semi-portal, level luffing cranes, for Prince Edward Dock. Specifications, etc., from Mr. Albert Blacklock, secretary, Bewick Street, Newcastle-on-Tyne; deposit £3 3s.

GLASGOW CORPORATION, May 7.—Work in connection with electric light installation at Carnwadrie housing scheme. Specifications and forms of tender from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow, C.2.

DUNDEE CORPORATION, May 10.—Supply and erection of two electrically driven, vertical spindle, main circulating water pumps, in pump room, in connection with Carolina Port generating station. Specification, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee; deposit £2 2s.

BILSTON URBAN DISTRICT COUNCIL, May 12.—Electric light installation in Market Hall and Yard. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s. Only firms on the National Register are invited to tender.

CENTRAL ELECTRICITY BOARD, May 12.—Supply and erection of 66 kV and lower voltage switchgear. Specification (No. M.E.E.-G.S. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2: deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12.—Supply and erection of 66 kV and lower voltage transmission lines, under the Mid-East England scheme. Specification (No. M.E.E.-S.L. 2) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12.—Supply of 33 kV and other cables, in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.-G.C.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

EPSOM URBAN DISTRICT COUNCIL, May 12.—Kiosks and converting plant (section I); e.h.t. and l.t. cables and laying (section II); and supply only of l.t. cables (section III). Specification and form of tender from Mr. H. W. Watts. Electricity Works, Depot Road, Epsom; deposit £2 2s.

GAINSBOROUGH URBAN DISTRICT COUNCIL, May 16th.—Twelve months' supply of paper insulated, lead covered, double steel tape armoured l.t. cables; and single-phase and three-phase meters. Further particulars from the Engineer and Manager, Electricity Department, Lord Street, Gainsborough.

CENTRAL ELECTRICITY BOARD, May 19.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme (London Area). Specification (No. S.E.E.-L.F.4) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

STAFFORDSHIRE EDUCATION COMMITTEE, May 24.—Electric light installation in existing Infants' Council School, Pelsall, near Walsall, which is to be enlarged and converted into a Senior Mixed Council School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4th.—Supply and erection at Ironbridge generating station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15 kW motor-generator set, battery-trickle charger, milking booster, and spare parts. Specification (No. 10) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phoenix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4th.—Supply and erection at Ironbridge generating station of works supply sub-station 3 300 V and 400 V metal clad switchgear. Specification (No. 9) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phoenix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1

Note.—An asterisk denotes that local representation is, in practice, essential.

BELGIAN GOVERNMENT TELEGRAPH AND TELEPHONE DEPARTMENT.—Ateliers de Constructions Electriques de Charleroi (A.C.E.C.), supply, laying and jointing of underground trunk telephone cables connecting (*a*) Brussels with Malines, Lierre and Antwerp, (*b*) Brussels with Hal and Mons, (*c*) Brussels with Termonde and Ghent. Total value of order over £450 000.

GHENT PORT AUTHORITIES, May 3.—Eight electric portal cranes. Cahier des Charges (No. W.4). (Reference A.X. 9 444).

VICTORIAN ELECTRICITY COMMISSION, May 5.—Supply of current limiting reactors, suitable for use on three-phase, 50 cycle, 22 000 V circuit (specification No. 30/19.) (Reference B.X. 6 226.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 6.—Supply of 750 kVA, oil immersed, self-cooled, single-phase transformers. (Reference B.X. 6 095.)

CAPE TOWN MUNICIPALITY, May 7.—Supply of l.t. ironclad switchgear. (Specification No. 492/1930.) Reference B.X. 6 293.)

CAPE TOWN MUNICIPALITY, May 7.—Supply of g.i. cross arms, stay rods, straps for insulators, bolts and nuts and porcelain reflectors, for street lamps. (Reference A.X. 9 424.)

DUBLIN BOROUGH COMMISSIONERS, May 8.—Automatic time-switches for public electric lamps. Specifications, etc. (5s.), from the Superintendent of Public Lighting, Tara Street, Dublin.

SOUTH INDIAN RAILWAY CO., LTD., May 9.—Supply of track bands, in connection with electrification of Madras suburban services. Specifications, etc. (10s., not returnable) from the Company's Offices, 91, Petty France, Westminster, S.W.1.

COPENHAGEN MUNICIPALITY, May 10.—Supply of switchgear and rectifier plant for Eskildsgade sub-station (Reference B.X. 6 271.)

COPENHAGEN MUNICIPALITY, May 12.—Supply and erection of two turbo-generators. (Reference B.X. 6 297.)

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VICTORIAN ELECTRICITY COMMISSION, May 12.—Supply of 22 000 V pin type supporting insulators for the year 1930–31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13.—Supply of 110 kV, single-phase, oil immersed, self-cooled, transformers, suitable for outdoor service. (Reference B.X. 6 096.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13.—Supply of terminal strips (P. and T. 151/2 000). (Reference B.X. 6 209.)

CHILEAN MINISTRY OF MARINE, May 15.—Supply of three-metric ton travelling electric crane and four-metric ton stationary electric revolving crane. (Reference A.X. 9 186.)

POWER SECURITIES CORPORATION, May 15th.—Works and materials in connection with Pykara hydro-electric scheme, including transmission line towers (specification E2; price 22s. 6d.); (insulators E5; 7s. 6d.); steel-cored aluminium conductors (E6; 4s. 6d.); steel earth wire (E7; 4s. 6d.); guying materials (E13; 4s. 6d.); generating plant (E14; 37s. 6d.); crane (E16; 7s. 6d.); and transformers (E18; 7s. 6d.). General conditions, 3s. 6d. Specifications, etc., from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

CAIRO MAIN DRAINAGE DEPARTMENT, May 17.—Supply of electric lamps, etc., for one year. Particulars from the Department, 2, Sharia Maleka, Nazli.

VICTORIAN ELECTRICITY COMMISSION, May 19.—Twelve months' supply of triple braided, h.d. copper aerial cable. (Reference B.X. 6 325.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 20.—Supply and erection of one 25 kVA, three-phase, 400/230 V 50 cycle generator. (Reference B.X. 6 307.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20.—Supply of terminal strips (schedule No. C. 578). (Reference B.X. 6 247.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20.—Supply of telegraph instruments (schedule C. 579). (Reference B.X. 6 248.)

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc.—(Reference A.X. 9 212.)

INDIAN STORES DEPARTMENT, May 26.—Two vertical and two horizontal centrifugal pumps, switchgear, etc. (Reference A.X. 9 416.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of 110 kV suspension insulators, for Mangahao power scheme, section 215B. Reference B.X. 6 300.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of cable clamps for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

CAPE TOWN MUNICIPALITY, June 4.—Supply of heavy current d.c. testing motor generator, and starting gear (specification No. 494/1930). (Reference B.X. 6 341.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, June 12.—Supply of 2 000 V switch units and l.t. switchboards (tender No. 1 649). (Reference B.X. 6 365.)

BULAWAYO MUNICIPALITY, June 13.—One 5 000 kW turbo-alternator, condensing plant, switchgear, transformers, etc. (Reference B.X. 6 321.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

POSTMASTER GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of indicators (schedule No. C.588). (Reference B.X. 6 333.)

Cable for Australian Government.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of multiple twin cable. (Reference B.X. 6 349.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of loading coil pots. (Reference B.X. 6 350.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24.—Supply of 110 kV outdoor steelwork and switchgear, for Waitaki power scheme—section 71. (Reference B.X. 6 238.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of condensers (P. and T. 151/2 240). (Reference B.X. 6 308.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 8.—Supply of telephonists' telephones. (Reference B.X. 6 352.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable.)

NEW ZEALAND GOVERNMENT RAILWAYS, July 16.—Supply of two overhead electric, 30 cwt., underhung, travelling jib cranes, with 12 ft. jib, for goods sheds at Wellington and Auckland. (Reference A.X. 9 442.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 29.—Supply of auxiliary turbines and generating sets, for Arapuni power scheme—section 305. (Reference B.X. 6 356.)

VICTORIAN RAILWAY COMMISSIONERS, July 30.—Supply and erection of turbo-alternators, condensing plant and control gear. (Reference B.X. 6 355.)

Tenders Accepted.

BARNES URBAN DISTRICT COUNCIL.—Derby Cables, Ltd., cables, £1 660.

PITLOCHRY PUBLIC HALL.—J. Scott and Co., electric light wiring and fitting, £181.

AYR CORPORATION.—Darroch and Espie, electric light installation in 80 houses, £339.

HALKYN RURAL DISTRICT COUNCIL.—F. Lloyd, electric light wiring of 24 houses, £144.

ALLOA CORPORATION.—Ormiston Bros., electric light installation for housing scheme, £354.

KINGHORN CORPORATION.—Fife Electric Power Co., laying 93 yds. of excess electric cable, £11 12s. 6d.

PORTSMOUTH CORPORATION.—Barnes, Portsmouth, re-wiring Pier bandstand, £63 17s. (Recommended.)

WHITSTABLE URBAN DISTRICT COUNCIL.—Whitstable Electric Co., Ltd., public lighting, £855 per annum.

DUNFERMLINE CORPORATION.—J. W. Melville, electric light installation for housing scheme, £137 os. 6d.

EAST MALLING PARISH COUNCIL.—Maidstone Corporation, street lighting by electricity from October 1 next.

SWANSEA EDUCATION COMMITTEE.—General Electric Co., Ltd., provision of electric oven at Technical College, £70.

BRADFORD CORPORATION.—Thomas Bolton and Son, Ltd., supply of 20 drums of copper trolley wire, £1 403 1s. 1d.

HULL CORPORATION.—Siemens Bros. and Co., Ltd., supply of feeder cable for tramways department, £5 279 6s. 3d.

GLASGOW CORPORATION.—T. B. and J. A. Mathieson, electric lighting installations at various fire stations. (Recommended).

LEEDS CORPORATION.—Measurement, Ltd., and Meter Manufacturers Association, supply of electricity meters for 12 months.

HONLEY URBAN DISTRICT COUNCIL.—F. Platt, electrician's work in connection with the erection of 12 houses, in two blocks.

LONDON COUNTY COUNCIL.—Barlow Bros. and Co., Ltd., electric light installation at Broxholme House, Fulham, £462.

AIR MINISTRY.—Siemens Electric Lamps and Supplies, Ltd., supply of Siemens carbon filament, vacuum and gasfilled lamps.

ORSETT RURAL DISTRICT COUNCIL.—Wallwin Co., installation of electrical automatic pumping plant for sewerage scheme. £1 650.

WESTMINSTER CITY COUNCIL.—Barlow and Young, electric wiring of St. James' dwellings, Silver Street, £187. (Recommended.)

DEWSBURY CORPORATION.—Derby Cables, Ltd., l.t. cables for about six months; and Hackbridge Cable Co., Ltd., e.h.t. cables, £245.

HERNE BAY URBAN DISTRICT COUNCIL.—E. C. Spray, strip and flambeaux lighting, for central windscreen, £134 3s. 2d.

COULSDON URBAN DISTRICT COUNCIL.—Reliance Telephone Co., installation of internal telephone system at municipal offices, £200.

SOUTHEND CORPORATION.—Pirelli-General Cable Works, Ltd., h.t. cables, £23 219 14s. 9d.; Union Cable Co., Ltd., l.t. cables, £38 114 2s.

NANTWICH RURAL DISTRICT COUNCIL.—T. Brereton and Son, wiring and providing lamps for houses in Alpraham, Haslington, Shavington and Walgherton. £233.

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WEST LANCASHIRE RURAL DISTRICT COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., works in connection with Tarleton and Hesketh electricity scheme, £16 753.

STOKE-ON-TRENT CORPORATION.—Barnett and Soans, wireless installation at isolation hospital, £67 7s. 6d.; English Electric Co., Ltd., supply of five electric motors, £116 1s.

SHOREDITCH (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., supply of sub-station switchgear, £9 871 5s.; Switchgear and Cowans, Ltd., supply of feeder panels, £1 701.

WALSALL CORPORATION.—Automatic Telephone Manufacturing Co., Ltd., provision of Strowger telephone system at new electricity offices and showrooms, £334 12s. 11d. (Recommended.)

HULL CORPORATION.—Supply of electricians' material for 12 months: B. Danby and Co., Ltd., General Electric Co., Ltd., Clark and Graham, Edison Swan Electric Co., Ltd., and T. B. Morley, Ltd.

BEXHILL CORPORATION.—W. T. Glover and Co., Ltd., supply of 1 600 yds. of e.h.t. cable in connection with Northern sub-station, £1 457 10s.; W. T. Henley's Telegraph Co., Ltd., two feeder pillars, £141 15s. (Both recommended.)

BATTERSEA (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., switch for new feeder at Nine Elms sub-station, £773 10s.; two switches for existing feeders, £1 547; and switches for 10 000 kW set and two switches for reactors, £6 563 15s.

BRADFORD CORPORATION.—Aiton and Co., Ltd., high pressure steam piping and John Spencer, Ltd., feed pump delivery piping, for Valley Road power station; Peter Brotherhood, Ltd., supply of air compressor for Valley Road power station; Scholey Construction Co., Ltd., supply of Lacy Hulbert automobile air compressor.

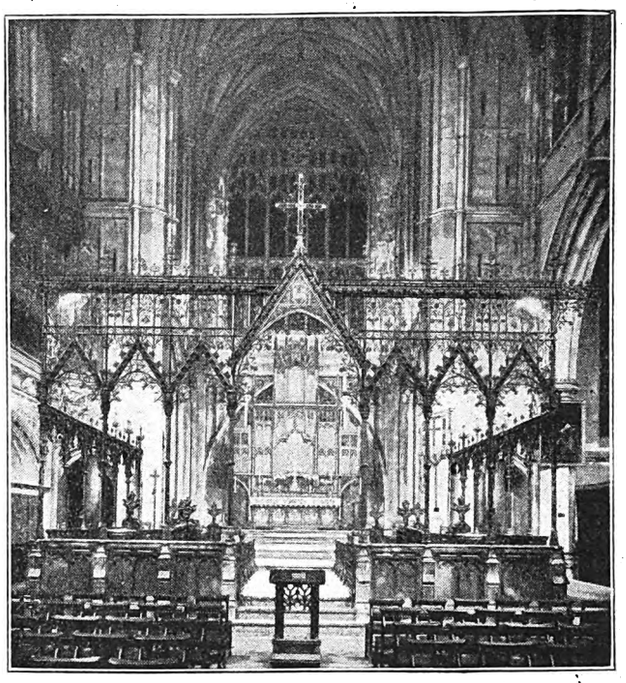
GENERAL POST OFFICE.—Cable manufacture, supply, drawing-in and jointing, Liverpool-Colwyn Bay, British Insulated Cables, Ltd.; London-Liverpool (London-Fenny Stratford section and Fenny Stratford-Birmingham section), Standard Telephones and Cables, Ltd.; Reading-Newbury, Siemens Bros. and Co., Ltd.; telephone exchange equipment, Temple Bar, London, Bishopsgate, London, E.C., and Walthamstow, Automatic Telephone Manufacturing Co., Ltd.; Electric lift, Cardiff Head Post Office, J. Bennie, Ltd.

LIVERPOOL CORPORATION.—Twelve months' supplies: cables. compounds and tapes for street mains, Callender's Cable and Construction Co., Ltd., British Insulated Cables, Ltd., and Berry, Wiggins and Co., Ltd. Alternating current electric motors and starting gear, Crompton, Parkinson, Ltd., English Electric Co., Ltd., Brooks Motors, Ltd., and Erskine Heap and Co. Electric cookers and kettles, Automatic Telephone Manufacturing Co., Ltd. Incandescent lamps, Commercial Electric Co., Ltd., Tungstalite, Ltd., and L. Andrew and Co. Meters, Ferranti, Ltd. Insulated cables, Mersey Cable Works, Ltd., and Liverpool Electric Cable Co., Ltd. (All recommended.)

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Extra high-tension and low-tension switchgear for Arlington Road sub-station. Tenders received: low-tension switchgear: Adamson, Green and Co., Ltd., manual operated, £3 650; Aeonic Radio, Ltd., £4 500; Crompton, Parkinson, Ltd., £3 760; Electric Construction Co., Ltd., £2 900; English Electric Co., Ltd., £3 628; Erskine, Heap and Co., Ltd., £3 820; Ferguson, Pailin, Ltd., £3 575; Harland Engineering Co., Ltd., £3 057; Lucy and Co., Ltd., £2 875; Walsall Electrical Co., Ltd., £3 350; B. Thomas, manual operated, £2 675; remote control, £2 831; British Thomson-Houston Co., Ltd., £4 482 and £8 923; General Electric Co., Ltd., £5 795 and £11 131*; Johnson and Phillips, Ltd., £4 910 and £9 900; Metropolitan-Vickers Electrical Co., Ltd., £4 157 and £4 757; New Switchgear Construction Co., Ltd., £5 028 and £9 978; Park Royal Engineering Co., Ltd., £3 490 and £3 850; A. Reyrolle and Co., Ltd., £2 675 and £2 831; J. G. Statter and Co., £2 641 and £3 195; Switchgear and Cowans, Ltd., £2 675 and £2 831; Whipp and Bourne, Ltd., £3 126 and £3 690. High-tension switchgear: English Electric Co., Ltd., manual operated, £4 371; B. Thomas, manual operated, £3 023; remote control, £5 816; British Thomson-Houston Co., Ltd., £4 407 and £5 174; Ferguson, Pailin, Ltd., £4 347 and £4 907; General Electric Co., Ltd., £4 313 and £5 292*; Johnson and Phillips, Ltd., £5 300 and £6 226; Metropolitan-Vickers Electrical Co., Ltd., £4 798 and £6 979; New Switchgear Construction Co., Ltd., £5 187 and £6 329; Park Royal Engineering Co., Ltd., £5 065 and £6 153; A. Reyrolle and Co., Ltd., £3 023 and £5 816; Switchgear and Cowans, Ltd., £4 236 and £7 321. *Recommended at reduced estimate of £14 798.

CHURCH LIGHTING.

IT is not to be expected that the designers of ecclesiastical edifices, built in the days when electric light was practically unknown, should have looked forward to the possibility of electrical illumination from concealed sources, or, for that



A general view of the lighting at St. Mary's Church, Portsea.

matter, any system of electrical illumination whatsoever. The lack of this foresight, though pardonable, does, however, present difficulties to those illuminating engineers who specialise in church lighting. Quite apart from the distribution of light for illumination purposes, there is the all-important question of the designing and placing of the apparatus, and where it is impossible to conceal the lighting units, a presentable and sympathetic system must be employed.

An example of the efficient solution of such a problem is St. Mary's Church, Portsea. The lighting of this large church, seating 2 000 people, presented some unusual aspects. Although the church is in many ways of cathedral proportions, it did not readily lend itself to any systems hitherto employed by the engineers for cathedral lighting. With a roof height of 70 ft. and nave 120 ft. long, and with a general lack of adequate concealment for lighting equipment, there was some difficulty in determining the best way of handling the situation. Decorative pendant fittings were not only unsuitable for the building, but prohibitive on the score of cost. Eventually it was decided to employ B.T.H. Type 1 018 wall lanterns, placed just below the clerestory windows on the north and south walls of the nave. Each lantern is equipped with a 500 W regular gasfilled lamp in a modified form of rectangular angle reflector, and the front of the lantern is glazed with suitable glass, the density of which is graded so that, while adequate protection is afforded to the eye from direct vision of the lamp filament, the absorption is kept within a reasonable limit.

The lanterns are of a design which is in keeping with the surroundings, and the artificial lighting is not only abundant in quantity but of a satisfactory quality, and comes from a position very similar to that of the daylight, thus preserving the natural shadow effects. The aisles, choir and sanctuary are lighted with B.T.H. Type 455 projectors, employing 300 W regular gasfilled lamps.

The lighting scheme was designed by the Illuminating Engineering Department of the Edison Swan Electric Co., Ltd., of 155, Charing Cross Road, London, W.C.2, and the contractors were Messrs. Barnes and Co., of 85A, Palmerston Road, Southsea.

Wigan T.C. has applied for a loan of £25 000 to cover expenditure on mains, switchgear and transformers for three years.

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WORK IN PROSPECT.

ABERDEEN.—Houses (200), at Torry, for T.C. Particulars from Council's Architect.

ASKRIGG.—Grammar school, 100 places. Particulars from Mr. J C. Wrigley, Education Offices, Northallerton.

BARNSLEY.—Council school, 640 places. Particulars from Cawthorne and Coles, Regent Street, Barnsley.

BARNSLEY.—Welfare centre. Particulars from Mr. H. Taylor, Church Street, Barnsley.

BEDFORD.—Conversion of 12, Rothsay Place into boarding house, for Bedford School. Particulars from Mr. O. P. Milne.

BILLERICAY.—Additional accommodation at Isolation Hospital. Particulars from Mr. Hugo R. Bird, architect, Brentwood.

BLACKPOOL.—New club premises in St. Anne's Road, South Shore. Particulars from Slater and Parkinson, architects, 20, Birley Street, Blackpool.

CHESTERFIELD.—Additions to various schools. Particulars from Wilcockson and Cutts, 12, Saltergate, Chesterfield.

CHESTERFIELD.—Extensions to hospital. Particulars from Jackson and Fryer, 6, Stephenson Place, Chesterfield.

CHESTERFIELD.—Central Baths. Particulars from the Borough Surveyor, Municipal Offices, Chesterfield.

CHESTERFIELD.—Public abattoir. Particulars from the Borough Surveyor, Municipal Offices, Chesterfield.

COLWYN BAY.—Houses (20), on Minydon Estate. Particulars from Mr. T. B. Gorst.—Bungalows (18), in Penrhyn Avenue. Particulars from Wooller and Sons.

CROYDON.—Firemen's quarters, etc., for the B.C. Particulars from Borough Engineer.—Houses (50), at West Way. Particulars from M. Brown and Sons (Croydon), Ltd.—Houses (84), for T.C. on Mitcham Road Estate. Particulars from Borough Engineer.

DEWSBURY.—Extensions to Technical College. Particulars from Mr. T. Blakeley, Town Hall, Dewsbury.

DONCASTER.—Houses (24), for R.D.C. Particulars from W. B. Crabtree, surveyor.

ELY, CAMBS.—Public hall and offices at 26, Market Street, for Loyal Order of Ancient Shepherds. Particulars from Mr. J. W. Merrywest.

FINCHLEY.—School, on Woodhouse Estate. Particulars from Surveyor.

GOLCAR.—Alterations to co-operative premises. Particulars from Lunn and Kaye, Milnsbridge, Huddersfield.

GORTON.—New store premises in High Street. Particulars from Thorne and Collier, architects, 66, Deansgate, Manchester.

HOUNSLOW.—Houses (138), Worton Estate. Particulars from G. Wimpey and Co.—Houses (124), Crossways Estate. Particulars from Perrys (Ealing), Ltd.

HUDDERSFIELD.—Proposed public washhouses. Particulars, Mr. L. Smith, 26, Ramsden Street, Huddersfield.

KING'S LYNN.—Alterations to "Volunteer Stores" public-house. Particulars from Steward and Patteson.

KIRKHEATON.—Extensions to co-operative shop premises. Particulars from the Architect's Department, C.W.S., 1, Balloon Street, Manchester.

LIVERPOOL.—Houses (1 400), for Corporation. Particulars from Borough Engineer.

MANCHESTER.—Alterations and additions to Constitutional Club in St. Ann Street. Particulars from Mr. P. E. Barker, 32, King Street, Manchester, architect.

MELKSHAM.—Extensions, Avon India Rubber Co., Ltd., to cost £30 000. Particulars from the contractors, Blackford and Son, Calne.

NEWCASTLE-UPON-TYNE.—Houses (547), on St. Anthony's Estate. Particulars from Housing Architect, 18, Cloth Market, Newcastle.

PONTEFRACT.—School premises. Particulars from the Education Officer, County Hall, Wakefield.

PONTLLIW.—School, for Glamorgan C.C. Particulars from County Hall, Cardiff.

PORTSMOUTH.—Erection of two new blocks at Mental Hospital, Milton. Particulars from Mr. E. H. Harvey, architect, The Square, Portsmouth.

ROCHESTER.—Houses (40) and flats (five blocks), for T.C. Particulars from Mr. W. Law, city surveyor.

SALFORD.—Houses (36), at Gerald Road, Pendleton, for T.C. Particulars from City Engineer, Town Hall.

ST. ALBANS.—School to accommodate 400, together with handicraft centre, etc. Particulars from Mr. A. E. Prescott, county surveyor, Hatfield, Herts.

TRADE PUBLICATIONS.

THE "Bastian" water heater is dealt with in a new issue by the BASTIAN METER CO., LTD., Farnham Road, Trading Estate, Slough.

"How Eighty Million Operations were Saved in 1929" is the title of a leaflet issued by KENRICK AND JEFFERSON, LTD., West Bromwich.

New price lists and descriptive leaflets relative to their products have been prepared by A. C. COSSOR, LTD., Highbury Grove, London, N.5.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.1, has published a folder relative to a new photo-electric cell just put into manufacture.

The SAXONIA ELECTRICAL WIRE CO., LTD., Roan Works, Greenwich, London, S.E.10, has issued list No. 11 029, concerning the subject of mercury switch tubes.

Specification No. A-200, describing and illustrating "Tonk a.c. motors, two and three-phase, has been published by CROMPTON PARKINSON, LTD., Guiseley, Leeds.

A coloured list of "Electa" table lamps of Royal Stanley Jacobean ware has been sent to us by the ELECTRIC ART SHADES (1928), LTD., Feering Factory, Kelvedon.

The METROPOLITAN - VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, has issued publication 7 452/1, dealing with the self-contained turbo-generating unit developed in 1927.

The technical details concerning the flood-lighting of a football match played at Mansfield recently are the subject of a new leaflet by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs, have issued publication P.253, dealing with copper sheet, sections; aluminium sheet, sections and matting. The new brochure replaces P.242.

A new leaflet describing "Saia" automatic time switches has been issued by the sole British agent, The SIFAM ELECTRICAL INSTRUMENT CO., LTD., Bush House, Aldwych, London, W.C.2.

The "Pavilion of Light" at the Ideal Home Exhibition, London, is described and illustrated in booklet form, issued by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

The LIVERPOOL ELECTRIC CABLE CO., LTD., Linacre Lane, Bootle, has published a new illustrated price list, reference L.O.S., dealing with cables and accessories suitable for overhead distribution and service systems.

List No. 135, dealing with indicating and recording liquid level gauges, and list P.24, relative to air compressor sets, have been issued by the DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton, Middlesex.

A well-produced brochure devoted to combustion steam generator units has been prepared by the COMBUSTION STEAM GENERATOR, LTD., Derby. It is well illustrated, and gives details of a number of the more recent power station installations.

KORTING AND MATHIESON ELECTRICAL, LTD., 711–715, Fulham Road, London, S.W.6, have issued list No. D 17130 relative to dust and moisture proof Karden domestic fittings and list No. F1928a dealing with reflector fittings for industrial lighting.

The latest publications of MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, London, W.C.2, include leaflet No. 1 113, dealing with type S.100 short-wave transmitters, and leaflet No. 1 111, describing type AD 6m "Universal" aircraft telegraph-telephone sets.

The first publication of the NATIONAL ACCUMULATOR CO., LTD., which gives details of the amalgamation of Peto and Radford, Ltd., and the Hart Accumulator Co., Ltd., has been sent to us. The issue outlines future advertising policy of the merger company and copies of the publication may be obtained from the Publicity Department, 50 Grosvenor Gardens, London, S.W.1.

DONOVAN AND CO., 47, Cornwall Street, Birmingham, have issued a comprehensive catalogue containing 160 pages descriptive of electric control apparatus for circuits up to 660 V. This catalogue is fully illustrated and contains technical descriptions of all Home Office "Safuse" switch and fuse gear, industrial switchboards, open type switchboards, combined switch wall sockets and plugs for factory and dockyard use, isolating links to comply with Home Office regulations and startors and control gear for a.c. and d.c. circuits. Every article in the catalogue is priced and the publication contains a large amount of information which should be of interest to every electrical engineer and architect.

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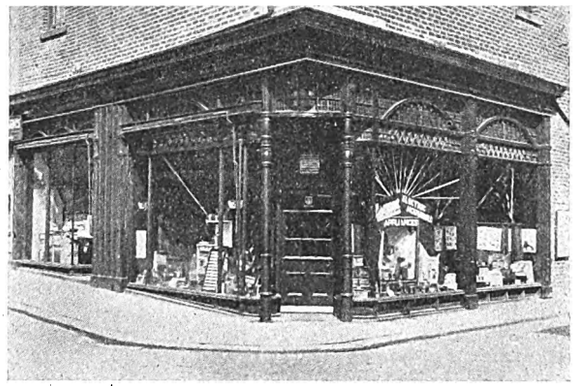
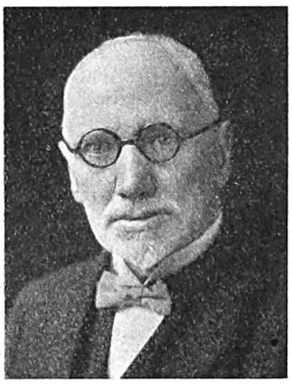
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Among those attending at the opening of the Central Scotland Electricity Scheme on Wednesday were the ex-Minister of Transport, Lt.-Col. Rt. Hon. Wilfred Ashley (left), Sir John Snell, chairman of the Electricity Commission (centre), and Mr. Herbert S. Morrison, Minister of Transport (right): See page 543.

Mr. Edwin Seddon, engineer and manager, Edinburgh, who is responsible for the new extensions at Portobello. See page 543.



The new showrooms of the Morecambe and Heysham Electricity Department which were opened on April 25. The corner shop has been fitted as a general showroom, while the adjoining shop has been converted into a domestic showroom.



A recent portrait of Councillor John Couston, convener of the Electricity Committee of the Edinburgh Corporation. See page 543.

Sir Andrew Duncan, chairman of the Central Electricity Board, was also at Edinburgh on Wednesday.

Mr. John A. Sumner, who has been appointed distribution engineer to the West Midlands Joint Authority.

Sir Archibald Page, chief engineer to the Central Board, also attended the opening of the Scottish Grid.

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ELECTRICITY SUPPLY.

Inauguration of Supply at Dunoon—Islington Extensions—Electric Power in Ontario—New Plant for Dorchester—Italian Enterprise in Turkey—Commissioners do not Approve Procedure by Licence.

CROYDON electricity department is to extend mains at a cost of £3 966.

Wick T.C. has borrowed £11 000 for extensions of its electricity scheme.

Glasgow Corporation Electricity Committee has authorised mains extensions at a cost of £14 500.

Dunoon's new electricity undertaking, which has cost £40 000, will be officially inaugurated on June 14.

Whitehaven T.C. has applied for a loan of £900 for relaying mains in a portion of the borough, as an unemployment scheme.

Islington (London) Finance Committee recommends the B.C. to borrow £36 000 for e.h.t. transmission mains and distributions.

Poplar Electricity Committee has obtained sanction for loans of £23 710 for services, £10 391 for meters and £5 899 for wiring installations.

An application by the Scottish Midlands Electricity Supply Co. to Alva T.C. for permission to erect a number of overhead lines in the town has been refused.

A public meeting of residents in the Strone, Kilmun and Blairmore districts of Argyll has been called to consider a proposed electricity scheme for the district.

Taunton Corporation has applied for a loan of £9 500 for additional boiler and economiser, forced and induced draught fans, pipework, etc., for the electricity works.

Dartford Electricity Committee is to erect a sub-station in Shepherd's Lane, at a cost of £3 248, in connection with supplies to the Heath Close, Heath Farm and Whitehill estates.

It is stated that a definite announcement regarding the possible erection of a power station in the Swansea district may be made by the Central Electricity Board about the end of May.

The assets of the Dominion Power Co., including several tramways and power transmission plants in South-Western Ontario, are to be sold to the Ontario Government for $21 250 000.

The Wallingford and District Electric Supply Co. is now in a position to supply electricity to the parish of Cholsey, and the P.C. has submitted a scheme of street lighting for the consideration of the R.D.C.

Stoke-on-Trent Corporation Finance Committee has received from the North Midlands Joint Electricity Authority the money for the purchase of the Corporation's power house, etc., amounting to £560 504 7s. 7d.

The approval of the Electricity Commissioners is being sought by Irlam U.D.C. of its proposal to enter into an agreement with the Stretford and District Electricity Board for a supply of electricity for Irlam and Cadishead.

Marylebone (London) Electricity Committee has entered into an agreement with Holloway's Properties, Ltd., for the installation of rising mains at Hanover House, High Street, and Wellington House, Barrow Hill Road, at a cost of £784.

Walsall Electricity Committee is to extend mains in Well Lane to supply 30 council houses, at an estimated cost of £210. The Corporation Works Committee is to erect additional lamps along the main road from Bloxwich to Walsall, at a cost of £216.

Swindon T.C. is about to extend its supply of electricity to the parish of Stratton St. Margaret. A supply is to be given to Upper Stratton by October and to Lower Stratton later. The charge for energy will be 25% above that in force at Swindon. The Corporation is prepared to spend £25 000 on laying cables.

Bedford Corporation has obtained sanction to borrow £15 000 for the development of the assisted wiring scheme.—The Electricity Committee reports that the average coal consumption per kWh for the years ended March 31, 1930, 1929 and 1928 was: 1930, 2·008 lb. (0·212d.); 1929, 2·386 lb. (0·2375d.); 1928, 2·44 lb. (0·273d.).

The Steyning Electric Light Co. has informed Henfield P.C. that, on the Special Order being granted, a high-pressure overhead cable will be carried from Hurstpierpoint, through Henfield, to Steyning, and will enable a supply of electricity to be given in Henfield this autumn. The Council has sanctioned the erection of the cable in the parish.

The North Wales Power Co. has applied for a grant to enable the company to complete the scheme for a supply of electricity to Newtown, Montgomeryshire. If a grant is not forthcoming the company does not propose to complete its scheme as far as Newtown, and in that case would not object to the Council undertaking its own scheme.

The Electricity Commissioners have informed the Dorchester T.C. that there appears to be no alternative to the installation of additional plant in the generating station, and that they will be prepared to give favourable consideration to an application for consent to the provision of plant of sufficient capacity to meet requirements for the next three years.

Southend Corporation has had under consideration suggested rules with regard to the wiring of premises, which have been prepared by the Borough Electrical Engineer, who has now been requested to report on the question of establishing a showroom. The chairman of the committee, Coun. Le Masurier, states that there is no intention of entering into competition with private traders.

It is reported that the company formed last year by the Credito Italiano, the Banca Nazionale and the Credito Banco Roma, Milan, for fostering Italian enterprises abroad has obtained a concession for the construction of works and the supply of electricity to several towns in Turkey. A company under the title of the Societe Turque d'Electricite is to be formed with a capital of £T1 000 000.

Arrangements have been completed for the development of water power for mining and other industries in the Sudbury district of Northern Ontario. These sites are capable of producing 100 000 H.P. The Legislature has voted $1 300 000 to be expended by the Hydro-Electric Power Commission. Of this total, $1 000 000 will be spent on actual development, and the balance on transformer stations and power lines.

Fulham (London) Electricity Committee has had under consideration the question of flood-lighting the electricity showrooms. The Borough Electrical Engineer has prepared a scheme, in conjunction with the makers of the necessary apparatus, which, in the opinion of the committee, will give satisfactory results.—Sub-stations are to be established at North End House, West Kensington, and Rivermead Court, Hurlingham, at the cost of £5 313.

Col. F. Gordon Tucker held an inquiry last week, on behalf of the Ministry of Transport, into the objections of the Alvaston and Boulton Urban Council to the proposal of the Central Electricity Board to erect an overhead cable in the Council's area. Col. N. H. Firmin, for the Board, said that it would not be possible to divert the line without great expense, amounting to about £10 000. All the other local authorities concerned had raised no objection.

Swansea Corporation's electricity mains are to be extended at an estimated cost of £1 090.—A reduction of 25% in the rental of the motors is to be made.—The Borough Electrical Engineer has reported regarding the risks involved through the unauthorised connecting up of wireless eliminators and other apparatus. A notice is to be published in the local Press calling attention to the necessity for giving notice to the Corporation of any additional apparatus connected.

It was suggested at a recent conference of North Wales local electricity authorities that the North Wales and South Cheshire Joint Electricity Authority should try to secure a simplified form of licence for the supply of electricity by local authorities, instead of putting them to the expense of obtaining a Special Order. The Electricity Commissioners have intimated to the Authority that they do not feel that a sufficiently useful purpose would be likely to be served by pursuing the question of initiating procedure by licence.

The Grampian Electricity Co. has drawn up for submission to the Electricity Commissioners a new scheme for the supply of electricity in an area which includes the counties of Aberdeen, Banff, Kincardine, Moray, Nairn, and parts of Inverness and Ross and Cromarty. The area is 5 500 square miles in extent, and the population is 280 000. It comprises 160 parishes and 26 burghs. The maximum price proposed is 8d. for burghs and 1s. for all other places. The energy required for the new area will be generated at the company's hydro-electric works nearing completion at Loch Rannoch.

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FINANCIAL INTELLIGENCE.

Accounts of Electrical Manufacturing and Equipment Companies, with Dividends, Quotations and Yields.

By "AUDITOR."

BANK RATE (1929–30).

1929.			1930.	
Feb. 7 ..	5½%	Nov. 21 ..	5½%	Feb. 6 .. 4½%
Sept. 26 ..	6½%	Dec. 12 ..	5 %	Mar. 6 .. 4 %
Oct. 31 ..	6 %			Mar. 20 .. 3½%

CO-OPERATION in certain directions calculated to more successfully meet foreign competition is reflected in the profits realised by many of the companies concerned, and this movement is likely to be carried further in the current year. An example of electrification in its latest form is the formation by Sir W. G. Armstrong Whitworth (Engineers), Ltd., of a Diesel electric traction department composed of experts who will investigate, on behalf of railway executives and engineers, the application of the Diesel electric form of traction to specific systems.

The following table shows the profits made by certain electrical manufacturing and equipment concerns during the past financial year, the dividends paid on the different issues, and some recent quotations and yields :—

ANALYSIS OF RESULTS OF CERTAIN ELECTRICAL MANUFACTURING AND EQUIPMENT COMPANIES WHOSE 1929 ACCOUNTS HAVE BEEN SUBMITTED.

1929 Accounts	Brought Forward	Profit, 1929	Total	Carried Forward	Annual Dividend	Recent Price	Par Value	Yield	Remarks
	£	£	£	£	%		£		
Automatic Telephone Mfg.	93 483	118 802	212 285	118 285	12½	37/6	1	6⅔	Controlled by International Automatic Telephone Co., Ltd.
British Aluminium	33 843	279 793	313 636	35 559	10	45/9	1	4⅓	The reserve fund amounts to £1 050 000, and the depreciation reserve to £1 000 000
,, ,, 5% Prior Lien Deb. ..	—	—	—	—	5	99½	100	5 1/21	
,, ,, 6% Pref.	—	—	—	—	6	21/6	1	5⅝	
British Insulated Cables	250 089	636 550	886 639	280 806	15	77/9	1	3 17/20	As a consequence of the settlement of taxation and other claims, the sum of £300 000 has been transferred to a dividend equalisation reserve.
,, ,, 5% Mort. Deb. Stock ..	—	—	—	—	5	98½	100	5 1/21	
,, ,, 5½% "A" Cum. Pref. ..	—	—	—	—	5½	20/9	1	5 7/16	
,, ,, 6% Cum. Pref.	—	—	—	—	6	23/9	1	5	
British Thomson-Houston	203 066	166 196	369 262	205 262	5	—	1	—	The Ordinary capital is held by Associated Electrical Industries, Ltd.
,, ,, 4½% Deb. Stk.	—	—	—	—	4½	—	100	—	
,, ,, 7% Deb. Stk.	—	—	—	—	7	104⅜	100	6⅝	
,, ,, 7% Cum. Pref.	—	—	—	—	7	23/6	1	5 11/16	
British Wagon	11 018	27 195	38 213	12 613	15	—	3 Pd.	—	Controls British Railway Traffic and Electric Co., Ltd.
,, ...	—	—	—	—	—	—	1 Pd.	—	
Canning (W.)	9 246	61 706	70 952	12 952	15	55/6	1	5⅜	Dividend maintained.
Clarke, Chapman	16 548	77 186	93 734	23 962	11	25/–	1	8⅘	The capital was last increased in 1919 by creation of ordinary shares.
,, ,, 7% Cum. Pref.	—	—	—	—	7	—	10	—	
Clifford (Charles)	44 773	14 483	59 256	39 196	15	—	1	—	The reserve now amounts to £80 000.
,, ,, 6% Cum. Pref.	—	—	—	—	6	19/–	1	6⅓	
Consolidated Signal	673	25 259	25 932	840	12	—	1	—	The figure of £25 259 represents dividend received from Westinghouse Brake and Saxby Signal Co.
,, ,, 6% Cum. Pref.	—	—	—	—	6	—	1	—	
Currys (1927)	2 114	40 331	42 445	2 446	5	5/–	10/–	2½	Accounts to January 14, 1930. Dividend maintained.
,, ,, 7½% Cum. Pref.	—	—	—	—	7½	12/6	1	12	
Davis and Timmins	21 316	26 068	47 384	20 819	20	—	1	—	The sum of £4 912 was transferred to reserve.
,, ,, 6½% Cum. Pref.	—	—	—	—	6½	—	1	—	
Edison Bell	9 780	28 146	37 926	8 676	10	—	1	—	£3 000 was written off preference share issue expenses, leaving a balance of £9 000 under that heading.
,, ,, 7½% Cum. Pref.	—	—	—	—	7½	14/4	1	10½	
Edison Bell (International)	—	5 620	5 620	5 620	—	7/–	1	—	First accounts.
Edison Swan Electric	18 929	50 965	69 894	13 250	10	—	4/–	—	The company guarantees the principal and interest of Edison Swan Cables, Ltd. 5½% debentures controlled by Associated Electrical Industries, Ltd.
,, ,, 7½% Cum. 1st Pref.	—	—	—	—	7½	25/–	1	6	
,, ,, 5% 1st Deb. Stk.	—	—	—	—	5	—	100	—	
,, ,, 5½% 2nd Deb. Stk.	—	—	—	—	5½	90	100	6⅛	
Electrical Apparatus	1 770	8 627	10 397	968	Pref only	—	1	—	Controls Bray, Markham and Reiss, Ltd.
,, ,, 10% "A" Cum. Pref. ..	—	—	—	—		—	1	—	
,, ,, 8% "B" Cum. Pref. ..	—	—	—	—		—	1	—	
Enfield Cable Works	31 650	129 408	161 058	33 559	25	90/–	1	5⅝	The reserve now amounts to £160 000 against a share capital of £550 000.
,, ,, 7½% Pref.	—	—	—	—	7½	27/6	1	5⅜	
Ericsson Telephones	18 235	64 087	82 322	19 322	8	—	1	—	Debentures redeemed in December, 1929.
,, ,, 7% Cum. Pref.	—	—	—	—	7	20/–	1	7	
Garrard Eng. and Mfg.	17 356	69 899	87 255	17 255	50	5/3	1s.	9½	The Company's reserve fund amounts to £65 000, which is equal to the ordinary share capital.
,, ,, 10% Pref'd.	—	—	—	—	10	—	1	—	
Hall Telephone Accessories (1928)	4 631	40 365	44 996	4 719	12	13/9	10/–	8 8/11	Share capital was increased to £175 000 in February, 1929.
International Automatic Telephone	69 736	133 517	203 253	82 579	12½	36/–	1	6 17/18	Patent Right and Goodwill stand in the balance sheet at £360 000.
,, ,, Deferred	—	—	—	—	12½	34/–	1	7 7/16	
,, ,, 7% Pref.	—	—	—	—	7	—	1	—	
Kolster-Brandes	—	23 208	—	2 748	—	6/–	1	—	First Accounts covering Fourteen months.
Lancashire Dynamo and Motor	7 809	18 157	25 966	7 227	5	—	1	—	Controls Crypto Elec. Co., Ltd. The company has reserved the right to pay off all or any of debenture issue at 103% at any time.
,, ,, 6% 1st Mort. Deb.	—	—	—	—	6	—	100	—	
,, ,, 5½% Cum. Pref.	—	—	—	—	5½	—	1	—	
London Elec. Wire Co. and Smiths	22 759	110 620	133 379	30 075	7½	28/–	1	5 5/14	The net profit for 1928 was £110 276.
,, ,, 7½% Pref.	—	—	—	—	7½	24/1	1	6 2/3	
Mather and Platt	106 006	228 398	334 404	109 855	15	43/9	1	6 13/16	The preference shares have a priority as regards capital up to £10 10s. each.
,, ,, 5% Cum. Pref.	—	—	—	—	5	8⅛	10	5⅛	
Midland Elec. Mfg.	13 139	45 182	58 375	14 640	22½	75/–	1	6	Share capital was increased to £187 500 in March, 1929.
,, ,, 7½% Cum. Pref.	—	—	—	—	7½	—	1	—	
Parker, Winder and Achurch	8 563	9 054	17 617	11 701	7½	20/–	1	7½	Dividend maintained.
,, ,, 6% Cum. Pref.	—	—	—	—	6	16/–	1	7½	
Pinchin, Johnson	80 103	381 533	461 636	84 446	30	46/6	10/–	6 13/23	Goodwill has been entirely written off, and the balance sheet exhibits an excellent financial position.
,, ,, 6½% Pref.	—	—	—	—	6½	24/–	1	5 5/12	
Stone (J.) and Co.	162 767	263 964	426 731	127 592	35	—	1	—	The 1928 dividend was 20%.
,, ,, 6½% Pref.	—	—	—	—	6½	—	1	—	
Reyrolle (A.)	78 892	98 021	176 913	75 680	12½	60/3	1	4⅛	Same dividend for past ten years.

The credit balance of £66 539 shown by accounts of CRYSTALATE GRAMOPHONE RECORD MANUFACTURING CO., LTD., for year ended January 31, 1930, compares with net profi, £88 883, during previous 16 months. Features of 1928–29 and 1929–30 accounts are compared below :—

	Jan. 31, 1930.	Jan. 31, 1929.
Preference Dividend	£8 000	£7 463
Ordinary Dividend	45 000	62 500
General Reserve	10 000	5 000
Investments in Associated Companies, at Cost ..	166 241	143 109
Cash	56 972	125 946
Debtors	38 155	35 938
Stocks and Stores	49 375	46 156
Trade Creditors	53 254	32 945
Carried forward	12 582	13 920
Dividend	33⅓%	41⅔%

At 3s. 6d. the 1s. ordinary shares yield 9½%, while the 10s. 8% preference shares at 9s. return nearly 9%.

The output of the big electrical combine known as ASSOCIATED ELECTRICAL INDUSTRIES, LTD., was satisfactorily maintained during 1929, and the dividend of 6% is maintained on a much larger capital. Some of the principal final figures are compared below :—

	Dec. 31, 1929	Dec. 31, 1928.
Profit	£365 961	£258 772
Debenture Interest	41 454	41 454
Written off Works, Plant, etc.	62 659	56 655
Preference Dividend	76 449	78 915
Ordinary Dividend	162 698	54 573
To General Reserve	15 273	25 000
Ordinary Share Capital	3 498 900	2 314 034
Dividend	6%	6%

At 27s. 3d. the ordinary shares yield 4⅓%, while the 4% mortgage debenture stock at 75 returns 5⅓% At recent quotations the 8% preference shares yield about 6%.

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COMPANY NEWS.

Decline of American Stock Quotations—Ever Ready Profits Still Improving—Progress of British Power and Light Corporation—Reports and Dividends.

A FEATURE of the past week's changes in electrical share prices is the weakness of the transatlantic favourites. Hydro Electric Securities have fallen below 50 again, and International Holdings to nearly 6½. General Electric sellers have predominated over buyers and American Telephone and Telegraph stock is 5 points lower at 255. Radio Corporation of America shares are also easier at about 65½. Cables and Wireless stocks have again been unloaded, and the 7½ per cent. "A" ordinary has dropped four points to 52½, and the "B" ordinary 1½ points to 27½, and the 5½ per cent. cumulative preference stock a couple of points from 96½ to 94½. Anglo-American Telegraph ordinary stock has eased a point to below 60. Marconi International Marine shares remain unchanged at 41/s. 3d.

Associated Electrical Industries shares have shed 6d., and are quoted 28s. The 7 per cent. debentures of the British Thomson-Houston company have been marked down 3 points to 102½. Crompton Parkinson 8% preferences are nearly 2s. lower at 22s. 6d., and Henley's ordinary have lost last week's fractional improvement. Callender's Cable "B" preference are under 27s., with a fall of 7½d. Exceptions to the weak tendency in the manufacturing group are the 10s. shares of the National Electric Construction Company, which have changed hands at over 24s.

A number of supply shares show improvement, Chelsea and County of London in spite of deduction of the dividends. Both the Midland issues are up, and Whitehall preference have put on threepence. South Metropolitans and London Electricity Supply show small declines. Victoria Falls shares have touched 62s. 6d.

Calcutta Tramways shares have reacted sharply to the Indian disturbances ; the ordinary shares have dropped during the week from nearly 14s. 6d. to under 11s., and the 5 per cent. preference shares from 12s. 6d. to 10s. A rise of a point has occurred in British Columbia Electric Railway preferred stock and Rio de Janeiro Tramways bonds. London Electric Railway preference and debenture issues are easier.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98¾
6½	,, ,, "C" 6½% Cm. Pf. Stk.	106	106	117½	98⅜
15	B'mouth & Poole El. S. Ord. ..	62/6	62/6	78/-	29/9
6	,, ,, ,, 6% Cm. Pf.	22/-	22/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/6*	26/-	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	49/4½	49/4½	60/-	32/6
5	,, ,, 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	82½	82½	81	77¾
4	Central Elec. Sup. 4% Deb. ..	95½	95½	95¾	88½
(a)	Charing Cross Elec. Ord. (£1) ..	27/6	27/6	51/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	26/6*	26/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	36/10½	36/10½	44/6	26/6
8	,, ,, ,, ,, 8% Pref.	28/-	28/-	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9*	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	48/9*	48/1½	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	,, ,, ,, 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	,, ,, ,, 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P... ..	17/6	17/6	19/6	17/6
4½	,, ,, 4½% 1st Mt.Deb.Stk.	90	90	92	80½
—	Hydro Electric Securities.. ..	49½	52½	87	20
—	International Holdings	6⅝	7⅝	35½	6
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	,, ,, ,, 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	,, ,, ,, 7% Part. Cum. Pf.	28/-	28/-	31/3	24/6
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	29/6	30/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	30/-	29/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/3	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	26/9	26/3	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord..	24/4½	24/4½	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅝	10¾	11½	9½
11	River Plate Elec. Ord. Stk. ..	205*	215	226	187½
(c)	St. James' & P.M. Ord. (£1) ..	27/6	27/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	26/3	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	95½	96	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	62/6	61/10½	69/-	46/3

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest.
1/9⅜	W'minster Elec. Sup. Ord. (£1) ..	26/6	26/6	52/9	24/-
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/9	24/6	25/4½	18/9
6	,, ,, 1st Mt. Deb. ..	103	103	106	97½
8	Yorks Elec. Power Ord.	33/9	33/9	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/-	23/-	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	93½	92½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	,, ,, ,, ,, 6% Pf. Stk.	129½	129½	133	103½
6	Calcutta Trams Ord.	10/10½	14/4½	24/-	14/-
5	,, ,, ,, 5% Cum. Pf.	10/-	12/6	15/9	13/-
(h)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	77	77	74¾	54
4½	,, ,, ,, 4½ Pf.	79½	79½	85½	78
4	,, ,, ,, 4% Deb.	81	81	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	,, ,, 4% Perp. Deb. ..	78*	80	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	,, ,, ,, ,, 4% Pf. Stk.	72	73	77	68
4	,, ,, ,, ,, 4% Deb. ...	80	81	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	94	94	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	73	73	75½	62
5	,, ,, ,, 5% Deb. ..	73	73	72¾	65½
4	Met. Rly. Cons. Ord. Stk. ..	66½	65½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	64½	64½	76	60½
3½	,, ,, ,, 3½% Deb. ..	71½	71½	73¾	67½
5	Met. Dist. Rly. Ord. Stk. ..	77½	77½	81¾	52½
4½	,, ,, ,, 4½% 1st Pref. ..	81½	81½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	115½	115½	118¾	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	88½	87½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9(i)	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/6	23/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86	86	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	28/-	28/6	58/6	26/3
8	,, ,, ,, 8% C.P.	53/1½	53/1½	56/9	49/6
4	,, ,, 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	10/-	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6*	99/4½	56/-
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/6	23/6	24/9	19/7
7	,, ,, ,, 7% Deb.	102½*	105½	109½	102½
10	Brush Electrical Ord. Stk. ..	127½	127½	153¾	120
15	Callender's Cable Ord.	75/-	75/-	91/3	63/9
6½	,, ,, 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	,, ,, 7½% B. Pref. ..	26/10½	27/6	28/3	25/-
12	Consolidated Signal Ord.	35/-	35/-	52/-	6/6
5	,, ,, 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	22/6	24/4½	27/-	14/-
6	,, ,, 6% Cum. 2nd Pf.	19/-	19/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	,, ,, 7% C.P. ..	18/9	18/9	22/9	20/-
4	,, ,, 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	90/-	90/-	112/6	60/-
7½	,, ,, ,, 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	,, ,, 6% C.P.	7/6	7/6	18/9	5/-
5½	,, ,, 1st Mt. Deb. ..	89	89	103½	86
6	,, ,, Conv. Deb... ..	66½	66½	107¾	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	20/6	20/6	92/3	17/10½
10	,, ,, 7% Partic. Pref. ..	29/6	29/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	48/1½	48/6	81/3	26/6
6½	,, ,, "A" C.P.	23/6	23/6	26/-	22/-
7½	,, ,, "B" C.P.	26/-	26/-	27/9	22/9
7	,, ,, 1st Mt. Deb. ..	104	103	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	131/3	132/6	136/10½	69/3
12½	International Auto. Telephone Ord	35/-	35/-	50/6	35/-
10	Johnson & Phillips Ord.	40/-	40/-	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	23/9	22/6	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	,, ,, ,, Cum. Pref.	31/3	31/3	34/3	28/9
4½	,, ,, ,, Deb. Stk. ..	92½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	22½	22½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	$255	$260	314½	144½
4½	,, ,, ,, Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	59½*	60½	63½	56½
6	,, ,, 6% Prefd. Stk.	102½*	103½	105½	91
1½	,, ,, Deferred Stk.	25	24⅞	27	22
8	Anglo Portuguese Tele. Ord. ..	23/1½	23/1½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	52½	56½	90½	73½
—	"B" Ord. Stk.	27½	29	104	33
—	5½% Cum. Pref. Stk. ..	94½	96½	99	90
3½	Eastern 3½% Pref. Stk.	64½	64½	70½	58½
4	,, 4% Deb.	78	78	83½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	32	32½	43½	26
—	International Teleph. & Teleg. ..	$74½	$73½	161½	48½
15	Marconi Int. Mar.	41/3	41/3	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	100½	100½	102½	95
12	Oriental Telephone Ord.	55/7½	55/7½	65/-	41/-
—	Radio Corporation of America ..	65½	66½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
4	Western Tel. 4% Deb. Stk. ..	78	78	82	73

(a) 19⅞d. per share. (b) 1s. 9·2d. per share. (c) 1s. 6.949d. per share. (d) 1s. 8·477d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅜d. per share.
(h) 88s. 2·136d. (i) 9 %. plus special bonus of 30% from sale of omnibus company's shares. * Ex dividend.

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Directors' Reports, etc.

HERBERT MORRIS, LTD.—Intm. div. at rate of 10% p.a. is announced.

• HASLAM AND NEWTON, LTD.—Paymt. of half yearly div. on cum. pref. shs., due May 1, is postponed.

BRUSH ELECTRICAL ENGINEERING CO., LTD.—Directors recommend paymt. of div. of 10% for past year. Surplus under co-partnership scheme is £2 787.

GATESHEAD AND DISTRICT TRAMWAYS CO.—Rev. for 1929, £123 999, increase £2 594; net pft., £25 516, agst. £18 288. Ord. div., 8%, agst. 6%. Fwd. £20 308, agst. £18 895.

WAYGOOD OTIS, LTD.—Pft. for 1929, £71 061, agst. £77 254, Fin. div. 7½%, makg. 10% (same) for year. To contingencies res., £25 000; to pensions res., £6 000. Fwd. £17 631, agst. £15 570.

IMPERIAL TRAMWAYS CO., LTD.—Directors announce that the assets of the company have been realised, and mtg. has been called for May 12 to consider resolutn. to wind up company voluntarily.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Fin. divs. recommended for year ended Dec. 31, 1929, 3½% on pref. shs., less tax, makg. 7% for year, and 8% on ord. shs., tax free, makg. 12% for year.

BIRMINGHAM AND DISTRICT INVESTMENT TRUST, LTD.—Directors have decided to recommend bonus of one £1 6% cum. red. pref. sh. for every ord. sh. held, and fin. div. of 6% in respect of year ended Dec. 31, 1929, payable on May 27.

SOUTH WALES ELECTRICAL POWER DISTRIBUTION CO.—Accts. for 1929 show credit blce., £93 666, agst. £89 060. Deb. int., £64 069, leavg. £29 597, agst. £24 990. To depreciatn. res., £15 000; to South Wales Power Co., £8 331, agst. £3 724.

TYNEMOUTH AND DISTRICT ELECTRIC TRACTION CO., LTD.—Rev. for 1929, £63 484, increase £1 209; net pft., £1 545, agst. £1 421. Div. on pref. to Sept. 15 last has been paid, but directors are unable to recommend div. on pref. from that date. Fwd. £795, against £330.

WESTERN UNION TELEGRAPH CO.—Gross revs., includg. divs. and int., for 3 months ended March 31, 1930, $33 578 027, agst. $35 642 794 in correspondg. period of 1929; total exes., $31 062 663, agst. $31 025 918; int. on bonded debt, $102 856, agst. $902 516; net income $1 486 803, agst. $2 714 360.

SOUTH WALES POWER CO., LTD.—Income for 1929, £60 731, agst. £58 205. Int. pref. div. and fees absorbed, £57 560, agst. £57 728; fwd., £24 354, agst. £21 182. A fwd. policy in regard to prices has been adopted, and resulted in increased power supplies, but some time must elapse before full advantage of this is secured.

PYE RADIO, LTD.—Pft. for year ended March 31, 1929, £71 510. After providg. for directors' fees and salaries, etc., and £5 830 for depreciatn., net blce. is £62 686, plus £2 788 brt. in. Pfd. cap. of £150 000 receives participatn. paymt. of 2%, makg. 10%, less tax, while dfd. cap. of £30 000 receives 100% less tax. Fwd. £12 022.

CORK ELECTRIC SUPPLY CO., LTD.—Rev. for 1929, £149 100, agst. £136 328; pft. £24 164. Fin. div. on ord., 5%, makg. 10% for year. Fwd. £17 220, agst. £14 170. Irish Free State Electricity Supply Board acquired company's electric lightg. undertakgs. on April 3, price to be paid being £496 500. Company still operates tramways.

CABLE, TELEPHONE AND GENERAL TRUST.—The directors have submitted to the shhldrs. proposals to increase the authorised cap. from £710 000 to £1 100 000, by the creatn. of 250 000 pref., 5 000 "A" pref. and 135 000 ord. £1 shs., to increase rate of annual div. on pref. shs. from 6% to 7% cumulative, and to rename the "A" pref. shs. "pfd. ord. shs."

URBAN ELECTRIC SUPPLY CO., LTD.—Net pft. for 1929, £102 224, agst. £100 832, plus £22 953, agst. £22 219 brt. in. To res. for depreciation, £30 000; to gen. res., £15 000. Fin. div. on ord., 4%, makg. 7%; to staff fund, £2 000. Fwd. £26 029. Pfts. of subsidiary companies, to extent to which divs. have been declared, have been brt. into accts. of hldg. company.

BABCOCK AND WILCOX, LTD.—Net pft. for 1929, £674 316, agst. £734 902, plus £118 363 brought in. To staff pensn. fund, £8 786; to res. £48 000. Fin. div. recommended on ord. shs., 8%, less tax, makg. 15% for year. Fwd. £75 992. Reductn. of pfts. is in large measure accounted for by exceptnl. accumulatn. of uncompleted orders. Very satisfactory volume of orders in hand.

AKTIEBOLAGET ELEKTROLUX.—Total income for 1929, Kr. 10 294 801, decrease Kr. 639 002; net pft. Kr. 8 539 983 (£47 443), decrease Kr. 583 768 (£32 431), plus Kr. 700 968 brt in. To res., Kr. 1 000 000. Div. 9%. Fwd. Kr. 1 565 952. Towards close of year, company brt. out a vacuum cleaner of a new type, and there are good prospects of increased turnover in this branch.

EVER READY CO. (GREAT BRITAIN), LTD.—Directors recommend paymt. of following fin. divs. for year ended March 31, 1930: On pref. shs., 5%, makg. maximum of 10% for year; on ord. shs., 25%, makg. 35% for year (same on increased cap.); payable June 2. Accts. show, subject to completion of audit, net pft. £244 754, agst. £210 167. Reserves and carry fwd. £534 198, agst. £500 696.

PIEDMONT HYDRO-ELECTRIC CO.—The Bancamerica-Blair Corporation and the Chase Securities Corporation offered for sale in New York on Monday $10 000 000 (£2 000 000) 30-year 6½% bonds of the Piedmont Hydro-Electric Co. An issue of Swiss francs 25 000 000 bonds of the company was made simultaneously in Switzerland by the Credit Suisse, and in Holland by Mendelssohn and Co. and the Nederlandsche Handels-Maatschappij.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Total rev. for 1929, £267 553, agst. £258 367; blce. to net rev. acct., £124 380, agst. £115 385, plus £95 397 brt. in. After provisn. for contributns. to contingency fund, res. for taxatn. (£15 000), sinkg. funds, and change of system acct. (£35 000), blce. is £142 651. Pref. divs. and intm. ord. div. have been paid, and fin. div. of 5½% on ord. shs., makg. 8½% for year, is recommended. Fwd. £98 861.

EINSTEIN'S ELECTRO-CHEMICAL PROCESS, LTD.—Net deficit on period from formatn. of company on Dec. 15, 1928, to Dec. 31, 1929, £21 554. Factory at Slough was only in partial operatn. at date of closing accts. Factory is now fully equipped, and work is in active progress, while factory at Acton has been punctually completed. Fully paid ord. cap., £324 000. Total called up on 8% pref. shs., £187 500. Prelim. exes., £42 251, plus exes. of additnl. issue, £1 207.

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO., LTD.—Income for 1929, £81 534, agst. £75 065. Blce. carried to res. acct., £45 421, agst. £46 486, plus £4 281 brt. in. After provisn. for sinkg. fund instalmt. and contributns. to change-over expenditure acct., £1 500; res. for depreciatn., etc., £10 000; and gen. res., £10 000, blce. available for distributn. was £26 795, out of which int. ord. div. of 4% has been paid. Fin. div. of 7% on ord. shs. is recommended, makg. 11% for year. Fwd. £4 795.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Rev. acct. for 1929 shows credit blce., £209 441, plus £152 076 brt. in. Int. on deb. stk., contributn. to change of system acct. (£50 000) provisn. for diffce. betwn. issue and redemptn. price of deb. stk., amts. placed to contingency fund, res. for taxatn. (£20 000), res. for depreciatn., and investmt. res. (£54 722) amtd. to £143 505. After provisn. for divs. on 7% and 6% pref. shs., fin. div. of 6% on ord. shs. is recommended, makg. 9% for year; fwd. £147 612.

INDUSTRIAL AND GENERAL TRUST.—At the mtg. on May 22, a resolutn. will be submitted for adoptg. new articles of associatn. to conform with the Companies Act, 1929. The alteratns. proposed are the inclusion of powers with reference to giving financial assistance for purchase of the company's shs. by or for the benefit of employees, and the issue of redeemable pref. shs.; increase of amt. which may be invested in any one security from 3 to 5% of combined sh. and deb. cap. (this restriction is not to apply to obligatns. of British Government); prohibiting distributn. as div. of pfts. arising from changes of investmts. or other dealings with cap. assets; authorising capitalisatn. of pfts. and issue of bonus shs. or debs.

JOHNSON AND PHILLIPS, LTD.—Pft. on tradg. acct. for 1929, after provisn. for bad debts, and charging to rev. upwards of £16 000 for maintenance of buildings, plant, etc., £155 191; deductg. directors' remuneratn. £1 150; auditors' and trustees' fees, £718, and deb. stk. int., £14 608, placing to res. re 6% deb. sinkg. fund, £15 217; and providg. for depreciatn., £20 984, leaves pft. £102 514, plus £80 903 brt. in. Intm. div. paid Nov. 22, 1929, absorbed £30 000. Fin. div. of 5%, less tax, recommended on ord. shs., makg. total of 10% for year; fwd. £123 418. Directors consider result of year's tradg. quite satisfactory. Pfts. earned show increase of nearly £50 000 over previous year. This improvemt. is due partially to increase in turnover, but principally to great economies effected in cost of productn. Important contracts have been secured during last few months, and prospects for current year are favourable.

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BRITISH POWER AND LIGHT CORPORATION.—Accts. covering period from date of incorporatn., May 7, 1929, to March 31, 1930, show rev. £29 924. After charging exes. and income tax, blce. fwd. is £20 536. Corporation was formed to operate, either directly or through subsidiary companies, electrical generatg. and distributg. undertakgs., and made arrangemts. for purpose of acquiring controlling int. in North Wales Power Co., Electricity Distribution of North Wales and District and whole issued sh. cap. of East Suffolk Electricity Distribution Co., South Somerset and District Electricity Co. and other concerns. Gross revenue of constituent companies for 1929 was £278 232. After deduct. expenses and transferring £30 690 to res. for depreciatn. and renewals, blce. is £150 752. Deductg. int., etc., on Treasury debs., there remains £40 730. Proportion of this attributable to corporation, with sundry earnings of the latter, amts. to £34 444.

Company Meetings.

KOLSTER-BRANDES, LTD.—Mr. W. A. Bartlett, presiding at the first annual general meeting last week, said the extensions to the company's factory were not completed until four months after the estimated date. This had the effect of considerably restricting output and profits. Replying to a shareholder, he denied that the company was heading for insolvency and liquidation. He thought they had done fairly well, not as well as expected, but better than a number of their competitors.

ENGLISH ELECTRIC CO., LTD.—Mr. W. L. Hichens, presiding at the recent meeting, pointed out that the report and balance sheet dealt with the period prior to the reconstruction scheme already approved by the shareholders and debenture holders, and said it was proposed, after the scheme had been sanctioned by the Court, to circulate a reconstructed balance sheet setting out the effect of the changes. The rather less favourable result of the year's trading was due to a slightly lower output and to a further fall in prices, but there had been a definite improvement in efficiency, which had gone far to counteract the drop in prices. It had been found possible to make considerable further reductions in stocks, thus releasing working capital. There had been a reduction of debenture commitments of the company and its subsidiary of £69 514. The report and accounts were adopted.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—Mr. Harry Kahn, presiding at the meeting last Friday, said the amount shown in the report as appropriated for payment of a final dividend of 5½%, less tax, on the ordinary stock (in view of a notice issued by the Inland Revenue that the new income tax of 4s. 6d. has to be deducted from dividends paid from April 6), would now read £8 440, and the carry forward would now read £6 038. Gross receipts for the year amounted to £2 748, a sum slightly less than last year's revenue, and net revenue carried to balance sheet was £25 099, or £107 less than last year. The policy of spreading risks was still being pursued; 57·79% of the value of securities was in debentures or charges, 16·31% in preference and 25·90% in ordinary and deferred shares and stocks. The report and accounts were adopted.

SIMMS MOTOR UNITS, LTD.—At the meeting on Monday, Mr. F. R. Simms, chairman, said he thought shareholders would agree that the net profit for the year had proved satisfactory at £44 651, against £42 946 last year. The directors, in spite of this satisfactory result, only recommended a final dividend of 5%, less tax, on the ordinary shares, which, with the interim dividend paid on November 1, 1929, of 5%, made 10% for the year, less tax, with no further distribution on the 6% cumulative participating preference shares. The directors were of the opinion that, bearing in mind the unsettled state of the country, as well as the industries generally, it would be advisable to exercise, for the past year, a cautious and conservative policy. With a view to further consolidating the company's position, the directors felt that this could best be achieved by placing the preference shares on a fixed dividend basis of 7½%. By the end of June their works at Percy Buildings would have been entirely removed to their new works at East Finchley. Percy Buildings would be kept for a very necessary enlargement of their administration, as for the development and manufacture of a number of new and important motor units. They had also extended the works of the Standard Insulator Co. at East Finchley. The results of the Standard Insulator Co. promised to become a record this year. With regard to branches, they opened a new one at Belfast last autumn, and this year they were prepared to open one in Calcutta and Buenos Aires. They would then have 23 fully-equipped and stocked branches at home and abroad. The report was adopted.

NEW COMPANIES.

E. S. COMPANY (IRELAND), LTD.—Cap., £500. To acquire electrical engineering business of W. Hall at 92, Great Patrick Street, Belfast.

ALTREE HULLCOCK AND CO., LTD.—Cap., £1 000. Electrical engineers, radio manufacturers and distributors, etc. Reg. Office: 61, Neal Street, London, W.C.2.

ALLIED ENGINEERING INDUSTRIES, LTD.—Cap., £3 000. Electrical, radio, and general engineers, etc. Solicitors: Amery Parkes and Co., 1, Arundel Street, London, W.C.2.

SOLVOLITE, LTD.—Cap., £100. Electricians, manufacturers and workers of and dealers in electricity, motive power and light, etc. Reg. Office: 256, Dickson Road, Blackpool.

ARNALS, LTD.—Cap., £2 000. To acquire business of wholesale dealer in radio and electrical sundries now carried on by B. Barker at 44, Curzon Street, Derby, as "Curzon Street Radio Stores."

PRIESTLEY PATENTS, LTD.—Cap., £1 000. Manufacturers and repairers of and dealers in household or domestic mechanical and electrical appliances, etc. Reg. Office: 28, East Parade, Leeds.

HUGHES ENGINEERING CO. (BIRMINGHAM), LTD.—Cap., £100. Manufacturers of and dealers in electrical materials, wireless and radio appliances, etc. Reg. Office:—3, Cherry Street, Birmingham.

AIR DUCTS, LTD.—Cap., £10 000. Manufacturers of and dealers in heating, ventilating and electrical plant and apparatus, etc. Reg. Office: 195, Stamford Brook Arches, Hammersmith, London, W.6.

J. AND C. FOR WIRELESS, LTD.—Cap., £2 000. Radio, wireless, electrical, mechanical, wiring, heating, light and power engineers, etc. Solicitor: E. M. Crowther, 23, Abingdon Street, London, S.W.1.

JOWETT AND CO., LTD.—Cap., £500. To construct, manage or control works and conveniences, including tramways, electric light and power supply works, etc. Reg. Office:—15, Brook Lane, Chester.

DODDS AND ATKINSON, LTD.—Cap., £500. Electrical lighting, wireless, mechanical and general engineers, etc. A permanent director: R. J. Atkinson, 34, Leeds Road, Harrogate, electrical engineer.

ELECTRO INSULATORS, LTD.—Cap., £1 000. Manufacturers of and dealers in insulating materials, insulated goods, electrical instruments, etc. A director:—S. Shirt, 9, Broomgrove Crescent, Sheffield.

R. MOORE AND SON (ELECTRICIANS), LTD.—Cap., £1 000. To acquire business of electrician and electrical engineer and contractor heretofore carried on by R. Moore at 35, Beresford Road, Longsight, Manchester.

RADIO CUSHIONS, LTD.—Cap., £2 625. Electricians, workers and dealers in electricity, sound conveyed by electricity and/or radio, etc. Solicitors: Courtenay Croome and Finch, 3, Lombard Court, London, E.C.3.

LUTON BROADCAST RELAY SERVICE, LTD.—Capt., £5 000. To construct and maintain wireless signal and other stations, to carry on the business of consulting wireless experts, etc. Reg. Office: 8, Queen Square, Luton.

ELECTRA CO., LTD.—Cap., £1 500. Manufacturers, exporters, repairers of and dealers in electric cables, wires, lines, accumulators, lamps, fittings, accessories, etc. A subscriber:—E. J. C. Deckers, 57, Rutland Square, Dublin.

ELSMORE HOLFORD, LTD.—Cap., £500. To adopt agreement between H. J. Holford and E. C. Elsmore, and to act as electrical engineers, etc. Solicitors: Wynne, Baxter and Keeble, 9, Laurence Pountney Hill, London, E.C.4.

BEACONECTRIC, LTD.—Cap., £5 000. To acquire business of electrical engineers and factors now carried on by C. Field, H. E. Field, J. A. Miles and W. J. Miles at 158, Stonhouse Street, High Street, Clapham, London, as "The Beacon Electrical Co."

BOLD ELECTRIC CLOCK CO., LTD.—Cap., £2 000. To acquire from J. Waxman and L. Marder full sole and exclusive licence of Patent No. 305 327 granted to H. Bold for improvements in electrically driven timepieces, etc. Reg. Office:—12A, Withy Grove, Manchester.

YUGO-SLAVIAN CONCESSIONS, LTD.—Cap., £5 000. To adopt an agreement with Michael Vinogradoff, to acquire lands, to produce, generate and distribute electrical energy or power; to carry on the business of a light and power company, etc. Reg. Office: Imperial House, 80, Regent Street, London, W.1.

THE LEAD MARKET.

According to Messrs. James Forster and Co. the market has had a weak tone throughout the last fortnight through lack of support either from producing or consuming interests. No change is apparent in the general position. Demand remains as dull as ever both here and on the Continent. The price is now down to a level which has not been seen since 1921, but the position is very much worse now than it was then, inasmuch as stocks were light at that period, the market being a free one, while at the present time they must be very heavy and will always militate against any sustained advance. Closing prices on April 25 were £18 for April, and £17 17s. 6d. for May, June and July, a fall of 12s. 6d. to 17s. 6d. per ton since our last report, a fortnight ago.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ARMATURE REPAIR CO., 28, Cross Street, E.C., electrical engineers. £19 4s. 9d. March 4.

AYLING, Mr. W. J., 3, Elm Park Road, Church End, N., electrical installation contractor. £13 14s. 9d. February 20.

BROWN, John, c/o Jenkins, motor and wireless engineers, Peach Street, Wokingham, electrician. £21 7s. 10d. March 18.

DOUTHWAITE (J. R.) AND CO., 15, Pilgrim Street, Newcastle-on-Tyne, electrical engineers. £15 12s. 8d. March 8.

MODEL REPAIRING CO., 8, Grosvenor Gardens Mews North, S.W., radio dealers. £14 12s. 4d. February 24.

NATHAN, James (trading as JAMES DAVIS), 92, Wood Lane, Becontree, wireless dealer. £18 10s. March 7.

ROCKALL AND CO., 7, Ham Yard, Great Windmill Street, W., electrical engineers. £36 15s. 9d. February 12.

RODERICK (L. J.) AND CO., Gorseinon, electrical engineers. £18 5s. 6d. March 17.

SIGNARTS, 30, Barden Road, Tonbridge, electricians. £17 8s. 1d. February 17.

STANSBURY, Alf. Leonard, 2, Empire Parade, Beckenham, electrical engineer. £91 8s. 10d. March 11.

TIMMINS, Mr. W. T., Cwmavon Road, Blaenavon, wireless dealer. £11 1s. 6d. February 6.

TROMBA ELECTRICAL CO., 51, Chalk Farm Road, N.W. £20 4s. 2d. March 5.

Deed of Arrangement.

BARBER, John Marsden, and BRIDGEWOOD, Leonard, trading at 21, York Place, Leeds, as CLIMAX ELECTRICS, electricians and electrical factors. Dated April 23, filed April 28. Trustee, T. A. Stoker, 71, Albion Street, Leeds. Liabilities unsecured, £1 956; assets, less secured claims, £666.

Receivership.

CLEARTRON (1927), LTD.—S. W. Tubbs, of 24, Basinghall Street, E.C.2, was appointed receiver on April 14, 1930, under powers contained in debentures dated March 28, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BARNETT (C.), LTD., London, W.C., wireless accessory dealers. Registered April 17, £150 third debentures, balance of £2 000; general charge. *£1 940. December 31, 1929.

BOOTH AND BOMFORD, LTD., Cardiff, electrical engineers. Registered April 14, mortgage to bank; charged on 99, Port Street, Evesham, etc. *Nil. February 8, 1930.

Satisfactions.

ELECTRIC CONSTRUCTION CO., LTD., London, W.C. Satisfaction registered April 15, £2 150, part of amount outstanding July 1, 1908.

EXE VALLEY ELECTRICITY CO., LTD., Exeter. Satisfaction registered April 14, £1 000 registered September 2, 1927.

LYMINGTON ELECTRIC LIGHT AND POWER CO., LTD. Satisfaction registered April 9, £10 000, total issued of amount registered October 7, 1902.

PULVERMACHER (I. L.) AND CO., LTD., London, E.C., medical electricians.—Satisfaction registered April 12, £500, registered October 9, 1928.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BORDER ELECTRICAL FACTORING CO., LTD. This Carlisle company, which has gone into voluntary liquidation, was only formed at the beginning of last year. It has an authorised capital of £5 000 in £1 shares, its directors, according to the Somerset House file, being William Hamilton Gardiner, John Ridley and Thomas Harris Little, the secretary of the company. In March, 1929, a charge was given by the company to its bankers, and in February, 1930, a debenture for £1 000 to T. B. Harris.

ODDIE AND CULSHAW, LTD., Southport. wireless dealers, etc. The statutory meeting of the creditors of the above was held on April 24 at the offices of Messrs. Goffey and Wheeldon, solicitors, 1, London Street, Southport. Mr. C. M. Oddie occupied the chair, and submitted a statement of affairs which showed liabilities of £1 653. The assets totalled £1 300, and were estimated to realise £822. After allowing for preferential claims the net assets were £764, or a deficiency of £889. It was reported that the company was registered in March, 1919, with a nominal capital of £1 000. The issued capital was £303, of which £153 was allotted for cash, and the balance was fully paid. During the year to March, 1925, there was a profit earned of £40, and in the following year, a profit of £50. For the year to March, 1927, the profit was £258, but in the following 12 months it fell to £78, and in the two succeeding accounting periods losses of £97 and £783 were sustained. After some discussion a resolution was passed by the creditors confirming the voluntary liquidation of the company with Mr. H. C. Binns, accountant, of 81, Dale Street, Liverpool, as liquidator, and a committee consisting of the representatives of Smith and Cookson, B.N.B. Wireless, Ltd., and Brown Bros., Ltd. The following are creditors: Smith and Cookson, Liverpool, £237; B.N.B. Wireless, Ltd., Liverpool, £236; Brown Bros., Ltd., London, £103; Fuller Accumulator Co., Ltd., Chadwell Heath, £37; Kolster-Brandes, Ltd., Sidcup, £33; Dutton, A., Southport, £237; Oddie, C. M., Southport, £275; Bankers, Southport, £245.

London Gazette, etc.

Company Winding-up Voluntarily.

BATTERY SUPPLIES, LTD.—Meeting of creditors at 4, King Street, Hammersmith, W.6, on Saturday, May 3, at 11 a.m.

Bankruptcy Information.

COX, Bernard Luther, Holmes Yard, Shirland Street, Chesterfield, electrical engineer. Receiving order, April 17. Debtor's petition. First meeting, May 2, 12 noon. Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. Public examination, May 16, 12.15 p.m., County Court, Market Hall, Chesterfield.

DOUDNEY, Edward, 93, East Street, Chichester, and 40, South Street, Chichester, wireless wholesale and retail salesman. First meeting, May 8, 12.15 p.m., Official Receiver's Offices, 12A, Marlborough Place, Brighton. Public examination, May 21, 11 a.m., Court House, Church Street, Brighton.

Notice of Intended Dividend.

MARSH, Basil, 6, Victoria Road, Brighton, Sussex, electrician. Last day for receiving proofs, May 9. Trustee: A. E. Orbell, 6 and 7, Old Steine, Brighton.

Application for Discharge.

MORPHY, Donal William, lately 4 and 5, Dorset Mews North, Upper Gloucester Place, London, N.W.1, manufacturer of wireless apparatus. Hearing, May 23, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Order Made on Application for Discharge.

MCLEOD, John Stuart (trading as MCLEOD BROS.), 189, Blackburn Road, Bolton, and also with a partner as MCLEOD BROS., at 55, Chorley New Road, Horwich, radio and electrical engineer. Discharge suspended for three months until July 15, 1930.

METAL AND CHEMICAL PRICES.

		Price.	TUESDAY, April 29. Inc.	Dec.
Copper—				
Best Selected	per ton	£59 0 0	—	£3 10s. 0d.
Electro Wirebars	,,	£66 0 0	—	—
H.C. Wire, basis	per lb.	9 5/16d.	—	—
Sheet	,,	9 3/8d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0 5/16d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	9 1/4d.	—	1 1/4d.
Wire ,,	,,	9 5/16d.	—	1 1/4d.
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 10 0	—	10s. 0d.
Foreign or Colonial	,,	£17 17 6	—	12s. 6d.
Tin—				
Ingot	per ton	£157 5 0	—	£7 5s. 0d.
Wire, basis	per lb.	2s. 2d.	—	1d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£17 2 6	—	17s. 6d.
Mercury	per bottle	£22 15 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2 1/4d.
Sodium Bichromate—Per lb., 3 1/8d.
Rubber—Para fine, 8 1/8d.; plantation, 1st latex, 7d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

323 952 J. H. Runbaken and G. W. Melland. Means for indicating when electric current is flowing in a circuit. (19/2/29.)
323 953 A. Schwarz and Dr. B. Lange. Electric tachometer. (20/2/29.)
323 966 General Electric Co., Ltd., H. C. Turner and W. Hamilton. Induction-type electrical instruments or relays. (7/3/29.)
323 974 Trevelyans (Birmingham), Ltd., and T. Gladdy. Electric tumbler switches. (20/3/29.)
323 981 Standard Telephones and Cables, Ltd. (R. Schenk). Automatic battery-charging device for telephone exchanges. (27/3/29.)
310 031 Allmanna Svenska Elektriska Aktiebolaget. Electric induction furnaces. (21/4/28.)
310 003 Bing Werke Vorm. Geb. Bing Akt.-Ges. Electromagnetic device for imparting an intermittent pendular movement to a swinging member. (19/4/28.)
318 195 Ateliers de Constructions Electriques de Charleroi. Starting of polyphase electric motors by means of auto-transformers. (30/8/28.)
316 659 E. F. Northrup. Inductor furnaces. (2/8/28.)
323 994 G. Fischer. Current-collectors for electric vehicles. (19/3/29.)
312 081 British Thomson-Houston Co., Ltd. Oil-filled lead-covered electric cables. (18/5/28.)
316 148 Siemens and Halske Akt.-Ges. System for transmitting alarm signals. (20/12/27.)
323 817 J. L. Baird and Television, Ltd. Television and like apparatus. (10/10/28.)
323 818 J. L. Baird and Television, Ltd. Television and like apparatus. (12/10/28.)
323 763 British Thomson-Houston Co., Ltd., and G. O. Watson. Electric ship-propulsion systems. (7/9/28.)
323 730 British Thomson-Houston Co., Ltd., and G. O. Watson. Electric power supply systems. (7/9/28.)
323 746 British Thomson-Houston Co., Ltd., and G. O. Watson. Speed measuring and indicating apparatus. (7/9/28.)
323 764 British Thomson-Houston Co., Ltd., and G. O. Watson. Protective-systems for alternating-current electric generators. (7/9/28.)
324 082 British Thomson-Houston Co., Ltd., F. J. Lane, and R. D. Parry. Electric protective apparatus. (11/7/28.)
324 065 Dr. E. Treibmann. Combination electrode for unipolar high-frequency curative treatment. (17/7/28.)
324 027 H. J. Round. Apparatus for recording and/or reproducing sound. (7/9/28.)
324 066 Edison Swan Electric Co., Ltd., and S. Rogers. Bonding or fixing devices for electric conductors. (12/9/28.)
297 360 G. Somajni. Electric remote control apparatus. (19/9/27.)
324 029 J. L. Baird and Television, Ltd. Television and like apparatus. (3/10/29.)
324 032 British Electrical Reproduction Co., Ltd., and C. Berrage-Moulton. Supporting devices for use in connection with sound reproducing apparatus. (8/10/28.)
324 049 J. L. Baird and Television, Ltd. Television and like apparatus. (10/10/28.)
324 007 A. Reyrolle and Co., Ltd., and H. W. Clothier. Plug and socket connectors for electrical circuits. (11/10/28.)
324 008 Standard Telephones and Cables, Ltd. (L. J. J. Schreiber). Anti-vibration mountings for switches such as are used in automatic telephone systems. (11/10/28.)
324 022 E. T. Williams. Construction of grids, plates, frames, and the like for use in electric accumulators. (13/10/28.)
324 094 Automatic Telephone Manufacturing Co., Ltd., C. Gillings, and T. G. Rice. Telephone systems. (15/10/28.)
324 040 A. E. C. Snell and F. S. Clifford. Electrical transmission or reproduction of sound. (15/10/28.)
298 917 British Thomson-Houston Co., Ltd. Automatic electric circuit breakers. (14/10/27.)
324 055 G. A. Atkins. Electric level luffing grab cranes. (16/10/28.)
324 056 Nalder Bros. and Thompson, Ltd., and C. L. Lipman. Electric time selective relays and time selective control devices. (16/10/28.)
324 097 R. A. Salaman. Control of theatre and like lighting systems. (16/10/28.)
324 059 Automatic Telephone Manufacturing Co., Ltd., and H. S. Woodhead. Electromagnetic relays. (16/10/28.)
324 099 T. McClelland. Magnetic sound records. (17/10/28.)
324 100 Standard Telephones and Cables, Ltd. (A. L. H. van der Straeten). Multiconductor ribbon cables and the manufacture thereof. (17/10/28.)
324 074 Standard Telephones and Cables, Ltd., and R. St. G. Terry. Electromagnetic relays. (17/10/28.)
324 075 Standard Telephones and Cables, Ltd., and R. St. G. Terry. Electromagnetic relays. (17/10/28.)
298 988 L. Thurm. Electric alternator for use especially as an amplifier. (18/10/27.)
324 101 J. R. Robertson and J. Vielle. Luminous vacuum tube devices. (17/10/28.)

Applications for Patents.

December 16.

38 524 A. E. Adams, S. J. Bastock and H. T. Dowling Union Construction and Finance Co., Ltd. Double-deck tramcars.
38 457 Akt.-Ges. Brown Boveri.—Electric regulating and controlling arrangements. (19/12/28, Austria.)
38 552 C. Arnold (Dow Chemical Co.). Preparation of magnesium and magnesium chloride by electrolysis.
38 490 Associated Electrical Industries, Ltd. Electric surge recorders. (14/12/28, U.S.)
38 472 Benjamin Electric, Ltd. and G. Campbell. Holders for thermionic valves, etc.
38 467 I. and S. Berliner. Train telephonic apparatus.
38 487 British Thomson-Houston Co., Ltd. Electric control devices. (15/12/28, U.S.).
38 537 P. P. Eckersley and Gramophone Co., Ltd. Wireless receiving systems.
38 475 P. Freedman. Metallic vapour lamps, etc.
38 445 B. P. Dudding and General Electric Co., Ltd. Vacuum seals.
38 473 R. C. Graseby. Electromagnets.
38 474 R. C. Graseby. Relay apparatus.
38 569 Hamberger Batterie-Fabrik, C. Dillger and D. Schmidt. Electric batteries. (22/3/29, Germany.)
38 411 A. Horstmann and Hortsmann Gear Co., Ltd. Gas controllers, electric time switches, etc.
38 482 H. Hough and A. H. Scott. Illumination of electric switches.
38 504 J. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). Firedamp proof incandescent lamp.
38 421 A. F. S. Kent. Mechanism of gramophones electrical pick-ups, etc.
38 493 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Relay system.
38 436 J. L. McLeod. Low frequency amplifying circuits.
38 478 E. and H. Rosenkelde. Electromagnetic relays.
38 423 R. W. Sawkins. Accumulator charging unit.
38 549 W. H. Scott. Electrical apparatus for controlling a motor from a distance.
38 436 Scottish Films Productions (1928), Ltd. Low frequency amplifying circuits.
38 567 Siemens-Schuckertwerke Akt.-Ges. Electric cables. (20/12/28, Germany.)
38 526 S. J. Smith. Electric clocks, etc.
38 420 A. M. Taylor. Transformers.
38 568 J. Blanco-Uztariz. Arrangements for controlling vehicle headlights.

December 17.

38 663 Associated Electrical Industries, Ltd. and C. Filmer. Motor control sytems.
38 706 H. H. Berry. Electric fires, etc.
38 620 G. F. Burwood. Electric relays.
38 633 J. J. Buser Akt.-Ges. and A. Egger. Connecting measuring instruments, etc. to electrical installations. (20/12/28, Germany.)
38 659 J. Craft and Metals Coating Co., Ltd. Manufacture of electrical condensers, etc.
38 595 J. Crawford. Electric fuse contacts.
38 574 W. H. Dallimore. Protection for telephone transmitters.
38 604 S. S. Guy. Electrically driven vehicles.
38 699 A. F. Henderson and H. B. Stocks. Mercury vapour lamps, etc.
38 618 K. V. Jorgensen. Circuit arrangements for electric signalling systems.
38 702 F. A. Lindemann. Photoelectric reproduction of sound.
38 605 London Electric Wire Co. and Smiths, Ltd. and N. M. London. Insulation of electric cables.
38 696 J. E. P. Rigaut and R. A. Simmons. Radio receiving apparatus.

December 18.

38 797 R. D. Ball, H. S. Carnegie and English Electric Co., Ltd. Self-starting synchronous motors.
38 813 British Thomson-Houston Co., Ltd. Furnaces. (18/12/28, U.S.)
38 814 British Thomson-Houston Co., Ltd. Motor control systems. (18/12/28, U.S.)
38 815 British Thomson-Houston Co., Ltd. Thermionic apparatus. (27/12/28, U.S.)
38 807 J. Charwat and F. Stacherl. Electric wall plugs. (19/12/28, Austria.)
38 727 F. G. Eckford. Thermostats.
38 792 Egyesult Izzolampa es Villamossagi Reszvenytarsasag. Incandescent lamps. (18/12/28, Hungary.)
38 713 Electric Construction Co., Ltd. Means for balancing rotating parts, etc.
38 795 Electric Control, Ltd., Heinan and Froude, Ltd., A. G. H. Oxley and E. G. Ross. Electrical equipment for use with running on, etc., of engines.
38 802 General Electric Co., Ltd. Luminous electric discharge tubes. (10/7/29, Germany.)
38 804 General Electric Co., Ltd. Manufacture of incandescent lamps. (29/12/28, Germany.)
38 834 L. B. Hewitt and Metropolitan Electric Tramways, Ltd. Electric motor controllers for controlling vehicles.
38 835 B. Hodgson, Mullard Radio Valve Co., Ltd., and O. S. Pratt. Electron emitting bodies.
38 734 F. A. Lindemann. Photoelectric cells.
38 855 Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. Microphones.
38 778 G. Newton, C. P. Smith and Standard Telephones and Cables, Ltd. Switching mechanisms for telephone systems.
38 801 P. Rosenberg. Manufacture of electrodes. (28/11/29, Germany.)
38 803 Siemens and General Electric Railway Signal Co., Ltd. (J. Parsons). Electric contact device.
38 780 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic telephone exchange systems.
38 783 Standard Telephones and Cables, Ltd. Piezo-electric resonators. (19/12/28, U.S.)
38 781 Standard Telephones and Cables, Ltd. (C. S. Ganeline). Impulse repeating arrangements for telephone systems, etc.
38 779 Standard Telephones and Cables, Ltd. (V. C. J. Meeuws). Non-numerical switching arrangements for automatic telephone systems, etc.
38 785 W. Thaw. Apparatus for delivering electric impulses from source of current supply.

COMING EVENTS.

Friday, May 2 (To-day).

Iron and Steel Institute.—Institution of Civil Engineers, Great George Street, Westminster, London, S.W. Annual meeting. 10 *a.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Institution, Savoy Place, Victoria Embankment, London. Lecture by Mr. C. W. Marshall on "The Metering Arrangements for the 'Grid' Transmission System in Great Britain." (To be followed by a discussion.) 7 *p.m.*

Tuesday, May 6.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.

Institution of Civil Engineers.—Great George Street, London, S.W. James Forrest lecture by Prof. R. V. Southwell, F.R.S., on "Aeronautical Progress, 1914-1930." 6 *p.m.*

Illuminating Engineering Society.—Royal Society of Arts, John Street, Adelphi, London. Paper by Mr. T. Austin on "Luminous Traffic Signals." 7 *p.m.*

Institution of Electrical Engineers (South Midland Students' Section).—Birmingham University, Edmund Street. Paper by Mr. A. H. Slade on "Routine Testing of D.C. Machinery." 7.30 *p.m.*

Wednesday, May 7.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting.

Electrical Contractors' Association (Dublin Branch).—Ordinary meeting.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.

Sheffield Illumination Society.—Visit to English Steel Corporation—Messrs. Vickers' Works.

Institution of Electrical Engineers (Wireless Section).—Savoy Place, Victoria Embankment, London. Paper by Messrs. P. P. Eckersley and N. Ashbridge on "A Wireless Broadcasting Transmitting Station for Dual Programme Service." 6 *p.m.*

Polytechnic (Electrical Engineering Department).—Lecture I (course of six lectures), by Mr. W. H. Date, on "Thermionic Valves." 6.30 *p.m.*

Thursday, May 8.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Southampton Branch).—Ordinary meeting.

Electrical Contractors' Association (E. Yorks Branch).—Builders' Exchange Room, Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

Institution of Electrical Engineers (South Midland Students' Section).—Visit to Messrs. "Birmingham Gazette," Corporation Street. 4 *p.m.*

Friday, May 9.

Institution of Electrical Engineers (London Students' Section).—Savoy Place, Victoria Embankment, London. Annual general meeting. Paper by Messrs. J. W. Moffatt and J. C. Emerson on "The Rotary Automatic Telephone System." 6.15 *p.m.*

Saturday, May 10.

Institution of Electrical Engineers (London Students' Section).—Visit to the Brookman's Park Regional Station of the British Broadcasting Corporation. 2.30 *p.m.*

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THE ELECTRICIAN

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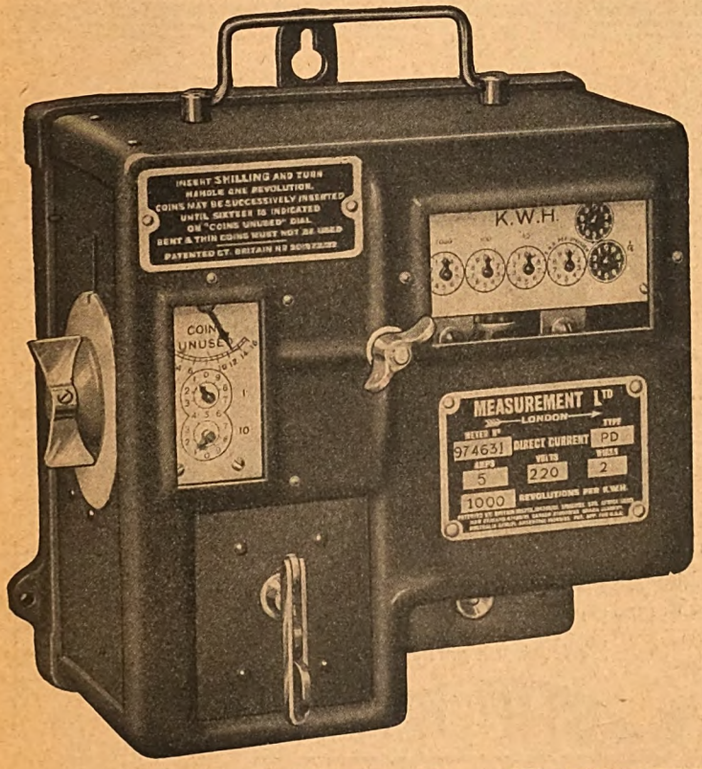

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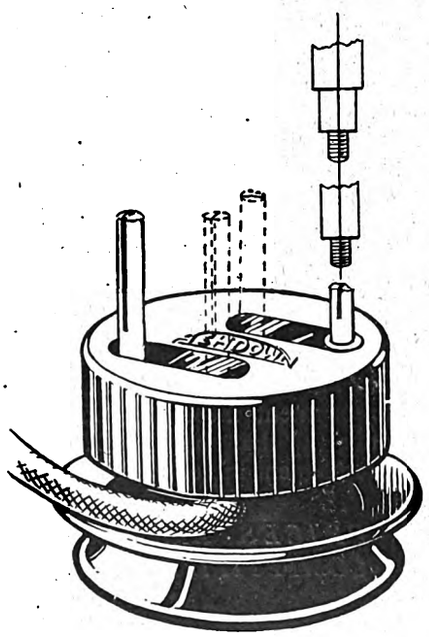

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

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International Electrification.

ONE of the most interesting documents relating to electrical development that has been issued for some time is the first annual report of the Board of Directors of the Société Financière de Transports et d'Entreprises Industrielles (commonly abbreviated to "Sofina"). This international financial undertaking with headquarters in Brussels took over the assets of the former Sofina company, which had long been engaged in studying the problem of the systematic organisation of the production and distribution of electricity, and is actively interested in a long list of progressive electrical and industrial companies in Europe, North Africa, and North and South America. Through its various finanial subsidiaries it has secured the technical, financial and administrative control of many operating companies in addition to holding large interests in others, the credit balance of the profit and loss account for the year ended December 31, 1929, being 116 217 174 Belgian francs (£666 956).

There is a great deal of information contained in the report, which is of general interest. The section entitled "A World Survey" gives a remarkable picture of the rapid growth of electric power production. Between 1923 and 1928 the energy produced in Belgium increased by 125%; in the Paris region of France the output rose from 534 600 000 kWh in 1920 to 1 740 000 000 kWh in 1928. In Italy public service power stations generated 4 550 000 000 kWh in 1920 and 10 580 000 000 kWh in 1929, all but 380 000 000 kWh being produced by hydro-electric plants. Private Italian plants produced an additional 1 500 000 000 kWh and 340 000 000 kWh were imported from Switzerland. Total exports of electric energy from Switzerland in 1928-29 amounted to 1 094 000 000 kWh out of a total Swiss production of 4 782 000 000 kWh. Japan's installed plant has quadrupled in power in ten years; it had reached 3 878 000 kW at the end of 1928 and of this amount 2 315 000 kW was generated by water power. Well conceived interconnections take advantage of the climatic differences between the basin of the Pacific and that of the Sea of Japan and minimise the importance of seasonal variations. By making greater use of thermo-electric stations for peak consumption in winter the hydro-electric plants in Japan have been able to avoid costly enlargements. In Great Britain and Germany the tendency is for the production of private stations (including those of traction undertakings) to increase less rapidly than that of distributing concerns. In Germany the share of private producers declined from over 52% in 1926 to less than 42% in 1929. On the basis of progress in recent years the development of the electrical industry in Germany—the installed power of plants is at present over 12 000 000 kW and is increasing at the rate of about 1 000 000 kW per annum—will require an annual expenditure of £50 000 000.

Concerning the electrical future of the European continent, the view is expressed that the day is coming when the national networks of electricity will be interconnected throughout the whole of industrial Europe. Powerful steam-driven plants will then have the support of the great water strongholds of Sweden and Finland in the north and the Pyrenees, the Central Plateau, the Alps with the Tauern and the Carpathians in the south, the electrification of the continent being thus assured with a minimum of waste. Already there is a good deal of interchange of power. Mention has been made of Swiss exports to Italy. Germany is also a large importer and exporter of energy. In 1928 she bought 293 000 000 kWh, mainly from Switzerland and Austria, but partly from France, and sold 181 000 000 kWh to France, Poland, Switzerland and Czecho-Slovakia. Switzerland exchanges over 1 000 000 000 kWh per annum with her neighbours. At present consideration is being given to a vast scheme for the transmission of hydro-electric energy from Norway to Germany via Sweden and the Baltic. "The domain of electrification is being extended. The meshes of the networks are being contracted and a

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single network no longer serves only a single city or a province, but an entire country." Main line railway electrification is proceeding at a rapid pace in Switzerland, France, Austria, and Italy. There are now 1 589 km. electrically worked in Switzerland and 85% of the traffic in ton-kilometres is now carried over electrified lines. In France, 1 400 km. have been converted and the electrification programme embraces 9 000 km., or about a fifth of the total extent of the French railways. This survey is a short but inspiring picture of steady progress towards a complete revolution in transport, industrial and domestic conditions on the European Continent. Are we in this country advancing with sufficient speed to ensure that we shall not be left further behind than we already are?

Current Topics.

"Grid Alive at 132 000 Volts."

LAST week THE ELECTRICIAN was alone among the electrical journals in publishing not only a description of the Central Scotland grid and the extensions to Portobello power station but a report of the proceedings at the opening ceremonies and luncheon at Edinburgh on April 30. This important event in the history of the British national electrification programme was very well staged by the Edinburgh Corporation and the Central Electricity Board. The occasion was favoured with a day which improved greatly in quality after Mr. MORRISON, who performed the task of throwing the switch with a look of the grimmest determination, had energised the grid. The early morning was grey and cold, but the afternoon was warm and sunny. As the large disc above the platform rotated, the black legend "grid switch open," changing to "grid alive at 132 000 volts" in red letters, the Lord Provost of Edinburgh said: "I take the hand of Glasgow," and shook hands with the Lord Provost of the western city whose power stations were now linked with Portobello by means of the large grey towers that stretch from Forth to Clyde and northwards towards Dundee and the Grampians. Those who subsequently stood beneath the conductors stretching upward from the sub-station insulators to the first tower did not require any printed notice to warn them that the grid was "alive," the continuous crackling being a sufficient indication.

Portobello's New Generators.

THE generator hall at Portobello, with the machinery all newly painted to a cheerful green and representing a total capacity of 117 500 kW, is an impressive spectacle, and Mr. EDWIN SEDDON is to be congratulated on having almost completed a very big task in a thoroughly efficient way. The last set of boilers is not fully erected, and there is still a little tidying up to be done in the yard between the power house and the river, but before the end of the year all the extension work should have been completed. When the new boilers are in service the thermal efficiency of the station is expected to reach 22·8 per cent., and if this figure is attained Mr. SEDDON and the makers of the plant installed at Portobello will have good cause to be proud of their work. At present the two new 31 250 kW British Brown Boveri turbo-alternators are being run without their full complement of boilers. On the acceptance tests the average steam consumption for one of these turbo sets was 9·115 lb. per kWh, the average for both being approximately 1 per cent. better than the guaranteed figure without allowing for the margin. It is an indication of the development in turbo-alternator design that has taken place within the past six or seven years that it is more economical to run the new 31 250 kW sets at 10 000 kW than to operate the 12 500 kW sets installed in 1922 at 10 000 kW.

Good Work.

IT is the fashion to throw stones at the telegraph service, and it is only fair to hand that much abused institution a bouquet when such an offering appears to be deserved. The last sheet of our telegraph message of about 1 200 words, giving the report of the proceedings at the opening of the Central Scotland grid, was delivered at our offices in Fleet Street about an hour and a quarter after the time at which the entire telegram was handed over the counter at Edinburgh. As THE ELECTRICIAN is not a daily, and there was heavy special traffic for the dailies to be handled, the telegraph service is entitled to credit for rising to the occasion in a very satisfactory way.

Price Fixing by Order.

NEW markets and more trade are the chief needs of the trading community, and neither is likely to result from the Consumers' Council Bill, which the President of the Board of Trade has introduced on behalf of the Government. This extraordinary measure is designed to enable the Board of Trade to appoint a Council to hold such inquests as they please on production, distribution, supply or price of articles of food, articles of wearing apparel, clothing materials, fuels and "any other article of common use" referred to them by the Board with the assent of Parliament; and to submit such recommendations as they think fit. The Board of Trade are even to step in with orders fixing maximum prices of scheduled commodities. This is an extension of the growing interference of the Government with the liberty of the individual as shown by the exceptional penalties which are prescribed in certain circumstances for members of the Consumer' Council. If a member neglects or refuses to make a declaration of secrecy, he or she may be fined £50 or imprisoned for three months, or suffer both penalties. Further, if any member discloses information about any individual business acquired during these investigations, he will be faced with a raising of the fine to £100, and of the term of imprisonment to two years. There is also a scale of pains and penalties for traders who contravene price-fixing orders made by the Board of Trade; but a great deal of water must flow under London Bridge before the harassed trader reaches that stage.

A Dangerous Path.

THIS, of course, is not the first experiment which Governments have made in price-fixing in the last fifteen years. Experience of former incursions into this dangerous field suggests that the maximum price tends to become the minimum price as well, or, in the alternative, that the article arbitrarily priced disappears altogether from the market. There is the further difficulty that cheaper articles may be increased in price, and that unless the quality of the scheduled article is strictly defined, there may be serious interference with the production of goods of a better quality. It is possible that the Bill may not get through Parliament, and if it does, that it will become a dead letter. All the same, its appearance at this time throws a lurid light on the attitude of a large section of political opinion towards the trading community.

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EAST ENGLAND ELECTRICITY SCHEME.

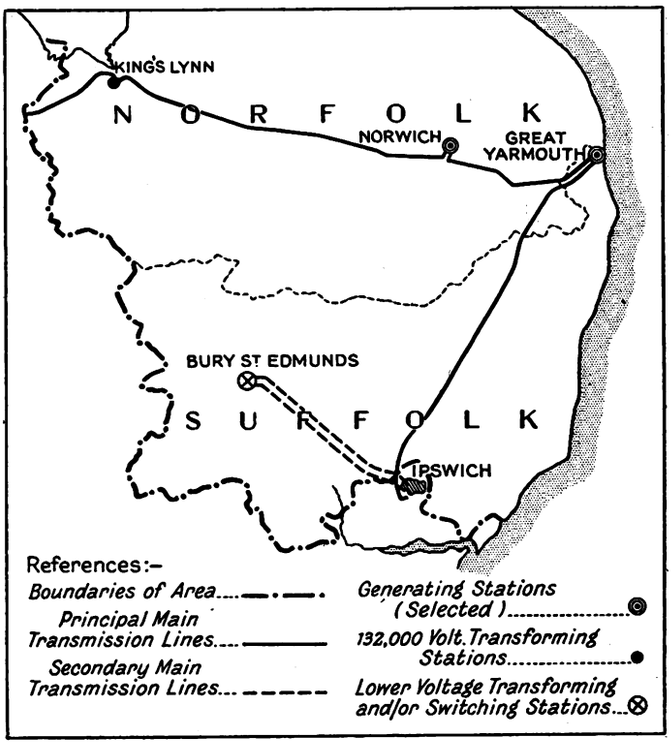
Eighth of the Grid Schemes Issued by the Electricity Commissioners—Arrangement for Meeting Requirements of Norfolk and Suffolk.

BY the publication on Wednesday of the East England Electricity Scheme, the Electricity Commissioners have now provided for the whole of England and Wales and part of Scotland, leaving only the sparser areas of South and North Scotland to be dealt with. The work of the Commissioners, so far as electricity schemes are concerned, is coming to an end, 72% of the geographical area of Great Britain having been catered for, representing 94·7% of the population and 99·4% of the units supplied from public supply sources. The East England Scheme is the eighth to be published, while the Central Board has already adopted six, the seventh being under consideration.

The aggregate maximum load on the undertakings in the East England area during the winter of 1928–29 was 26 059 kW, and is estimated to reach a total of 61 225 kW in 1937–38, an increase of about 135%. By the winter of 1943–44 the aggregate maximum load is estimated to amount to 82 500 kW. The sales of electricity in this area during the year 1928–29 amounted to 48·2 million units, or an average of 61 units per head of population, and are estimated to reach a total of 162·7 million units in the year 1937–38. By 1943–44, sales are estimated to reach a total of 221 million units, or 280 units per head of population.

The extent of the area is about 3 438 square miles, and the population at the last Census was approximately 788 880, representing an average density of about 230 persons per square mile. It embraces the whole or part of the areas of supply of 18 authorised undertakers operating between them 11 public generating stations, including the extension area recently granted to the Corporation of Ipswich, the supply for which is provided for by the present scheme. The cost of generation in this area in 1936–37, when the full capital charges under the scheme fall to be met, will form approximately 77% of the total cost of the units delivered by the Central Board to authorised undertakers for distribution in turn to their bulk and other consumers. The remaining 23% represents the expenses incurred by the Central Board, and includes the capital and other charges upon the Board's transmission system and their general administration expenses. The stations determined to be selected stations are the South Denes station of Great Yarmouth Corporation and the Thorpe station of Norwich Corporation. The scheme also permits of the operation, if necessary, of the station of King's Lynn Corporation under temporary arrangements between the Central Board and that Corporation. On the data at present available to them, the Commissioners have concluded that additional generating plant in the selected stations will be required as follows: (i) South Denes (Great Yarmouth Corporation). An addition of 15 000 kW of 3-phase 50-cycle generating plant and equivalent boiler plant (for operation by the winter of 1932–33); a further addition of 15 000 kW of 3-phase 50-cycle plant and equivalent boiler plant (for operation by the winter of 1935–36); and a further addition of 15 000 kW of 3-phase 50-cycle plant and equivalent boiler plant (for operation by the winter of 1939–40). (ii) Thorpe (Norwich Corporation). An addition of 15 000 kW of 3-phase 50-cycle generating plant and equivalent boiler plant (for operation by the winter of 1941–42).

The scheme provides for about 131 circuit miles of overhead primary transmission lines to be operated at 132 000 V between phases, the carrying capacity of each primary line covered by the estimates being not less than 50 000 kW. The primary transmission lines will be joined up to the selected stations at Peterborough and Ipswich in the area of the South East England Scheme; and will thus constitute an essential supplement to the main transmission system between the two generating stations in question by completing a ring main. For interconnection of selected stations with one another and with the systems of authorised undertakers or of the Board, these extra high pressure overhead lines and/or underground mains will be erected by the most convenient route in each case, from: (1) Norwich to Great Yarmouth; (2) Norwich to King's Lynn; (3) King's Lynn to Peterborough as far as the boundary of the area; and (4) Great Yarmouth to Ipswich. In connection with these principal main transmission lines, transforming stations will be provided at such points convenient for the purposes of supply to or from Great Yarmouth (60 000 kVA), King's Lynn (10 000 kVA), and Norwich (30 000 kVA). Overhead lines designed for operation at 33 000 V or other approved voltage between phases will be erected over the most convenient route from Ipswich to Bury St. Edmund's, while transforming stations will be provided at such points convenient for the purposes of supply to or from Bury St. Edmund's (5 000 kVA), and Ipswich (5 000 kVA).



Illustrating the East England Scheme. It is proposed that the base load output be allocated to Great Yarmouth station.

It is estimated that by the end of the financial year 1937–38 the capital expended under the scheme will have been as follows:—

By Central Board—	
Transmission lines and transforming stations, including capitalised interest	£594 328
By Owners of Selected Stations—	
On extensions of existing stations (30 000 kW of generating plant and equivalent boilers, etc.), together with additional boiler plant equivalent to 18 000 kW	306 074
Total expenditure	£900 402

On the basis of individual development by the various authorised undertakers in the absence of the scheme, it is estimated that provision would have to be made by 1937–38 for further generating plant amounting to 58 500 kW (inclusive of the above-mentioned figure of 30 000 kW) to meet the load in the area and to allow for further immediate growth, representing an estimated net capital expenditure of £527 537. By the year 1937–38 a proportion of the existing spare plant in the generating stations at Great Yarmouth and Norwich will have been released for revenue earning purposes under the scheme, such released plant amounting in all to about 22 580 kW and representing an actual expenditure of about £383 860. Allowing for the non-release of spare plant in the absence of the scheme, it appears that the system of inter-connection for the East England area can be effected by a capital expenditure up to 1937–38 of £594 328, as compared with an investment of £605 323 under the existing system (i.e., the preceding items of £527 537, less £306 074, plus £383 860). It is of interest to note that the Commissioners' estimate that in the five years 1933–38 there will be a saving to the undertakers in the area of about £218 578.

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VARIETIES AND USES OF MICA—I.

Value as an Electrical Insulator—Few Sources of Large Sheets—Possibility of Utilising More Finely Divided Mica.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

MICA shares with asbestos the distinction of possessing as a natural substance and in its natural state, remarkable properties which render it of extremely great value in the manufacture of electrical apparatus. It is, perhaps, the most important of solid insulating materials, being used very extensively, especially where great electric strength is required. The methods of its use are already many and varied and, as will be indicated later, there are possibilities of still further important developments of its use. For these reasons it demands an important place in a review of the raw materials of the electrical industry.

Historically the earliest use of mica seems to have been for window lights. The name of one of its principal varieties, moscovite, is said to have been given after the material had been observed in this use in Russia (Muscovy). The general use of mica in the electrical industry has only been developed within the last quarter of a century, Some twenty years ago, probably the majority of electrical machines depended almost entirely on the use of varnished cloth for the insulation of their highly stressed parts. The use of such fabrics, however, rapidly decreased as the art of applying mica advanced. In its earliest applications to windings, mica was applied principally in the form of tapes formed of overlapped mica splittings bonded to a paper, cambric or silk, and this use still continues.

An outstanding advance was made by the development of the Haefely cell for high voltage wingings. The Haefely process, named after its inventor, consists in wrapping the slot conductors with sheets of micafolium, which are pulled tight by the ironing action of the hot bars of a special machine rotating slowly round the slot portion of the winding. In parallel with this advance great improvement was made in the methods of bonding mica both for tapes and for sheet used either flat or moulded to simple shapes, and further important developments in this direction are now being made by the successful use of a new variety of synthetic bonder known as "Glyptal." Another interesting recent development is introducing the use of mica in very finely divided form bonded with lead borate to form a high voltage insulation with remarkably low losses at high frequencies.

By nature, mica is a crystalline mineral consisting mainly of a double silicate of aluminium and potassium, often with magnesia and iron oxides, the constituents varying in the varieties mined in different localities. It occurs extensively in the earth's crust, first as a constituent of primary igneous rocks such as granite, and also in metamorphosed rocks known as schists, in which the mica is segrated in layers and pockets. It is thus not by any means a rare material. Rocks consisting apparently almost entirely of mica particles form great masses of the hills of Macedonia and the mica dust lay thick and slippery on the roads cut and climbed by our troops there during the war. Unfortunately, however, the occurrence of mica in large crystals is limited to comparatively few sources and since, up to the present time, its methods of use have demanded pieces of medium to large sizes, it remains one of the most costly insulative materials used. Should success attend attempts which are being made to use mica in more finely divided form, some change in the problem of supply may possibly result.

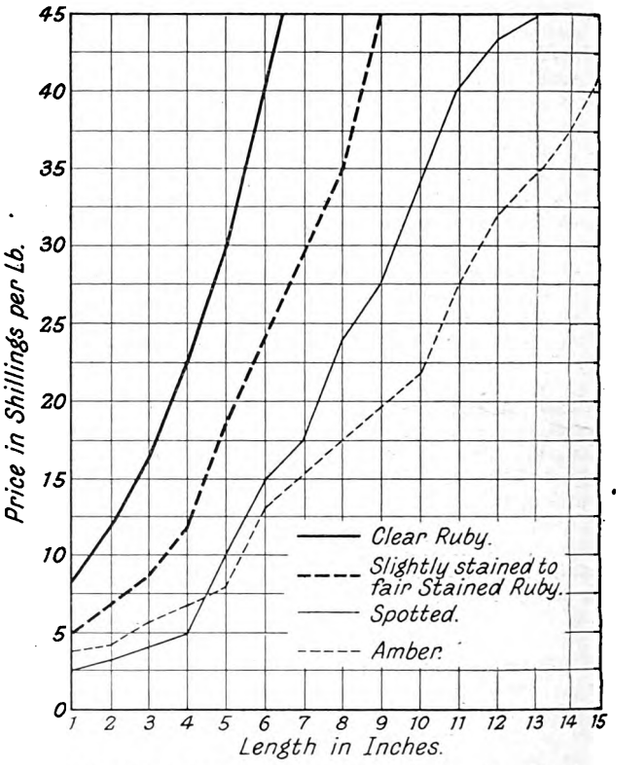

Fig. 2.—Comparative prices of various qualities of block mica. The prices are approximately proportionate for cut mica sheets having a width up to 50 per cent. of the length.

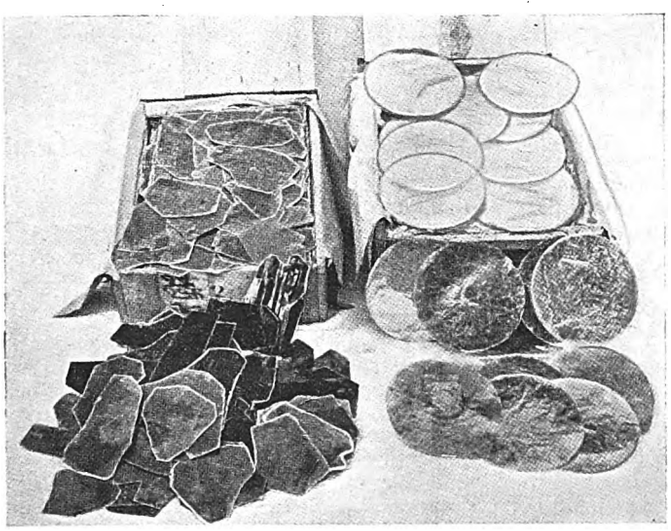

Fig. 1.—Block mica and mica splittings (pan-packed) as received from the mines.

It may be noted here that while there are a considerable number of firms catering for the mica demand of the electrical industry, practically all the mica received in this country passes through the agency of three or four leading brokers.

The principal varieties of mica commercially exploited are as follows:—

Muscovite or *Ruby* or *Potash Mica* is the most common form. It may be colourless to ruby, green or brown, and clear or spotted. It has vitreous lustre and is more or less transparent. It is obtained mainly from India, but Rhodesia, East Africa, Argentine and the United States contribute important quantities and supplies exist also in Russia, Switzerland, Sweden and other countries. Fig. 1 shows some fine specimens of India mica as handled at the mines, and Fig. 2 shows mica, white and ruby, as received in this country.

Phlogopite or *Amber* or *Magnesia Mica* varies in colour from pale yellow to dark amber and green. It has a pearly lustre, and even in thin sheets is merely translucent. Canada and Madagascar are the most important producers of this variety.

Biotite or *Black Amber Mica* contains a high percentage of iron oxide, which renders it useless for electrical purposes. It is very dark green or brown to black in colour and is more brittle than phlogopite.

Lepidolite or *Lithia Mica* varies in colour from light mauve to yellow, greyish white or white. It is very hard and brittle and will not withstand heat but fuses at ordinary temperature. This variety is scarce and is not used in the electrical industry.

For purposes of electrical insulation only, muscovite and phlogopite need be considered. Their approximate compositions are shown in Table I. It will be noticed that phlogopite contains relatively small quantities of alumina

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and potash but a comparatively large amount of magnesia, and that it has less water of constitution.

TABLE I.—Typical Percentage Compositions of the Principal Kinds of Mica

Kind of Mica.	Silica.	Alumina.	Magnesia.	Potash	Fluorine.	Water.
Muscovite* ..	45·1	36·6	—	11·8	traces	4·5
Phlogopite† ..	39·6	17·0	26·5	9·9	2·2‡	2·99
Biotite‡ ..	39·0	15·5	11·3	8·6	1·3	3
Lepidolite§ ..	51·5	25·9	—	11·0	5·8	0·95

* Also contains traces of iron oxide. † Also contains 0·5 to 0·9% of iron oxide.
‡ Also contains 22·8% of iron oxide. § Also contains 0·3% of iron oxide and 4·9% of lithia.

Table II shows a simple sub-division of the two varieties with an indication of some of their properties and uses. Both the varieties in block form come under the B.E.S.A. Class C insulation materials; when converted into the various grades of micanite by the use of a suitable bonder they are recognised as B.E.S.A. Class B materials. In these materials it is stipulated that the mica content must not be less than 30% by volume.

TABLE II.—Varieties of Mica for Electrical Insulation.

Muscovite Varieties			Phlogopite Varieties.		
Ruby or white Indian splittings.	Green spotted	Ruby Block	Amber Splittings	Silver Amber	Amber block
Characteristics			**Characteristics**		
Best electrical and mechanical properties. Hard; Good splitting	Splittings rather irregular.	Rather hard; easily split.	Uneven and soft.	Very soft; splits badly.	Soft; excellent heat resistance.
Applications			**Applications**		
Undercut commutator micanite. Micafolium for Haefely wrap. Slot cells. Tapes. Hard micanite. Moulding micanite.	Punched washers.	High voltage washers.	Special armature segments. Armature band insulation.	Moulded micanite.	Heating elements.

Between the two varieties of mica there are important differences, which greatly affect their suitability for particular conditions of service. Muscovite mica is more flexible and splits more readily than phlogopite. The former can be divided into laminæ ·001 in. in thickness without cracking, and with very little waste, whereas the latter is more difficult to cleave and tends to form "heels," i.e., differences in thickness between the edges of the same splitting. On the other hand the phlogopite splittings usually have a finely crinkled surface which for some built up mica work forms an advantage, as it anchors the bond and tends to prevent the splittings from slipping under pressure. Phlogopite is softer than muscovite, and is, therefore, more suitable for commutator segment separators which are not undercut. Phlogopite has another advantage over muscovite in that it will withstand higher temperatures. Muscovite begins to lose its water of composition at about 450 deg. C. and nearly all its water is given off at about 800 deg. C. It is thus unsuitable for such work as heating element construction for domestic appliances. Phlogopite, on the other hand, contains less water to lose and does not begin to lose it below about 900 deg. C. Some phlogopite can safely be used for temperatures up to 1 000 deg. C.

In electrical strength muscovite is much better than phlogopite. When tested in sheets of about ·002 in thickness, phlogopite breaks down at about 2 000 V per mil, whereas muscovite goes to about 3 000 or 4 000 V per mil, or even higher. With regard to both heat resistivity and electric strength it should be remembered that these properties of almost any kind of mica are so good in comparison with those of other insulating materials that for most applications except high temperature and high voltage or high frequency work any variety of mica can be used which is rendered suitable by its other characteristics.

The use of block mica in plain sheets is limited by the scarcity and cost of the material in large pieces. Fig 2 shows the comparative prices of the various quantities of block mica as given in a chart issued by the Micanite and Insulators Company, Ltd., the largest mica specialists in this country and the originators of the name Micanite, which was introduced as a trade name in 1893, but has since passed into general use as a designation for any material consisting of mica splittings held together by an adhesive. Fig. 3 shows a group of materials and products of this firm. It is interesting to note than the lamp shades in this illustration are of the newly developed "Glyptal" micanite, to which reference has already been made. Most of the splittings used by this firm in the manufacture of micanite are prepared from Indian Ruby mica.

The maximum commercial sizes in which Ruby mica can be obtained are about 8 in. by 8 in., 6 in. by 12 in., etc., sheets of more than 80 sq. in. being uncommon, and consequently very expensive. Spotted mica (muscovite) can be obtained in sheets up to but rarely exceeding 12 in. by 12 in. Amber

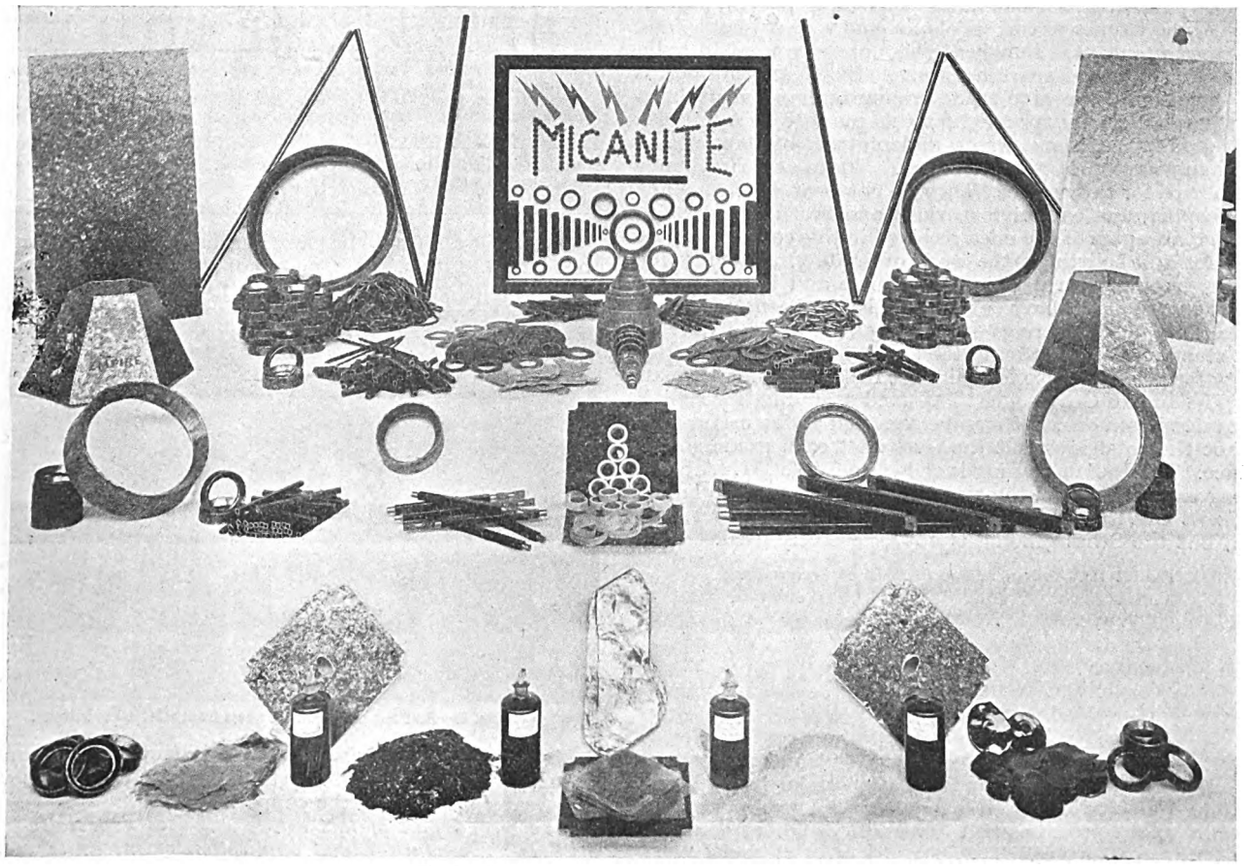

Fig. 3.—Group of raw materials and micanite products.

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(Phlogopite) mica is found in slightly larger sheets than the Muscovite varieties, the largest commercial sizes being about 12 in. by 12 in., 9 in. by 18 in., etc.

In view of the cost of clear mica, either in sheet form or splittings, free from stain, streaks or spots, every consideration should be given to the actual service considerations when specifying mica for particular purposes.

For many purposes great electrical strength, low power factor and very good heat-resisting properties are not essential,

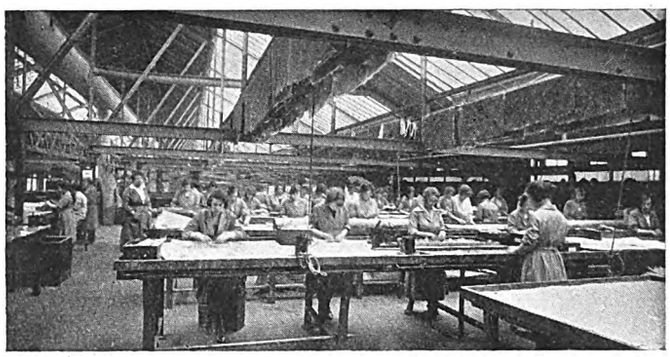

Fig. 4.—Sorting mica in the Metropolitan-Vickers Works.

and in these cases economies can be effected safely by using stained or even spotted or streaked mica. Spots and streaks often consist of iron in one form or another, and mica in which they occur is not suitable for high voltage or high frequency work. The existence of spots, however, does not reduce the electrical strength very much and spotted mica is used extensively and safely for low voltage work, including commutator segment separators, the element insulation of electrical heating and cooking apparatus, switchgear insulation, and for the manufacture of insulating washers. The existence of streaks should be viewed with caution, since some of these represent conducting paths between the laminæ. Where the insulation involves only low voltage stresses through the thickness of the sheet, even these impurities are often not dangerous, but in order to avoid any risk to reliability most manufacturers of high-grade electrical apparatus absolutely prohibit the use of mica marked with dark lines.

The principal uses of plain sheets are for electrical condensers, and for punching washers and separating pieces, as, for instance, the flanges of coil spools for fine wire solenoids, and in X-ray equipment. Punched pieces are also used to build up the insulation of sparking plugs. Block amber mica is used extensively for high-grade commutator segment insulation, and is usually specified for this purpose in Admiralty contracts and in general where undercutting of commutator segment insulation is not permitted. White and ruby mica are too hard for this service. They do not wear down as much as the copper, and excessive sparking and brush wear result.

The greater part of the mica received in this country arrives in the form of splittings, the work of grading, trimming and splitting having been performed by male and female native labour in India. Many attempts have been made to standardise the splittings according to areas available. Such standardisation is important as a means of comparing quality for price and also for guidance in selection for ultimate use. The Indian Government has fixed a grading for slab or block mica based on what may be regarded as the useful area, i.e., not the total area but the sizes that each grade should produce. The Indian grading is shown in Table III. A Swiss grading exists, in which the sizes are about one grade larger, i.e., Swiss Grade 2 corresponding with Indian Grade 1, and so on, but the Swiss grading is not extensively used.

TABLE III.—Indian Standard Sizes of Splittings.

Grade.	Useful Area. (sq. in.)
Extra special	60 and upwards.
Special	48—59½
A1	36—47½
1	24—25½
2	15—23½
3	10—14¾
4	6—9½
5	3—5½
6	1—2¾

Even with the Indian standardisation there is often considerable difficulty in obtaining uniformity of supplies, due no doubt to the processes and low grade of labour employed for splitting and sorting. The splittings are sometimes mixed, so that what may appear to be a box of high-grade size is in reality an inferior grade due to the large percentage of smaller splittings included.

It is usual when obtaining splittings to ascertain how they are packed, whether loose or pan-packed, in the latter case the splittings being packed in round, or sometimes square cakes. Round pan-packed cakes are seen on the right in Fig. 1. Pan packing is usually adopted for the better varieties, as it ensures more careful selection, due to the fact that the splittings are arranged by hand, and small fragments and dust are more or less eliminated. Loose packed splittings do not receive so much attention. For general manufacturing purposes small splittings are used wherever possible, to reduce cost. In any case special selection of splittings is necessary according to the uses required.

The smallest grades of mica splittings, costing about 5d. per lb. can be used for making micanite for commutator segments by the new tower-building method in which the splittings are scurried down a tall tower in blasts interspersed with powdered bond. When hand-making is necessary in the absence of tower-building equipment larger sizes of splittings must be used to obtain an equal quality of product. The ruling sizes and prices for splittings used for some typical purposes are shown in Table IV. The apparent discrepancy in price for the first two items in this table is explained by the fact that there is a larger percentage of small splittings in the first item, and in the second a predominance of larger splittings in order to permit later bending and moulding.

TABLE IV.—Ruling Prices of Splittings for Typical Applications.

Application.	Approx. area. (sq. in.)	Approx. price. (per lb.)
Tower built segment micanite	1—3	5d.
Tower built moulding micanite	1—3	10d.
Segment or V ring micanite (hand-built)	2—6	2s. 3d.
Admiralty cell mica	10—5	4s. 3d.

Recommended grades and characteristics of mica splittings for typical applications are shown more fully in Table V.

TABLE V.—Recommended Sizes and Varieties of Mica for Various Purposes.

Application.	Quantity.	Thickness (inch)	Characteristics.
Commutator segments from tower built micanite. Hard mica plate	60% with 1 sq. in. area. 30% „ 2 „ „ „ 10% „ 3 „ „ „	0·0005 to 0·0015	Fairly hard, unstained, clear ruby or white splittings.
Moulding micanite from tower-built sheets.	40% with 1 sq. in. area. 50% „ 2 „ „ „ 10% „ 3 „ „ „	0·0005 to 0·0015	Soft, flexible, unstained clear white splittings.
Slot cell insulation made of built-up mica backed with flexible materials.	5% with 1 sq. in. area. 50% „ 2 „ „ „ 30% „ 3 „ „ „ 15% „ 4 „ „ „	0·0005 to 0·0015	Very soft, flexible, unstained, clear white splittings.
Micanite for V ring mouldings and high voltage slot cell insulation.	5% with 2 sq. in. area. 25% „ 3 „ „ „ 40% „ 4 „ „ „ 25% „ 5 „ „ „ 5% „ 6 „ „ „	0·0005 to 0·0015	Very soft, flexible, selected large size, unstained, clear ruby or white.
Slot cells for Admiralty Specification and for traction motors.	30% with 10 sq. in. area. 35% „ 12 „ „ „ 35% „ 14 „ „ „	0·0005 to 0·001	Very soft, large flexible, unstained, ruby or white.

Even this does not by any means exhaust the field of application. For example, no use of amber splittings is shown,

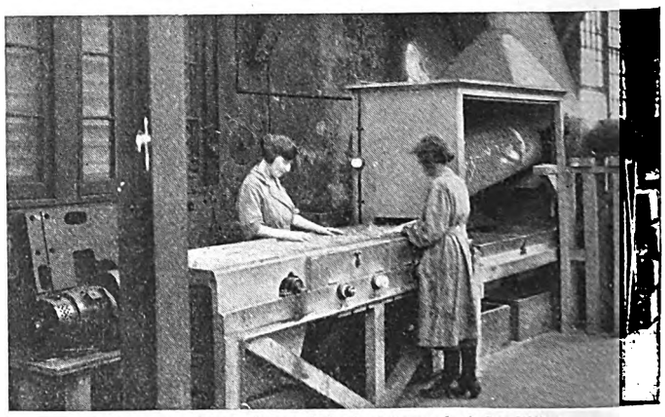

Fig. 5.—Building mica cambric sheet from selected splittings.

these being chiefly reserved for the manufacture of commutator segment micanite, which has to be of such softness that it will wear equally with the copper.

[*The second part of this article will deal especially with the methods of production and application of micanite and other forms of mica bonded with adhesives.*]

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TELEPHONE INSULATION.

Impregnating Mediums—Difficulties in Coil Work—Open Tank Impregnation—Use of Paraffin and Beeswax.

(FROM A CORRESPONDENT.)

IMPREGNATION is applied in telephone work with the object of rendering material impervious to water. There are a number of substances which, while perfectly good insulators in themselves, readily take up moisture within their pores and thus present a comb-like maze of conducting passages throughout their mass. In some instances waterproofing is not the primary reason for impregnation, but these are decidedly in the minority. Sometimes fine textile covered wire is impregnated previous to winding in coil form so that the whole shall be adherent. Impregnation is also used to render surfaces adhesive for purposes of assembly of terminals and the like.

It is not sufficient for an impregnating medium simply to be waterproof. Obviously it must of itself have insulating properties. Sometimes it must be transparent so as not to obscure colouring of wires, etc., and often there is a limit on the flowing temperature especially for use on apparatus in tropical climates.

Generally speaking, for the actual process of impregnation the substance has to be rendered fluid by the application of heat. The other method, that of employing a solvent, while satisfactory for the preparation of waxed papers, fabrics, etc., is not suitable for treatment of completed apparatus, parts, coils, switch insulators, and so forth, because great difficulty is experienced in driving off the solvent from the internal portions.

Open tank impregnation is carried out for smaller parts, but naturally cannot be applied to the larger coils. The usual method in such cases is to dry the parts under vacuum (about 28 inches) and then treat with the fluid compound without breaking the seal.

Perhaps wax impregnation is the most common and it includes the use of paraffin, beeswax and such materials. These have the advantage that they do not become brittle on solidifying nor do they affect the colour visibility of parts to which they are applied. In telephony probably the largest use of paraffin wax lies in the treatment of condensers and paper insulated cables.

Beeswax by itself has very little application—it has decidedly acid tendencies. For the treatment of onion skin paper for coil interleaving a mixture of beeswax and paraffin wax in the proportions of one to one is popular. The addition of resin and carnauba wax makes the compound both harder and of better insulation value. Resin oil also is often added. With additions as mentioned the paraffin-beeswax compound is used to a large extent for the impregnation of switchboard wiring, coils, etc.

Temperatures for treatment with the different mixtures naturally vary and more than a little skill is required for getting the best results. Round about the boiling point of water (212 deg. F.) has been found suitable for most of the wax mixtures. If the temperature be allowed to run too high there will be every chance of the proportions changing—the resin is the first to be thrown out.

Resins, Asphalte and Oils.

Resins are used largely in combination with resin oils in the proportion of four to one. Impregnation takes place at about 250 deg. F. in vacuo. Repeating and retardation coils are treated in this manner.

Asphalte impregnation is used to some extent but not for coil work. For sealing condensers it finds one of its chief applications. The great advantage of asphaltic mixtures is that they may be so blended as to be quite flexible.

Oils, although used for impregnation of papers, silks, and such materials, do not find application in telephone manufacture itself—impregnated materials are bought from manufacturers.

At the present moment there is a difference of opinion amongst telephone manufacturers in regard to the advisability of impregnating certain types of coils, especially those subjected more or less to constant current as in automatic work. Any traces of water present in a coil form a path of low resistance for leaks, but there is another and more serious reason why all water should be kept out. It has been found quite impossible to produce enamelled wire absolutely free from pinholes. These are kept to a minimum by suitable tests applied to a percentage of the wire deliveries, but still wire with small holes has to be accepted. Again the materials of which the wire and coil are made are liable to be corrosive; for instance, the impregnated onion skin paper previously mentioned is distinctly so—and as such may act on the unprotected parts of the wire directly beneath one of the minute holes. It only requires the presence of water to initiate the chemico-electrical action which may result finally in severance of the wire. Impregnation with a suitable wax removes this trouble. On the other hand, waxes are liable to flow under certain conditions at temperatures which laboratory tests have indicated to be quite compatible with stability. There are a number of reasons for this, one of the chief being the additional rise due to rapid working for a limited period of time. Flow of impregnant is a serious matter for it easily covers up contacts and jams the delicate armatures. Thus it is that there is a divergence of opinion on the question of impregnating. It was once tried to split the difference by draining the coils in vacuo after the initial impregnation. This prevented flow but did not seem to improve the resistance to possible corrosion; furthermore, it was expensive, and so was finally abandoned.

WORLD POWER CONFERENCE.

Special Arrangements for Visits to German Power and Industrial Plants.

SOME 400 papers have been submitted in connection with the second plenary meeting of the World Power Conference, to be held in Berlin from June 16 to 25. The most important statements will be dealt with by the General Reporter of each section at the meeting. The discussions that will then take place will constitute the most valuable part of the Conference, and result in important decisions being reached. Apparatus specially installed for the purpose will transmit the speeches, simultaneously, in English, French, and German, the three official languages of the Conference.

On the conclusion of the Conference, special facilities are being granted for visiting the most important power and industrial plants in Germany, the number of such plants that can be visited numbering over 200. These include in Berlin, the chief electrical manufacturing works, power stations, gas works, scientific institutions, and the largest steam-accumulator plant as well as the largest rectifier traction station in the world; in its environs, lignite mines and important lignite power stations; in the Rhineland, coal and lignite mines, coking plants, iron and steel works, electric power stations, long-distance gas supply plants, a 220/380 kV plant and the largest pumped storage hydro-electric plant in Europe; in Central and Southern Germany, several large pumped storage hydro-electric plants now under construction, chemical works, a large steam-power plant operating with steam at extra high pressure at Baden, and the 220/380 kV transmission line from Rhenish-Westphalia to Switzerland. Provision has also been made for visiting the large hydro-electric stations of Bavaria and the Deutsches Museum at Munich, as well as important chemical works. Visits will be paid to the generating stations for supplying current to electrically operated railways in Silesia as well as to well-known coal mines and foundries. Tours are also being arranged to the shipyards of Northern Germany, as well as to the various technical universities.

FARADAY MEDAL AND KELVIN LECTURE.

At the Institution of Electrical Engineers, on May 1, the President, Col. Sir Thomas F. Purves, presented the Faraday Medal to Sir Ernest Rutherford, F.R.S., saying that no one would ever ask why this award had been made.

The presentation was followed by the twenty-first Kelvin Lecture, on "Some Recent Advances in the Electron Theory of Metals," by Mr. R. H. Fowler, F.R.S., who expressed the belief that quantum mechanics would proved adequate to deal with the problems presented by electrical conductivity and magnetism, though there was still much work to be done.

The Council dinner was afterwards held at the Waldorf Hotel, Aldwych, London.

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LARGE TRANSFORMER DESIGN.

Our Recent Progress in Great Britain—Units of 80 000 kVA under Construction—Some of the Difficulties—Mechanical and Thermal Stresses.

By E. T. NORRIS, M.I.E.E., Member A.I.E.E., Chief Designer, Ferranti, Ltd.

AN outstanding feature of engineering progress in this country during the last few years has been the rapid increase in size or rating of the largest transformers. Two years ago the largest transformers built in this country were not more than 25 000 kVA at 33 000 V, whereas at the present time transformers of 60 000 kVA at 132 000 V have been built, and even larger units of 75 000 kVA and 80 000 kVA are under construction.

Although actual manufacture of such large transformers has only recently taken place, their design has been evolved

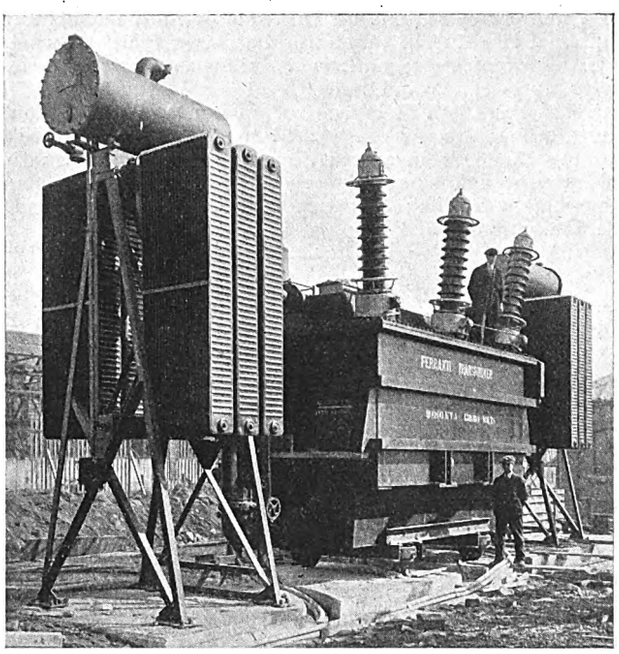

Fig. 1.—20 000 kVA transformer in course of erection.

through long periods of accumulating experience. Indeed, many years of continuous design work have been spent entirely on these large transformers. Innumerable trial designs must be made with all manner of proportions, before the final design is reached in which conflicting characteristics are reconciled into harmony with well-balanced proportions and safe reliable performance. As the size of a transformer increases, its design becomes more difficult and complicated. Electrical, mechanical and thermal stresses grow more acute and demand more accurate and complete technical knowledge for their satisfactory control. Many firms to-day are successfully building transformers on methods developed by experience and from designs based on trial and error, rule of thumb and empirical formulæ. Such firms run serious risk in attempting considerably larger sizes—a risk often not appreciated until too late.

In designing a transformer larger than any he has done before, the designer is extrapolating from his curve connecting Size of Transformer with Design Experience. It is necessary that this curve be accurate and fundamentally sound. The extrapolation in any case requires skill and judgment with a certain amount of imagination. Unfortunately, imagination tends to run riot. Its branches must, therefore, be ruthlessly pruned and its roots firmly embedded in solid fact. Imagination as a substitute for technical knowledge and without a sufficient foundation of fact inevitably results in failure.

During normal operation a transformer of any size is subjected to electrical, mechanical and thermal forces, or stresses. Electrical stresses, i.e., insulation stresses, are dependent mainly on the voltage and not on size; in fact, the difficult and relative cost of providing for these stresses lessen as the size of transformer increases for a given voltage. The necessary thicknesses of insulation are approximately constant, and hence for the larger transformers the space taken up by nsulation is relatively less. So far, then, as electrical stresses are concerned, a 30 000 V transformer of 30 000 kVA is easier to design than one of 300 kVA for the same voltage.

Mechanical and thermal stresses, however, whilst being affected by other characteristics, become rapidly more severe as the size of transformer increases. Since there are danger limits to these stresses, there comes a time when the stresses are as large as is safe. Alterations must then be made in the design so that either the stresses are reduced or better provision is made for resisting them.

For example, in very small low voltage transformers, the primary and second windings may each be wound as a single solid coil, and its temperature rise will be small, i.e., the thermal stresses will not be appreciable. As the size is increased the temperature increases until a point is reached when the coils would become excessively hot. At this stage the thermal stresses must be reduced either by reducing the current density, or, alternatively, by improving the cooling of the coils, each coil being split into two or more sections with cooling spaces between them. In a similar manner, if the size is increased still further, this improvement in cooling will no longer be sufficient and additional means must be adopted.

The ability to design really excellently and economically transformers of a given range of sizes is not, in itself, by any means a guarantee of success in the design of considerably larger transformers. In the case of the very small transformers just referred to, a designer who did not realise that thermal stresses existed at all would be under no handicap and might well be producing transformers of efficient design and excellent quality with a deservedly good reputation. His attempt at the larger size design would, however, result in immediate or ultimate failure.

To qualify for the ability to design satisfactorily the larger sizes, it is not enough for the designer to know that thermal stresses will be serious and to make a guess at suitable provision for them. It will nearly always be extremely expensive both in time, money and reputation, if alterations have to be made after the transformer has been constructed. The designer must have sufficient technical knowledge to be able to predetermine quantitatively the actual values of the temperatures concerned. He must check this knowledge

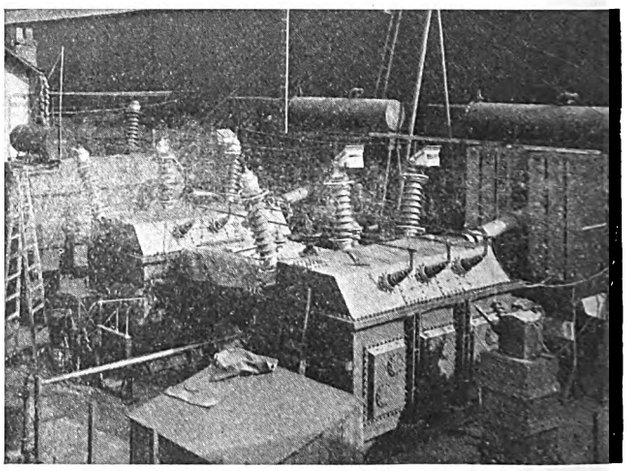

Fig. 2.—Temperature test on large transformer.

against measurements of the negligible stresses on the small transformers he has been building, and, if necessary, obtain thermal constants and other data by experiments. Then, when thermal design formulæ have been developed which are theoretically sound; which are sufficiently complete to deal with any proposed new construction, and which have been quantitatively checked, the larger size of transformer may be designed with confidence.

Load and no-load losses, since they cause thermal stresses, may be included under that heading, although frequently

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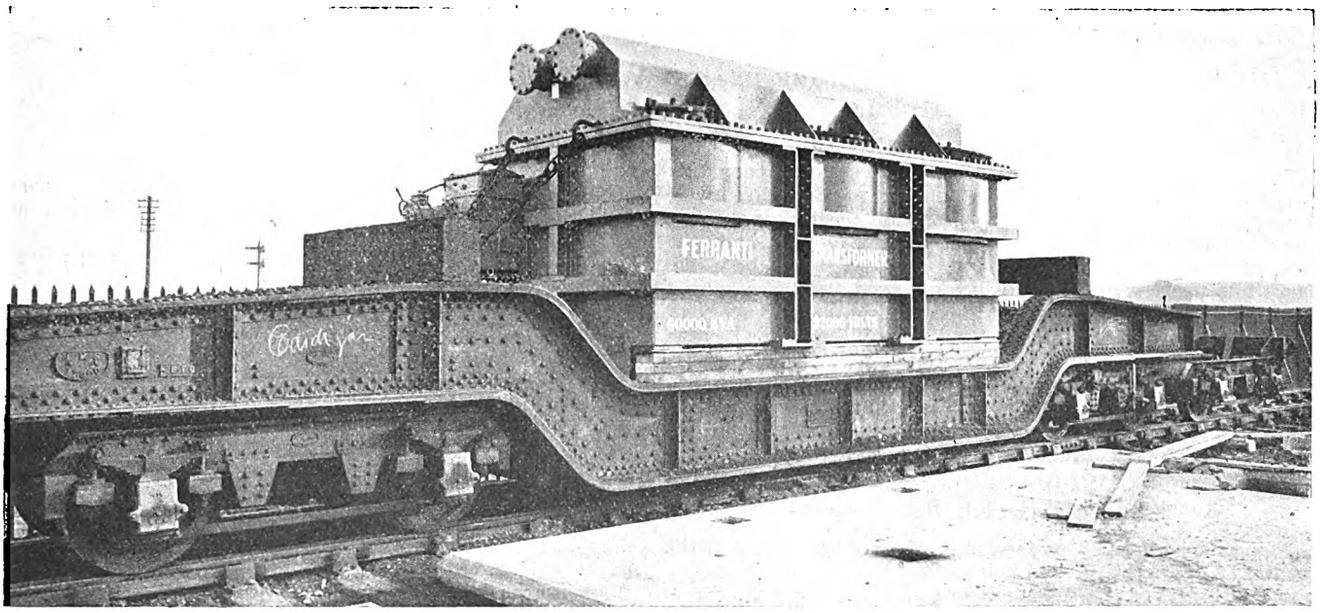

Fig. 3.—60 000 kVA transformer on railway well wagon.

they have other and more urgent limitations due to efficiency guarantees.

Copper losses resulting from load currents in the windings are easily calculable, but the extra losses due to eddy currents in the conductors are more difficult to determine, and, moreover, increase rapidly with the size of transformer. Winding arrangements which would give an insignificent eddy current loss in a 300 kVA transformer would, if used in a 60 000 kVA transformer, give a quite prohibitive loss of two or three times the load copper loss. There are many other components of the load loss which, in transformers of 5 000 kVA or so are negligible, and indeed often unsuspected, but which may easily reach alarming proportions in transformers of ten and twenty times that size.

Study of tank losses.

Some years ago a number of transformers of comparatively large size, for those days, were built to a certain order. On test, it was found that the load loss was increased 40 per cent. by putting the transformers into their tanks. It was known that, due to the leakage flux setting up eddy currents in the tank walls, the tank increased the load loss somewhat, but such an enormous increase was entirely unexpected. Since the transformers were, of course, completely built before the test was made, the only solution was the extremely costly one of making new and much larger tanks. So far as transformers hitherto built were concerned, it had been sufficient to know that the tank loss was not serious, but the satisfactory building of these transformers did not prevent serious trouble when the larger ones were attempted. Somewhat belatedly the characteristics of tank loss were studied and methods developed for its accurate predetermination and control.

Complete technical knowledge is equally necessary for the calculation and control of mechanical stresses and no-load losses. In particular, core iron losses are sure to give trouble in large transformers unless the characteristics accentuated by size are properly appreciated and provided for. In certain cases of neglect, the iron losses will come out high on test, and, at least so far as the purchaser is concerned, give timely warning, but most frequently the trouble is more insidious, there being no evidence of it for several years until complete breakdown either wrecks the transformer or destroys part of the core.

The subject has been considered hitherto on the assumption that a firm has had to rely entirely on its own resources and provide and develop its own technical ability in increasing its range of manufacture.

There is, however, an alternative to this procedure which has, at first sight, attractive features. If the experience desired has been obtained elsewhere, and this source of information can be tapped, not only will duplication of technical and experimental work be avoided, but a possible element of risk will be removed, and mental stress in the firm's own design office greatly reduced. In the past this method has been frequently adopted. Some firms in this country who were in a position to do so looked to American friends for advice and assistance whenever new technical or constructional problems arose.

The practice, while giving temporary relief in special cases is thought to be bad as a habit. It is, moreover, doubtful, if the shifting of responsibility is good for the health of the firm's own technical staff. In any event, so far as this country is concerned, the method is now of no avail. British manufacturers of transformers have made tremendous progress in recent years, and America no longer holds the position of technical supremacy which was hers for several years after the War. Her manufacturers have sheltered from the chilly, if healthy blast of competition, largely by substituting financial operations. Standard American practice still includes features such as single-phase units, water cooling coils and convective oil circulation—features long since abandoned by most European manufacturers.

There are, then, no new problems in the design and construction of large transformers; no phenomena or characteristics peculiar to size; merely problems which are present in the smallest transformers, but more or less accentuated and intensified. Factors which are negligible in small design—so negligible that the designer need not, and often does not, know they exist—become important and vital in large designs. In short, for a firm to be in a position to build large transformers successfully, complete technical knowledge of the design of smaller transformers is essential.

It is not enough to be able to build transformers well. Manufacturers must know just how well and why so well. Transformer designing, often regarded as an art, is also a science.

LOW TEMPERATURE CARBONISATION.

THE Department of Scientific and Industrial Research has issued a report of a test carried out last June by the Director of Fuel Research on the "Babcock" Low Temperature Carbonisation Plant at the Dunston Power Station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. (Stationery Office, 9d. net). The plant, which is fully described, is designed for the production of power, the solid smokeless fuel being crushed at the outlet of the retort and discharged direct on to the chain grate stoker of a B. and W. boiler. The crushers are designed to produce a suitably sized coke.

The yields of products per ton of coal, as charged to the retort and per ton of dry coal, were :—

	As Charged.	Dry.
Coke (cwt.)	14·65	15·04
Tar (gals.)	16·4	16·8
Spirit scrubbed from gas (gals) ..	2·5	2·6
Gas (cu. ft.)	37·690	38·700
Gas (therms)	26·38	27·09

No practical difficulties were encountered in the operation of the retort. The carbon balance, which includes all the loss of the carbon in the volatile products during the cleaning periods, shows a loss of 4·5 per cent., which indicates that the test was satisfactory.

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UNEMPLOYMENT AND WORK—II.

Making the Worst of It.

By SIR ERNEST J. P. BENN.

IF our politics were healthy, we should hear both sides of the unemployment question. As it is we only get different views of one side of the matter. Three political parties, all playing the same game, all offering bribes and all promising the impossible tend not unnaturally to drive the common sense out of popular discussion. How much better we should be if one party told us we were going to the dogs, and the other, taking the natural line of opposition, argued that we were on the road to prosperity! In that case the public would perhaps be able to discern the truth and would understand that we are really in a fairly natural position, and that there is not as much to worry about as interested politicians would have us believe. As it is we are doing ourselves no good at home and infinite harm abroad by encouraging the notion that we are all out of work.

Success Breeds Success.

Trade depends upon buyers, and a little more study of the mentality of the buyer and a little less emphasis on the supposed interests of the seller might make a striking alteration in the state of affairs. As we are all buyers at some time or another, it is not difficult for any of us to understand how buying may be discouraged. We do not, for instance, rush to a theatre when we hear that the seats are mostly empty. On the contrary, we queue up in the rain to crush ourselves in when we are told that everybody is going to see some particular play. A cynic might say that we are sheep and must have a lead to follow. I prefer to think that in the matter of buying we like to feel the moral support of association with others. After all, a very great deal of our buying is only done because others do it also—women's fashions make this point quite clear. Then the average person dearly loves to be associated with success. He will buy a newspaper because he hears of its big circulation and avoid another journal which is probably far superior because it is understood to have difficulty in finding readers. When, therefore, we shout to the world that we are unemployed, the world pities us, but looks elsewhere for its purchases. Just as success breeds success, so failure breeds failure.

If the worst that is said about unemployment is true, it is nevertheless extremely foolish from a business point of view to emphasise the trouble. But the worst that is said is happily very far from true. Our position is infinitely better than we make it out to be; we have more employment than ever; we pay more wages than at any previous time. The income of the working classes taken as a whole is larger, the general standard of living higher. Considering our post-war difficulties, mostly created by political folly, we are in an economic position which reflects the highest credit upon those of us who still do real work. When two years ago I put this point of view to the annual meeting of the Charity Organisation Society, I was widely criticised and held up to scorn as a heartless creature. I find, therefore, no little satisfaction in listening to Mr. J. H. Thomas and applauding his efforts to get even the Socialists into a frame of mind when reason can be applied to this troublesome problem.

There is complete unemployment of the old-fashioned kind—total absence of any chance of work—to be found in one or two specialised industries and in several special districts. The industries are those which, like coal, have been ruined by politics, and the districts are those where an unnaturally large industrial population was introduced to make munitions of war. The rest of our vaunted unemployment, so far from being an old trouble, is in reality a new social benefit. No doubt it is making an ever-increasing quantity of trouble, which must in fairness be charged not to the failure of industry but to the success of the political agitator.

The point will perhaps be made more clear if the reader will imagine that instead of being English with our love of self-depreciation we were Americans with a genius for boost. What a different story we should tell! Our newspapers would be full of our wonders and our triumphs. The psychological skill which has had the world madly jazzing for the last few years would put the dole dope over one hundred per cent. The illustrated papers would display the smiling photograph of Sam the sea-side Chauffeur, who a few years ago had to earn a living in five months of the year and do odd jobs in the off season. Now, thanks to the wonders of Prosperity George and his People's-Budget-Every-time-Payment-Plan, Smiling Sam charges rather more for his five months' work and draws his "Loving Lloydy" for the other seven months. "Sam don't have to worry over odd jobs, and the cinema returns are up so many million dollars. Sam's health is better, his wife sees more of him and the country is a better place to live in."

But, fortunately, we are not American, and we cannot amuse ourselves in this fashion, although it would be the proper and logical thing to do, if we believed all we said to ourselves when we first voted for the People's Budget and all the alluring delights of ninepence for fourpence. We go to the other extreme, and now that we have secured to the full and more all the "benefits" which we ourselves planned, we set up a wail to the world that we are down and out and unemployed.

There is, of course, a vast, tragic difference between Smiling Sam and the coal-miner who has had no work for years, and in between the two are many grades of trouble, but we lump them all together in our lazy way, treat them all as if they were alike, and degrade our own intelligence by refusing to face up to facts.

When we discuss the causes of unemployment we take the line of least resistance and blame the foreigner, the war, the money market or some other remote and nebulous bogey which has no chance of answering back. Thus, for example, we seldom mention women. But, surely, if industry has put two men out of work and absorbed three women (for that is roughly what has happened) the numbers of employed are increased by 50 per cent. and a big step forward is made by the feminist movement. This from the industrial or the feminist point of view is triumph rather than disaster, except to that shallow, safety-first type of thinker who forgets that nothing can be done without cost. We may differ as to the wisdom of making wholesale payments to juveniles, but we can all agree as to the absurdity of using such payments as evidence of industrial depression.

The Ministry of Labour is but thirteen years old and was established to arrange and facilitate employment. So great is our common respect for Government institutions, that to suggest that the Ministry itself is one of the causes of unemployment sounds like a species of gross sacrilege. But surely the question is worth examination. If the Ministry, instead of enjoying a blank cheque on the public purse, had been floated as a company, it would have gone into liquidation years ago. A study of its prospectus, of the speeches and promises of its authors and advocates, shows that every hope on which it was founded has been falsified. This conclusion is inescapable whether we examine the matter in principle or in detail. When the State first said to the worker: "We will find you employment," it drove a fatal crack into our economic foundations, comparable to the effect of one of those noisy pneumatic drills on the concrete foundations of our roads. A totally new and altogether false thought was put into the minds of millions of people. The nature of industry, the true character of work, and the sense of personal responsibility which is inherent in them, were all smothered up in political falsehood. Economic salvation, depending as it does upon value for value, was cast aside and discarded for the tempting but devastating lie—ninepence for fourpence.

Trusting the Government.

We are a simple, docile people, which fact in itself is perhaps a point in our favour, but when those qualities lead us, as they have done in recent years, to accept as sacred and perfect everything labelled with the authority of Government, it is time that we developed a few of the balancing qualities of cynicism and pugnacity. As it is, if a government uses a word, say, "Peace" or "Coal" or "Housing" or "Employment," we all seem to take it for granted that the actions of governments in these matters must be good. It does not seem to dawn upon us that in some circumstances and in some mouths talk of peace may lead to war, or talk of coal may drive us to oil, or that official fussing about employment may put us all out of work.

The subject becomes the more worth enquiry when we remember that the Ministry of Labour, set up to facilitate employment, has in the course of a very short career simply

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established legions of bureaucrats whose living absolutely depends upon the absence of the very employment which they were appointed to provide.

Not only do we tempt our people to develop the spirit of idleness, but in doing so we make it much more difficult for the great majority who are happily immune from any such temptation to exercise their natural right to work. We multiply rules and regulations which are supposed to help and often only hinder. For example, we raise the school leaving age with the silly idea that by withdrawing boys and girls from industry we are making jobs for men and women. There are, of course, a few cases where this notion is more or less well founded, but in other cases the absence of a boy will throw the man out of work as well. By removing the soprano from a church choir you do not make more employment for the bass, and so it is with an industrial unit ; there is a proper proportion of skilled and unskilled men and boys and women and girls which gives the requisite efficiency and enables the produce to be marketed. If that proportion is disturbed the whole trade may be dislocated. Yet we go on merrily with this sort of folly, a little more each day.

We need a new outlook, a change of heart, an alteration of our philosophic viewpoint. We must give up the Safety First mentality and write upon our banners a more inspiring thought. Success and happiness are personal achievements and cannot be conferred upon us by order.

In talking in this way I am running risks, but I face them gladly. I have too often been called a heartless wretch, in those and other more decorative words, for doubting the sense of the " benefit " idea. But when I stand on the pavement outside a Labour Exchange and look into the faces of my fellow citizens as they drag themselves up to receive their doles and allowances, I become more convinced than ever that if there is any heartlessness in this discussion at all, it is to be found heavily coated and hidden by the sloppy sentimentality of a social policy which ignores most of the truth of life. Studying the expressions of these poor victims, I see qualities which are denied by the popular philosophy of social rights. I believe that if the doctrine of personal responsibility were preached to them. and if we framed our policy in such a way as to give it a chance, they would not only be much better off but would have a chance to enjoy the delights, now denied to them, of personal pride and healthy self-respect.

There is real happiness to be won by facing difficulties, and if we were honest with ourselves we would give up the notion either that life can be so arranged as to be free from difficulty, or that it would be worth living if that could be done. Ignoring truth, we seek a snobbish satisfaction in pretending to shoulder the difficulties of others. Needless to say we do not really shoulder them, we merely vote rates and taxes for the purpose.

A straightforward appeal to the manhood of the nation would flatter and delight millions who are now encouraged to regard themselves as hopeless automata in a machine of which they can know nothing and should care less.

BOOK REVIEWS.

Principles of Electrical Engineering. By W. H. Timbie and V. Bush. 2nd Ed. (London : Chapman and Hall.) Pp.vii+595. 22s. 6d. net.

A more appropriate name for this volume would, I think, be " The Physical Basis of Electrical Engineering." As stated in the preface, it does not attempt to give an exhaustive treatment, but to illustrate and explain the fundamental physical conceptions on which the applied science of electrical engineering is founded. The subjects treated are well selected and cover, roughly, Resistance and Kirchoff's Laws, Electrolytic Action, Magnetism and Magnetic Materials, the Magnetic Field, Induced and Generated E.M.F., and Forces on Conductors, Thermionic Conduction and, finally, Dielectrics. That a second edition should be required proves that it has been successful, at least in America, but its place in an English technical syllabus is difficult to find. Though described as a first course, the mathematical parts are too advanced for a true beginner and much of the text is too elementary for an advanced student.

The treatment is unequal—parts are very good indeed. The authors boldly tackle the problem of magnetic action from the basis of the line integral (and slyly introduce the elements of vector notation—i.e., Gibb's " dot " product, which corresponds with Heaviside's scalar product). This is excellent and the sooner the study of magnetic fields in terms of work and forces on an isolated N pole drops into disuse the better. The treatment of dielectrics is interesting but not so satisfactory. In particular the authors seem (to me) to dodge the issue in the treatment of displacement current. These two parts have been selected as exhibiting the strength and the weakness of the whole book. On several points I have found a clear explanation of matters on which it is very easy to become confused and the limits of accuracy of engineering theory have been clearly set out. No doubt many engineers will be surprised to find that some formulæ which they have become accustomed to treat as exact are only close approximations. The book is rather long for the subject matter but it is, therefore, easy reading. It is valuable for those appeals to first principles which we all at times have to make (and has a most valuable summary of important formulæ in heavy type at the end of each chapter), but does not give a sufficiently rigorous examination for a research worker or physicist. There are a large number of examples and exercises.

W. F. C.

Design of Electrical Apparatus. By John H. Kuhlmann. (London : Chapman and Hall). Pp. xii+455. 30s. net.

The author of this work is not only a designer, but a teacher of design. The object is to present a practical method of design in a clear and simple form, with explanations of the theory, procedure, and limits of design. The author has succeeded in his task. The work is divided into four main sections : d.c. machines, synchronous machines, induction motors and transformers. In the first section the construction of machines is followed by voltage formulæ and output equations. Armature winding, the magnetic circuit and losses, efficiency and temperature rise are dealt with later. An important feature is the discussion of commutation and commutating pole design. The second section follows the same treatment of subjects, and each contains the working out of a sample design. The third section deals very fully with the principles of the design of the stator and rotor of an induction motor. Sample designs are worked out and general characteristics are discussed. In the last section, transformers are fully dealt with and many sample designs are given. The constructional details are very clear, a large proportion of the illustrations being reproduced from photographs taken during manufacture. The book should appeal to those associated with the testing of the apparatus referred to, and to students in technical colleges.

Cyril Sylvester.

Starkstromtechnik. Seventh Edition. Vol. 1. Edited by E. v. Rziha and J. Seidener. (Berlin : W. Ernest und Sohn). Pp. xx+1 039. Price, in linen covers, 34 marks ; in leather covers, 37 marks.

This is one of the best pocket books covering electrical engineering on the market. The publication was always good, and successive editions have enhanced its value by adding to its practical nature, much of the earlier somewhat academic treatment being discarded. Apparently the present (7th) edition has been largely rewritten and much enlarged. Volume 1, now under review, opens with a section of 52 pages devoted to those parts of higher mathematics needed by electrical engineers. The second lengthy section deals with fundamental principles underlying electrotechnology. The new material here includes electric strength of materials, the electron theory and theoretical electrochemistry. The second on measurements deals with the various types of instruments, transformers, meters and methods of measurements. Transformers and machines are treated by numerous experts, and examples of the several types are given in the following section. Much of the information here will be of particular use to designers. Rectifiers form a new section of the book.

Batteries, starters, controllers, switchgear and accessories are fully dealt with. Illumination is one of the sections which have been completely re-written and includes information on train lighting, and on car systems for starting and lighting. Under electric heating, the various types of furnace are discussed in conjunction with their respective applications. The concluding section is devoted to cooking and heating appliances, and from the English reader's point of view must be regarded as one of the poorest in the book. Taken as a whole the book is well written, well illustrated and well made.

The following sections have been left over for the second volume now in preparation : power stations, networks, industrial, railway and ship installations, and agricultural applications.

S. Parker Smith.

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MAGNETOSTRICTION CONSTANT FOR ALTERNATING MAGNETIC FIELDS.

Application to the Production of Mechanical Oscillations—Stress Unaccompanied by Strain—Flexural Forces.

MR. F. D. Smith, M.Sc., A.M.I.E.E., in a paper on "The Magnetostriction Constant for Alternating Magnetic Fields," read before the Physical Society, defined a magnetostriction constant K for the Joule effect by the equation $p = KH$ where p is the alternating mechanical stress produced by a small alternating magnetic field H superposed on a steady magnetic field H_0. It was shown that the alternating intensity of magnetisation I, produced by an alternating strain $\delta l/l$ is given by the equation $I = K\frac{\delta l}{l}$, K being the same constant in both equations. These equations were used to calculate the motional impedance of a laminated ring toroidally wound and vibrating in its fundamental radial mode. K has been measured for various values of H_0 with a ring of the alloy Fe 60 per cent., Ni 40 per cent. It was shown that the magnetostriction effect for steady magnetising fields could be inferred from the measurements with alternating magnetic fields, if the reversible permeability and the differential permeability of the alloy are known.

Ring Oscillation Period.

Dr. J. H. Vincent: I think that the Physical Society is to be congratulated on the presentation of this paper, which marks a distinct advance in the application of magnetostriction to the production of mechanical oscillations. I suppose that the formula given for the period of oscillation of an anchor ring in its fundamental radial mode is only approximate. The period of oscillation for an infinitely thin ring is the circumference divided by the velocity of sound in the material. If the anchor ring is supposed to have its orifice filled up with the same material, we approach the case of a wire vibrating radially. Whenever a current flows in a wire of magnetostrictive material the radius of the cross-section must change in consequence of the magnetic field which the current produces. This should entail a number of interesting consequences, some of which might be capable of experimental demonstration.

Dr. D. W. Dye: I have read the present paper with much interest and wish to congratulate the author upon a difficult piece of work in a field not hitherto explored. I admire the author's courage in obtaining the results he has worked out, in spite of the admixture of paper, paraffin wax and nickel-iron alloy investigated. These must form a specimen of rather poor vibratory properties. There are three points to which I would like to draw attention: (1) In discussing the Young's modulus of the alloy the author states that Pierce should not have used the term aSB' as a term to be subtracted from Young's modulus. Pierce is quite consistent in what he has done; the difference between him and the author is simply one of definition of Young's modulus, which is different in the two cases. One is free to choose either. (2) The dimensions of the built-up ring, as shown in the diagram, indicate a ratio of 1 : 3 between outer and inner diameters of the ring. This will result in a corresponding ratio of magnetising fields between inner and outer edges. The results obtained are, therefore, those referring to an average magnetisation corresponding to this range of H. (3) The values obtained from the circle diagram and by the theory given pre-suppose a pure mode of radial vibration in which the stresses are purely compressional and tensile in the direction of magnetisation. From my experience of quartz specimens of all shapes and sizes I should not be at all surprised to find that a ring of the shape shown had overtone flexural modes such that the vibratory energy was divided up between two or more modes of vibration. This would profoundly affect the magnetostriction constant as here determined. In the analogous case of the quartz plate, the effective piezo-electric constant nearly always comes out at about one-third only of its theoretic value when the motion is complex, simply because energy is divided up between various modes, only one of which reacts piezo-electrically upon the maintaining circuit. I would suggest that a ring of greater thickness should be tried to see if the same result is obtained.

Mr. A. W. Benton: I consider the paper of quite outstanding interest and importance. There was one remark, however, made by the author in presenting his paper to which I felt exception might be taken. Mr. Smith spoke of the "alternating current producing stresses unaccompanied by changes of dimensions in the magnetic material." It is difficult, if not impossible, to conceive of any stress not accompanied by strain, and, as a matter of fact, the mathematical reasoning would appear to hold good if small dimensional changes accompany the alterations in stress. It may interest Fellows to know that over 50 years ago Dr. Du Moncel, and I believe others, described telephones based on magnetostriction effects. A rod of magnetic material attached to the centre of a diaphragm reproduced music and speech without acoustically modified currents circulating round the rod. It would not appear, however, that anyone has used the reverse, or Villari effect, as a telephonic transmitter. The very considerable changes of stress which could be produced by acoustic vibrations in a rod or wire made of a magnetic material especially susceptible to the Villari effect could be used to modify the strength of a current and thus form a transmitter.

Mr. Smith said, in reply: The simple formula given in the paper for the fundamental mode of radial vibration of a ring is, as Dr. Vincent points out, only approximate. An exact calculation which takes into account the finite radial width of the ring shows that the error involved in this approximation is negligibly small for the comparatively thin ring used in the experimental work.

I agree with Dr. Dye that the theory given by Pierce for the vibrating rod is accurate provided that Young's modulus for the material is suitably defined. Pierce does not, however, define this modulus in his paper, and the usual simple definition is therefore implied, whereas another rather complicated definition is required if his theory is to be consistent. There is no doubt in my mind that the predominant mode of vibration of the laminated ring is radial. The sound in air emitted by the vibrating ring is audible and it is possible to explore its surface with a small stethoscope. The sound intensity appears to be uniform over the whole of the outside and inside cylindrical edges. The flexural forces in the vibrating quartz disc arise from the fact that the diameter of the disc is usually large in comparison with the wave-length of sound in quartz at the frequency of the vibration. The expansions and contractions of the quartz in the plane of the disc, depending upon Poisson's ratio, are partially prevented by a lateral constraint from the inertia of the disc, and radial stresses are produced. These stresses are not quite symmetrical with respect to the quartz disc because the piezo-electric properties are not, in general, quite uniform throughout the disc, and stresses are therefore provided which can excite flexural modes of vibration. In contrast to the quartz disc, which is usually large in two directions in comparison with the wavelength, the laminated ring is small in two directions in comparison with the wavelength. Expansions and contractions in the directions of the thickness and the radius of the ring, depending upon Poisson's ratio for the material, are practically unconstrained. Moreover, the ring is built up from a large number of their stampings assembled at random, and any appreciable variation of the magnetostriction constant along the circumference is improbable. It is difficult to imagine how any stresses can arise which might excite a flexural mode of vibration.

Forces in Equilibrium.

The conception of a material in a state of stress without strain, which Mr. W. A. Benton finds difficult to accept, can perhaps be most clearly realised in the following case. Let a long thin rod of a material, having the property of magnetostriction, be magnetised so that its length and cross-section change. The rod can be restored to exactly the original dimensions by forces applied to its ends and surface so that it is completely freed from strain. These forces are in equilibrium with the forces arising from stresses in the material so that a state of stress without any strain whatever is produced.

Proposals for the establishment of telephonic communication between the Channel Islands and England have been brought before the Channel Islands States of Deliberation. It is proposed to land the cable at Saint's Bay. The total expenditure is estimated at £4 140. The maintenance costs of £210 per annum would be borne by the Post Office, which would also pay 5% on the capital outlay.

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SALFORD RELAYS.

Redesigned Types for a Variety of Purposes—Protection of Generators, Transformers, Parallel Feeders and Transmission Lines—Reverse Power and Moving Coil Types.

THE Salford instrument works of the G.E.C. have recently redesigned a number of their well-known relays, including overload induction relays (with inverse time element), super-sensitive leakage relays, reverse power relays and d.c. moving-coil relays. It will be seen from the particulars given below that they embody many ingenious features of considerable interest to engineers concerned with the distribution and transmission of power.

On a.c. systems the ever-growing size of power stations and distribution networks means that more and more time and money is lost if there should be any failure in the system, and the problem of automatic protection has become one of the utmost importance. Modern distribution developments have made it essential that, if a fault arises in any part of the system, the trouble be confined to as small an area as possible, and that no part of the system should be closed down unnecessarily. The object throughout must be to promote continuity of supply by isolating the faulty section, and it was with this aim in view that the latest Salford designs were produced. Various combinations of these are also manufactured in self-contained forms. This series of relays provides for the full and complete protection of generators, transformers, parallel feeders, ring mains and transmission lines.

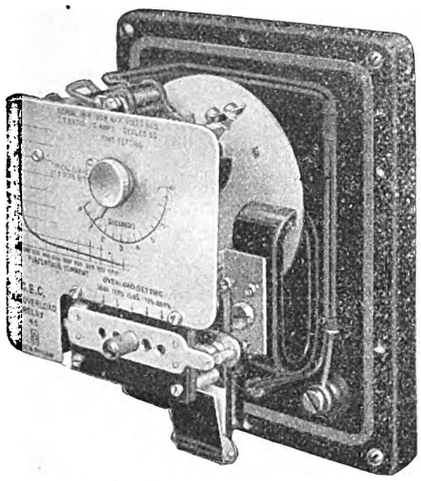

Fig. 1.—Overload induction relay.

The specialised and localised form of protection given by these relays is well illustrated by the Salford overload induction relay (Figs. 1 and 2), to which is fitted an inverse definite minimum time element. This feature allows the mains

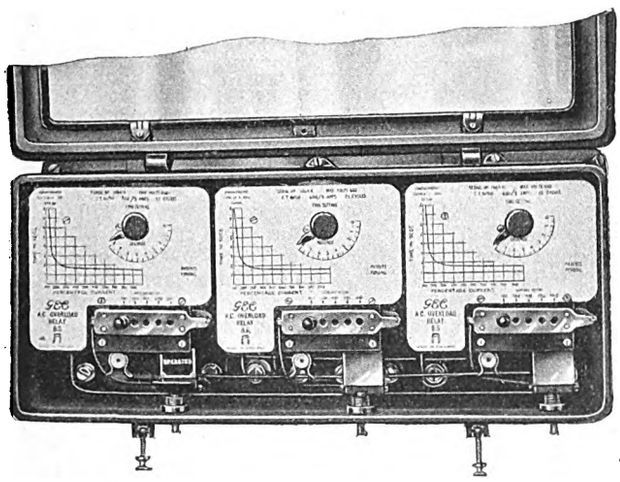

Fig. 2.—Three-pole form of overload induction relay.

superintendent to regulate the operation so that either the relay (or relays in the case of a ring main system) next to the fault is the only one tripped, the remainder of the system being unaffected, or the relays trip in their correct sequence, irrespective of the severity of the fault. This may mean hundreds of pounds saving to a large undertaking. For currents greater than 1 000 per cent. full load current the time of operation is approximately constant. The relay works on the induction principle, and will withstand overloads of 1¼ times full-load current continuously and 10 times full load current for a short time without damage or loss of accuracy; full-load current is 5 A. The settings can be varied independently, the time setting from ½ to 8 seconds and the current setting up to twice full load. A patented safety device is fitted, to allow the tapping to be changed while the relay is on load without risk of open-circuiting and damaging the current transformer or endangering the life of the operator; in addition, if an overload or fault occurs on the system while the current setting is being altered, the relay will still carry out its protective functions. The relay is not operated by momentary surges such as may be caused by switching operations, and, if the load falls during the operation, it will automatically re-set, even at the point of making contact. The power consumed on 50-cycle circuits with normal full-load current is not more than 3·2 VA. The relay is made in single- and three-pole forms.

For use on high-voltage circuits of small current capacity where bushing transformers are used, the G.E.C. manufactures a specially sensitive form of overload induction relay, which imposes a minimum load on the transformer. This relay has

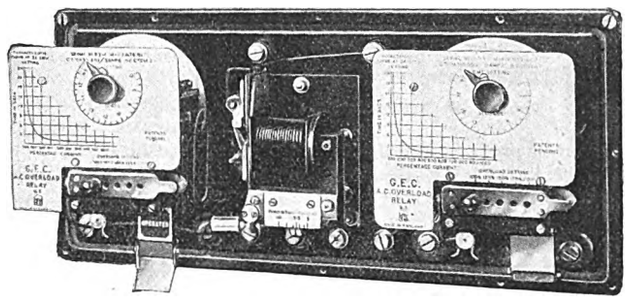

Fig. 3.—Relays for leakage protection.

all the advantages of the standard form already described, with the addition of reduced power consumption (not more than 1·6 VA on 50-cycle circuits with normal full-load current.)

For leakage protection, a special super-sensitive relay is manufactured, and can be supplied combined in one case with two overload inverse time-element relays (as illustrated in Fig. 3), the combination thus giving complete overload and leakage protection to a three-phase circuit, generator or transformer. Used with shunt-tripping circuit breakers, this relay is able to isolate any faulty circuit and warn the operator of abnormal conditions; as its name implies, it operates with extreme sensitivity, thus minimising interruptions to the service and damage to machines. The principle of operation is the attraction of a sensitively-balanced armature to an electromagnet, when the voltage or current exceeds that for which the relay is set. When operated from a standard current transformer with a 5-A secondary, it will indicate leakages of 5-10 per cent. In view of the robust construction of the relay, the power consumption is particularly low (0·03 VA at minimum setting), and every part is liberally designed to be suitable for general power station use.

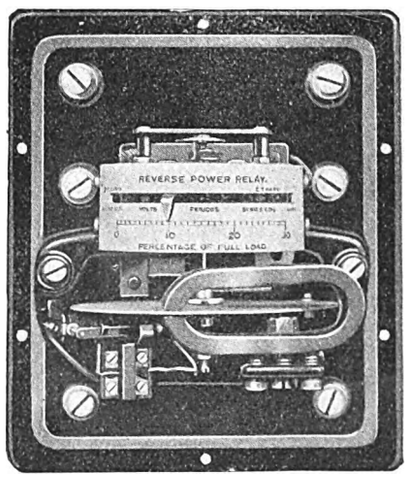

Fig. 4.—Reverse power relay.

Besides being used for leakage protection, Salford supersensitive relays in single-pole form have a wide variety of other applications, including a.c. or d.c. over-voltage or overload protection. They can also be arranged for use as out-of-balance relays for a.c. earthed systems, balanced-core protection relays (a.c.) or tell-tale relays for industrial purposes.

An improved form of the Salford reverse power relay has lately been introduced. This relay (Fig. 4) is constructed

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on the induction wattmeter principle, and can also be arranged as a differential reverse power relay (for reverse power and leakage protection on the McColl system), and as a biased differential relay (for parallel feeder protection). The movement consists of a disc rotating between a pressure electro-magnet and a current electromagnet. The value of reverse power at which the relay operates can be varied by an adjustable pointer from zero to 30 per cent. of the normal forward load. The loss in the pressure coil is 0·6–1·5 W, and the voltage drop in the current coil (at full load) is 0·36 V. The relay operates instantaneously. In addition to the projecting pattern as illustrated a flush pattern in a round case is also available.

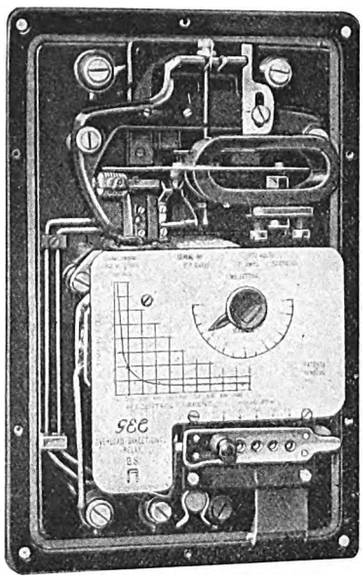

Fig. 5.—Overload and directional relay.

For cases where combined overload and reverse power protection is desired, a specially-designed overload and directional relay (illustrated in Fig. 5) is available. This relay incorporates an inverse time-limit overload element with a directional element, mounted in a common case and with their ci cuits suitably connected.

The latest pattern of the Salford moving-coil relay developed by the G.E.C. fulfils a variety of functions in a reliable and economical manner. It can be arranged either as a current relay (to give protection against overload and/or reverse current), or as a voltage relay (for over and/or under-voltage protection). The relay (Fig. 6) is operated with shunts in series with the load, and is generally similar to most permanent-magnet, moving-coil instruments, except for certain modifications that give important advantages to the present design. For instance, the much higher working forces greatly increase the contact pressure and the torque of the movement; this ensures very reliable operation and prevents the possibility of trouble from adhesion of contacts. A further advantage is due to a very low resistance movement allowing the use of shunts with a low millivolt drop (e.g., 150 millivolts at full load), which allows power to be economised without the reliability being impaired. The overload capacity complies with the appropriate British Specification, and the relay is guaranteed within 4% of the adjustable current setting. If required, the d.c. over-load relay can be fitted with an indicating pointer, so as to serve also as an ammeter.

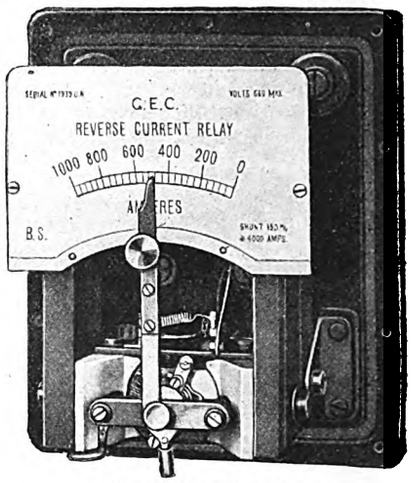

Fig. 6.—Moving coil relay.

SOFT SOLDERS AND JOINTS.

Advantages of Pure Tin and Tin-Antimony Alloys for Electrical Purposes—Avoidance of Lead in Preliminary Tinning.

PART 1 of a Report of the British Non-ferrous Metals Research Association on the Jointing of Metals, dealing with soft solders and soldered joints, has been issued to members. It extends to 96 pp. and is illustrated with micro-photographs and diagrams. The chapter headings are (1) Soft Solder Alloys; (2) Physical Properties of the Solder Alloys; (3) Strength (Shear) of Soldered Joints; (4) Metallurgy of a Soldered Joint; (5) Corrosion Resistance of the Solder Alloys; (6) Some Practical Considerations.

With respect to electrical resistivity and conductivity it is stated that within the limits of the compositions dealt with, the presence of antimony causes an increase in electrical resistivity which is most marked in the absence of lead. In this case the resistivity continues to rise with antimony concentrations beyond those plotted; but in the Pb-Sn-Sb alloys the maximum resistivity occurs when the limit of solid solubility of antimony (in tin) is reached. Tin shows the minimum resistivity of all the specimens examined; the maximum value being attributable to pure lead. The addition of lead to tin and to tin-antimony alloys has little effect until the proportion of lead exceeds that required for the alloy to be wholly eutectic in constitution; this characteristic being most marked in alloys saturated with antimony. Additions of lead beyond the eutectic point accelerate the increase in resistivity. Of the graded solders, grade "A" shows the lowest resistivity and grade "D" the highest.

Measurements of temperature coefficients of resistivity were made only in Sn-Sb alloys and those constituting grade "C" solders. This question is more fully discussed in relation to the temperature coefficient with respect to joints. Within the temperature limits of the experiment (0—100 deg. C.) the resistivity of pure tin is lower than Sn-Sb alloys, the presence of antimony causes a reduction in the temperature coefficient which continues up to (and beyond) an Sb-Sn ratio of 0·065. With the Pb-Sn-Sb alloys the reverse is true; the temperature coefficient increases with increasing antimony content until the limit of solid solubility of antimony in tin is passed. The presence of lead, in addition, would appear to lend uniformity to the values. The effect of antimony is probably negligible in practice.

Attention is drawn to the performance as a solder of pure tin and its alloys with antimony. Tin has the highest electrical conductivity of the soft solder system, being 16% higher than grade "A" solder. Additions of antimony reduce the conductivity somewhat, but an antimony content of 6% may be added and still maintain a conductivity sensibly the same as the best tin-lead solder. It has been found from tests on a number of joints typical of the kind used by electrical engineers for the stator and rotor end connectors in induction motors that the presence of antimony in solders would not increase the resistance of a stator or a rotor by more than 0·8%. The presence of antimony does not cause the increase in resistance of a joint with temperature to be appreciably greater than would be the case in its absence. This is of importance because the desirable electrical properties of pure tin are unfortunately accompanied by relatively low shear strength which can be fully compensated by additions of antimony. Antimonial-tin holding 6% antimony gives a joint shear strength on copper of three tons per square inch, practically equal to the maximum joint strength obtainable with any solder. In addition it has an elongation of 35% and (Izod) impact strength of 22 foot lb., the latter figure being nearly 60% greater than grade "A" solder. In conjunction, the fact that it retains its strength to a point of 40-50 deg. C. higher in the temperature scale than any lead-containing solder will perhaps point its eminent suitability for certain electrical purposes, notably the jointing of armature conductors to commutator necks. For the maximum effect it is, of course, essential that all preliminary tinning be done with either pure tin or antimonial-tin; otherwise, if a lead-tin solder be used for tinning the advantageous strength at elevated temperatures will be lost; the presence of even small quantities of lead introducing the lower melting point lead-tin eutectic, liquid at 183 deg. C., in the absence of which, melting does not occur below 243 deg. C.

ELECTRIC DOOR CONTROL.

We should be glad if manufacturers of electrically operated systems of door control would communicate with us. A correspondent who is interested in the matter sepecially desires to obtain particulars of switch or push button controls suitable for a 200 V 50 cycle supply, whereby a communicating door can be opened or closed without the necessity of rising from one's chair.

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POWER STATIONS IN RUSSIA.

Revised Programme of New Work and Extensions for 1929-30.

IN the April number of the "Bank for Russian Trade Review," a list is given of "regional and republican electric stations under construction or in process of extension during 1929-30." It is stated that the growing demand for electrical energy in connection with the industrial development of the U.S.S.R. necessitated an extension of the original programme elaborated for the electrical industry in the current financial year. The revised programme provides for large capital investments for the speeding up of the construction of electric stations in all parts of the country.

The first group in the list relates to "regional stations in course of erection and extension during 1929–30," and includes 27 items with a total capacity of 2 017 000 kW, the cost being given as 436 940 000 roubles. The largest stations in this list are Dnepr (372 000 kW), Moscow Electric Trust (224 500 kW), Elektrotok (139 500 kW), Shterov (115 000 kW) and Nizhni-Novgorod (110 000 kW).

Group 2 embraces "new regional stations to be started this year." There are twelve of these with a total capacity of 757 000 kW, the estimated cost being 57 340 000 roubles. The Bobrikov and Southern stations in this group are each to be of 150 000 kW, New Leningrad of 100 000 kW, and Zuev of 88 000 kW capacity.

Group 3 consists of "Republican electric stations for the People's Commissariat for Transport," and includes only two stations of a capacity of 42 500 kW, to cost 5 800 000 roubles.

Groups 1, 2 and 3 combined represent 2 816 700 kW and 500 080 000 roubles. In addition, local and rural stations with a total capacity of 75 400 kW are planned for erection in 1929-30 at a cost of 18 229 000 roubles.

It is pointed out that the principle underlying practically all the new stations at present under construction is the utilisation of local fuel or water power. Of the large stations now being built only the Moscow and Leningrad thermo-electric power stations will work on imported fuel. The central thermo-electric power stations are to produce electricity and steam for technical and heating purposes. A number of such stations are to be erected in Moscow and Leningrad.

"The total investments, including those in the reconstruction and extension of local, factory and village electric stations, will amount this year to 760 million roubles. Half of this sum will be provided by the State budget, and the rest by the banks, consumers of electric power, local budgets, and so on."

[*We give the foregoing information for what it is worth, being unable to separate reality from hot air in the case of statements relating to Russia.*—ED.]

BROOKMANS PARK B.B.C. STATION.

AT the Institution of Electrical Engineers, on Wednesday, a paper read by Capt. P. P. Eckersley, M.I.E.E., and Mr. N. Ashbridge, B.Sc., on "A Wireless Broadcasting Transmitting Station for Dual Programme Service," describe the first of the twin 50 kW transmitters (Brookmans Park) erected in connection with the B.B.C. Regional Scheme.

The paper deals with the considerations underlying the choice of sites for such broadcasting stations, the type of power supply adopted, and the factors contributing to reliability in operation, as well as with the wireless transmitters themselves.

The paper deals, further, with the general station layout, the building and the auxiliary services, as well as with low-frequency apparatus for supplying modulation to the transmitter and apparatus for testing and monitoring purposes.

Of particular interest is the use of high-tension direct-current machines at this station for the production of high-tension voltage for anode supply to the main power valves. The type of generator developed especially for this work is considered in some detail.

DIOLITE'S VICTORY AT NEWMARKET.

Sir Hugo Hirst has received numerous congratulations from his many friends on the victory of his colt Diolite in the race for the Two Thousand Guineas at Newmarket on Wednesday, when, with F. Fox in the saddle, it won by two lengths. We hope this will be followed by a win for Sir Hugo Hirst's colours at Epsom next month.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Hertz" as a Unit Name.

[TO THE EDITOR.]

SIR,—In order to commemorate the first demonstrator of the reality of Maxwell's theoretically suggested free electro-magnetic waves, the Germans originated the idea of naming the unit of frequency (one vibration per second) a "Hertz." This idea was obviously not very fortunate, and the Washington Conference in 1927 rejected its universal adoption in radio-telegraphy. In fact, the name was inappropriate as vibrations of the order 1 c/s had been studied for centuries before Hertz, who never worked with slow-order vibrations. Had "a megacycle per second" or "a kilomegacycle per second" been termed a Hertz, perhaps the christening had met with wider approval.

This is not the suggestion I wish to make, however, but to point out another unit, more and more important, and still without a name, though its twin brother has had one for a long time. The unit, which has distinctive claims to bear Hertz's name, is that of electric fieldstrength now called "volt/cm" or "millivolt/m" or by other cumbersome names. Everyone concerned with broadcasting knows that in connection with radio consideration of electric fieldstrength have been the hobby of many. Consequently, there is now a real need for a name for this unit.

Hertz was the first to compute, and in a crude manner to measure, the field around an antenna. Now, the unit for the magnetic twin brother is called a *Gauss* (Γ); *let us call the practical unit for electric fieldstrength a Hertz*, and let us abbreviate it to E, as there is no Greek h.

The choice of a suitable submultiple or multiple of the C.G.S., E.M.U. must be governed by the following two considerations:

1. Easiest mode of expressing all kinds of fieldstrengths in practical problems, ranging from 1 EMU (or 1 μV/m) to 10^6 EMU in Radiotechnics, or from 10^8 to 10^{12} or 10^{13} in electrical power engineering and in the science of atmospheric electricity.

2. Least confusion with actual German practice of using "Hertz" for cycles per second, where radiotechnics is concerned with the range 10^4 to 10^8 or 10^9, and electrical power engineering with the range 10^1 to 10^2.

Both considerations are best complied with by making:

1 Hertz = 1 $E = 10^6$ *e.g.s.e.m.u.* of Electric Fieldstrength.

Then *e.g.* 1 $E = 1$ V/m; 1 $mE = $ m V/m; 1 $\mu E = 1$ μ V/m; normal Field of the Earth = 150 $V/m = 15$ k E; disrupting field for air 6 000 $V/cm = 0{\cdot}6$ ME, and so on.

Thus radio engineers generally would have to use submultiples of the Hertz and electrical engineers multiples; little confusion would ensue from the change of sense.—Yours faithfully,

BRUNO ROLF, Ph.D.

Alsten-Stockholm.
April 22.

Surges on Overhead Lines.

[TO THE EDITOR.]

SIR,—In the paper by Messrs. Melsom, Arman and Bibby, of which an abstract appeared in THE ELECTRICIAN of April 25, mention was made of a number of shut-downs, due to salt being deposited on insulators by winds from seaward, and the difficulty in re-starting caused by the salt adhering firmly. This trouble was also mentioned in greater detail by several correspondents in your Overhead Lines issue of January 31 last.

We have the consent of the Lothians Power Co. to state that during a salt storm one of the Lothians Co.'s 11 000 kW lines, which runs along the coast for some twelve miles, and was fitted with "Pernax" patent birdguards, gave no trouble whatever. A similar line without these guards, situated ten miles from the coast, flashed over several times, although similar insulators were fitted on both lines. The Lothians Co. considers that these guards were entirely responsible for this difference in results.

We understand that similar comparative results have been experienced on other lines.—Yours faithfully,

The Croydon Cable Works, Ltd.,
J. H. C. BROOKING,
Managing Director.

Mitcham Road, Croydon.
April 29.

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CONTRACTS IN ELECTRICAL PRACTICE.

Legal Aspect of Breaches—Case of Unexpected Obstacles—Stoppages on the Ground of Improper Performance.

By BASIL BARHAM.

IN electrical practice a contract is generally an arrangement whereby one of the parties agrees to supply certain plant or machinery, or to carry out certain work with certain specified material and in a specified manner, and the other agrees to pay so much, either during or within some specified period after the carrying-out of the work.

The completion of such an agreement is not compulsory on either party; it may be set aside by mutual consent, or steps can be taken, in the event of either party failing to fulfil his obligation, to arrive at a decision as to the amount of damage, if any, either party has suffered through the other's breach of covenant and to see that such damage is made good. At one time, it was a custom, when drawing up the terms of a contract, to insert certain "penalty" clauses which, however high sounding and formidable, could not be legally enforced; penalty clauses are still included as a general thing, but their wording is usually such as to render them enforceable. No contractor should enter into any contract whatsoever without knowing exactly what he is doing, what he is undertaking to do, and what will happen if he fails to carry out his undertaking partially or wholly, or takes longer over the work than he has agreed.

The time may arrive, during the carrying out of some electrical contract in which work has to be done as well as material supplied, as, for example, during the wiring of a house or factory for electric light or power, when the contractor may have to call a halt and ask himself the question: Can I continue to carry on the work with any chance of making a profit? If he sees no profit in the future, it will be necessary for him to consider whether immediate stoppage will not help him to cut his loss. Should he arrive at that decision he may have to face a serious loss; one even greater than that which he would incur were he to complete the work, for by shutting down, he not only becomes exposed to an action for breach of contract, but may, and probably will, have to forfeit the value of all materials brought upon the job and the value of work already done.

Judicial Decisions.

It has sometimes been argued by contractors that they were not fully aware of the difficulties likely to be met with in carrying out the work at the time they signed the contract, and that, consequently, the terms of the agreement can be set aside or extra payment claimed. In a case that came under the notice of the writer only a short time ago, a contractor had agreed to get out certain foundations and to erect a building. The ground was "cleared ground," i.e., ground which had been occupied by buildings which had been razed. The contractor put down two or three trial soundings with iron rods and the result of these, in conjunction with a study of a local geological map, showed that the subsoil was good clay. He quoted a price, obtained the order, set to work and found almost immediately a huge mass of reinforced concrete, with all sorts of ramifications and complications and he sought to be relieved of the contract or, alternatively, to be paid a higher price for the work. Of course, his position was hopeless.

To quote another case, it will be remembered that in "MacDonald *v.* the Mayor of Wokington," a case which was tried in 1892 and has formed the base of many subsequent judgments, a builder contracted with a corporation to execute certain sewerage work according to plan, specification, and working drawings. In the course of the work it was found that a good deal of the tunnelling which had been specified was impracticable, owing to the quantity of water in the soil; and the builder suggested certain modifications of the scheme. These proposals were rejected, whereupon he threw up the contract on the ground that the presence of water in such quantities had not been disclosed to him and that his alternative proposals should have been accepted. In an action to recover the balance due to him on the contract, so far as it had been performed, Baron Pollock found for the defendants, and held that the builder could not refuse to finish the work, nor claim to be relieved of his undertaking because the nature of the difficulties met with, whether expected or unexpected, made performance according to the plans and specification difficult or impossible.

It is the custom, in connection with big work, to agree that some person shall be present to supervise or superintend the work to see that materials and performances are as specified. The fact that the contractor or his representative may not see eye to eye with such a superintendent does not entitle a contractor to abandon the job. It has been pointed out that in a certain case a contractor agreed with a second party, which was the local authority, to execute certain works according to plans and specifications, under the superintendence of the defendants' engineer, within a period of 18 months. During the progress of the works some deviation from the plans was made which, unfortunately for the contractor, caused difficulties to arise with certain land owners affected, as a result of which the builder stopped work. Later, he sued to recover for work and labour done and money paid to the use of the defendants. It was held that a contractor to execute certain sewerage works for a sanitary authority under the Public Health Acts is not entitled to abandon the contract because of difficulties created by the landowners affected. This case may be cited as that of Dickinson *v.* the Richmond Sewage Board, 1893.

There is another way in which a contract is sometimes broken and that is when the work is stopped by the party or parties for which it is being carried out, such stoppage being usually on the grounds that the work is being improperly done, or done with materials other than those specified or is being carried out by inexpert, careless or ignorant workmen or under imperfect supervision. In that case the builder or contractor is entitled to recover, as damages, all the expenses to which he has been put, and the profit which he would have made. He will, however, find it necessary to justify the course he was pursuing in the work and where the use of materials other than those specified is alleged, he may find it difficult to explain why he was using, let us say, 600Ω grade of cable instead of 1 200 Ω as specified.

It must be clear, in such a case as that imagined, that the other party to the contract has definitely given instructions for the work to stop. A case may be imagined in which certain work, let us say the wiring of a factory for electric light, is specified and the party for whom the work is to be done agrees, as part of his contract, to pay the sum of, say, £100, after the work has been in progress for a certain time and the balance on completion. The mere fact that the employer did not pay or refused to pay the £100 by the time specified would not be held by the courts to be evidence that he had broken or abandoned his contract. In Rees *v.* Lines, 1837, the plaintiff contracted to build a house for the defendant, according to a certain plan, for an agreed sum. After proceeding with the work and making a payment of £15 on account of the contract, the defendant, it was alleged, had broken the contract by refusing to pay a further sum. In an action by the builder to recover the balance of the contract it was held that the fact that the defendant, when asked for money, had stated that he would not pay a farthing, was not proof that he had abandoned the contract, as up to that time he had not done anything to justify the work being stopped, seeing that he was not, in law, liable to pay any further sum until after the work was finished.

BY-PRODUCT STEAM FOR CENTRAL HEATING.

The City of Winnipeg, Manitoba, is the proud possessor of one of the Empire's cheapest electricity supply installations. The domestic consumer in the City enjoys the lowest rates on the American Continent, and in 1928 the average number of units employed by the domestic user was 3 384. An interesting fact in connection with the City "hydro" plant is the utilisation of offpeak load electricity from the hydro-electric stations, together with steam from the standby steam electric plant, for heating blocks of buildings in the neighbourhood of the plant. Two hundred large buildings in the centre of the city are now heated from this single plant, and in residential areas on the outskirts private companies are setting up plant for the heating of blocks of homes. The general experience seems to be that people are willing to pay as much as 15% more than it would cost them for coal in order to secure the compensating advantages of thermostat control of heat with relief from dirt and worry.

Another important factor is the estimated reduction in fire losses in the city by $2 000 000 during the past five years.

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NEWS IN BRIEF.

Royal Society Address By Wireless—Canada and Machinery Imports—Oldham and Domestic Electrical Appliances—Pulverised Fuel in 1905—A Long-distance Telephony Conference.

SOUTHPORT Lighting Committee has received from the local Chamber of Trade a suggestion for flood-lighting the public buildings.

The summer meeting of the North Midland Centre of the I.E.E. will be held on June 5 and 6, when a visit will be made to Buxton.

A junior scientific officer, with honours degree in physics or electrical engineering, or its equivalent, is wanted for an Admiralty establishment at Portsmouth.

Sir Ernest Rutherford, president of the Royal Society, is to deliver a wireless address from London to the members of the Royal Society of Canada at the annual meeting of the Canadian Institution on May 21 at Toronto.

Glasgow Tramways cycle sports meeting will be held at Parkhead on May 13.

Ayrshire Electricity Board held a domestic efficiency exhibition at Fairlie last week.

Leeds Electricity Committee has authorised the purchase of a further 10 000 prepayment meters.

An electric cookery demonstrator and showroom assistant is required by Darlington Corporation.

Eastbourne Electricity Committee has decided to make the minimum period for the hire of electrical domestic apparatus three years instead of one year.

Ilford Corporation has been recommended to accept a tender amounting to £21 290 for the erection of electricity offices and showrooms at Clarks Road.

Hungerford U.D.C. is to apply for powers enabling them to meet the expense of lighting the Hungerford town clock, the Government auditor having intimated that expenditure incurred in the matter was not legal.

Manchester Electricity Department issued during last year a quarterly "Power Service Bulletin." The series is being continued this year, and the March issue contains articles on "Applications of Electricity," "Electric Heat" and "Good Factory Lighting."

The Borough Electrical Engineer has reported to Oldham Electricity Committee that the electricity showroom is doing well. Cookers supplied number 454, and wash boilers 198. During one week in April four washing machines and 21 vacuum cleaners were supplied.

The International Consultative Committee for Long-Distance Telephony began on May 1 a fortnight's conference in Stockholm. Among the countries represented are Germany, Belgium, Denmark, United States, France, Great Britain, the Netherlands, Sweden and Switzerland.

The Liége International Exhibition of Industry, Art and Science was officially opened last Saturday, the King and Queen of Belgium and other members of the royal family being present. The exhibition includes halls devoted to electricity, metallurgy and applied science.

A party of students taking the Electrical Housecraft Course at Battersea (London) Polytechnic visited the model electric kitchen of the Electrical Association for Women on April 29. Miss C. Haslett gave an address, which was followed by a short talk by Miss Norvick on "Electrical Methods in the Kitchen."

The Automobile Association is of opinion that flood-lighting of main roads is the only perfect means of abolishing the menace of glaring headlights and minimising the number of road accidents, and it is suggested that the Central Electricity Board's cables running along the trunk roads should supply the energy for providing the necessary light.

On Wednesday and Saturday of last week, the public were admitted to view Birmingham Corporation's Hams Hall and Prince's power stations.

The next meeting of the Institute of Fuel will be held on May 14, at Burlington House, London, W., when Mr. C. M. Walter will give an address.

The annual dinner of the Bradford Engineering Society was held at the Great Northern Victoria Hotel, Bradford, on May 2, when the guest of honour was Mr. Thomas Roles.

Swansea and Merthyr Joint Hospital Board has decided that the new mental institution be lighted and heated electrically. A scheme has been prepared by Mr. T. J. R. Kiernan and the borough electrical engineer of Swansea, Mr. J. W. Burr.

Irvine Housing Committee recommends that the Council's next housing scheme be all-electric.

Birmingham Health Committee is to provide a lift and goods hoist in the nurses' home and laundry, respectively, at Dudley Road hospital, at a cost of £1 560.

Members of the North West Midlands Students' Section of the Institution of Electrical Engineers will visit the Hope Cement Works, Hull, on Wednesday, May 21.

Plans for extensions and alterations to the Chester Electricity showrooms, Northgate Street, have been prepared by Mr. F. C. Saxon. Tenders for alterations are to be invited.

The 35th general meeting of the German Bunsen Society will be held at Heidelberg, from May 28 to June 1. Names of persons desirous of participating should be sent to "Ortsausschub der Deutschen Bunsen - Gesellschaft, Heidelberg, Ploeck 55," the local committee which will also find accommodation.

The Crown Agents for the Colonies invite applications for appointments as: (1) engineer and manager; (2) electrical engineer; (3) electrician; and (4) station engineers in connection with the Kano (Nigeria) water and electric light schemes. Reference numbers: M.2 155, M.2 162, M.2 163, and M.2 158, for Nos. 1, 2, 3 and 4 respectively.

The Duke of Northumberlnad has been elected president of the Royal Institution for the ensuing year. Amongst the managers elected are Dr. W. H. Eccles, Sir Charles Parsons Mr. C. C. Paterson, Mr. R. W. Paul and Lord Rayleigh, while the visitors include Mr. F. H. Berryman, Mr. C. V., Drysdale, Dr. A. O. Rankine; Mr. E. H. Rayner and Mr. R. S. Whipple.

In the "Queen's Engineering Works Magazine" for April, 1930, published by W. H. Allen, Sons and Co., Ltd., attention is called to the fact that this year is the jubilee year of the business, which was founded by the late Mr. W. H. Allen in 1880, and that a celebration of the event will take place during the summer months, when a suitable memento will be published.

In his budget speech on May 1, Mr. C. A. Dunning, Canadian Minister of Finance, dealt with Customs Tariff changes. Amongst the provisions are free entry under the British preferential tariff and reductions under other tariffs for all non-specified machinery such as boilers, electrical equipment, etc., which is of a class not made in Canada, and an increase of the duty on same under the general tariff; free entry under the British preferential tariff for heating and cooking appliances, with an increased general tariff rate on gas stoves and ranges; and extension of the existing margin of preference on lighting fixtures and appliances.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of May 8, 1880, stated that makers of electric lighting apparatus anticipated a large amount of business in the coming winter. The permanent lighting of the new Victoria Docks by 30 Siemens lamps was to be the most important contract to be undertaken in this country.*

A small electric furnace designed by Dr. C. W. Siemens for melting highly refractory metals was exhibited to the Royal Society. In a test 2 lb. of broken files were melted in 20 minutes.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of May 12, 1905, described a visit to the General Electric Company's works at Salford, of which the latest productions in the form of relays are described in this week's issue. At that time the works' average annual output of these included 32 500 sets of telephone apparatus, 91 000 electric bells, 17 800 indicators, 15 000 switches, 11 250 sets of telegraph apparatus, 510 telephone annunciators and small switchboards and 115 large switchboards.*

A paper read by Mr. Eustace Carey before the Liverpool Section of the Society of Chemical Industry referred to a number of experiments proving that more water could be evaporated per pound of fuel in boilers constructed for coal dust firing than in boilers burning lump coal.

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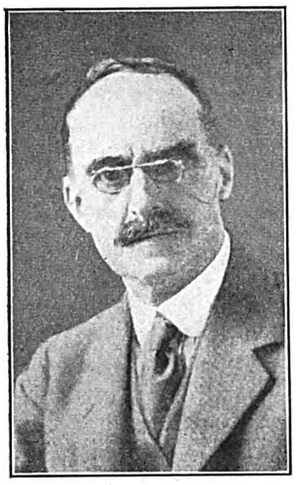
PERSONAL.

MR. W. Marsh, engineer and manager, has completed 25 years' service with the Brighton Corporation tramways undertaking.

The Electricity Committee and staff of the Electricity Department of the Coventry Corporation and representatives of the Coventry branch of the E.C.A. entertained Mr. George Tough on April 30, at the Queen's Hotel, on the occasion of his retirement as engineer and manager of the Coventry Electricity Department. The Mayor (Alderman Fred Lee) presided, and during the evening Mr. Tough was the recipient of several handsome presents. Coun. C. Payne, on behalf of the Electricity Committee, presented a fruit bowl and claret jug; Mr. W. J. Marston (who is succeeding Mr. Tough), on behalf of the staff, presented an oriental tea service; and Mr. H. Beesley, on behalf of the local contractors, presented a silver cake basket. See page 597.



Mr. G. Tough, engineer and manager, Coventry, who is retiring.

Mr. Douglas Hays, of the Falkirk and District Tramways Co., was, last week, presented with a canteen of solid silver monogrammed cutlery to mark his 25 years' service and retirement.

Mr. Stanley A. Young, who for the past seven years has been contracts manager of Post Office telephones for the Reading district, and who left Reading last week to take up a position as district manager at Aberdeen, was presented with a fountain pen, with marble stand and swivel holder, by a number of personal friends; and also with a gold watch and gold pencil, and a case of bottles of scent for his wife, from the department at Reading.

Maidstone Town Council has appointed Miss Wheeler as lady demonstrator at the electricity showrooms.

Mr. Arthur Charles Watts, partner in the firm of the Premier Electrical Co., of Tunbridge Wells and Paddock Wood, has been re-elected chairman of the Sussex branch of the Electrical Contractors' Association.

Obituary.

ALDERMAN F. E. READ, aged 65 years. He was for many years welfare master at the works of the English Electric Co., Ltd., and at one time served in the "Faraday." He was a member of Staffordshire County Council, and had served on the Town Council continuously for 21 years.

Sir BENJAMIN LONGBOTTOM, on May 1, aged 53 years. He was a member of the I.E.E. Council, joint managing director of Laurence, Scott and Electromotors, Ltd., vice president of the British Electrical and Allied Manufacturers' Association, director of Richard Johnson, Clapham and Morris, Ltd., honorary treasurer of the Manchester Chamber of Commerce, and chairman of the Chamber's engineering section. In 1924 he was chairman of the British National Committee of the first World Power Conference, and was created a knight in the following year. He was president of the Manchester Association of Engineers, 1926–7, and of the Manchester Engineers' Club. A recent portrait of Sir Benjamin appears on page 597.

MR. DANE SINCLAIR, on May 6, aged 78 years. Mr. Sinclair had been associated with British Insulated Cables, Ltd., first as general manager, then as managing director, and latterly as chairman. His early years were spent on the staff of the telegraph department of the North British Railway and subsequently in the service of the Japanese Government as inspector of telegraphs. In 1882 he was appointed engineer to the National Telephone Co. in the Glasgow district, shortly after becoming London manager, and in 1892 engineer-in-chief. This position he held until 1902, when he became associated as general manager of the British Insulated and Helsby Cables, Ltd. Mr. Sinclair was a pioneer in the development of automatic telephones, and he was largely responsible for the formation of the Automatic Telephone Manufacturing Co., of which he was a director, and for the acquisition of the Strowger patents. See page 597.

THE E.T.B.I.

Report of the Annual General Meeting—Mr. Marryat's Successful Presidency.

THE annual general meeting of the Electrical Trades Benevolent Institution was held at the Institution of Electrical Engineers, Victoria Embankment, London, on April 29, at 2.30 p.m. The chair was taken by Col. Sir T. F. Purves, the President of the Institution of Electrical Engineers. The minutes of the last annual general meeting were read and confirmed, and the report of the committee was read. The chairman then proposed that the report of the committee and accounts and balance sheet for the year ended December 31, 1929, as submitted, be approved and adopted. In moving the resolution, the chairman voiced the satisfaction, which he felt must be general amongst all the members of the Institution, at the magnificent collection which had been achieved by Mr. Howard Marryat, and the consequent increase in the invested funds of the Institution; the total actually collected by Mr. Marryat being £9 800, which was far in a way the largest collection that had been experienced in the history of the Institution. Col. Sir T. F. Purves then pointed out that the continued increase in the number of grants which were made annually demonstrated very clearly the necessity for this Institution. The running costs of the Institution came to only 5½% of the actual income, whilst the actual expense incurred in dealing with this tremendous number of grants and pensions was only 3½% of the amount actually expended. One item which he noticed appeared to be a legacy, and he thought it was not out of place to remind the industry as a whole that this Institution should not be forgotten when dealing with their wills.

The other point which Col. Sir T. F. Purves thought worthy of comment was that this Institution and the Benevolent Fund of the Institution of Electrical Engineers acted in the closest co-operation in all of their activities.

Mr. Eck proposed, and Mr. Gatehouse seconded, that the following be elected as Members of the Council: Messrs. A. G. Beaver, C. H. Cox, J. Y. Fletcher, E. A. Gatehouse, W. E. Hobbs, L. C. Penwill, R. Robson, S. D. White.

ELECTRICAL WOMEN.

Details of the Fifth Annual Conference of the Electrical Association for Women.

THE fifth annual conference of the Electrical Association for Women is to be held in London on May 15 and 16. The conference will open with the annual general meeting, at the Park Lane Hotel, at 11.15 a.m., and this will be followed by a luncheon at the hotel at 1 p.m. The speakers will include Mrs. Wilfred Ashley (President), Mr. Herbert S. Morrison, Minister of Transport, the Rt. Hon. Margaret Bondfield, Minister of Labour, and Sir Felix Pole, chairman, Associated Electrical Industries, Ltd.

A visit to the H.O. Industrial Museum will be made at 3.30 p.m., and a reception by the London Executive Committee will be held at the Institution of Electrical Engineers from 8 to 10.30 p.m.

On May 16, a visit will be made at 10.30 a.m. to the works of J. Lyons and Co., Greenford, while the afternoon will be left free, though informal visits can be arranged if desired.

A ball will be held at the Park Lane Hotel, and Mrs. Wilfred Ashley will receive guests at 9 p.m. The Eric Ross "Dazzle" cabaret has been engaged.

THE NATIONAL REGISTER.

The annual meeting of the National Register of Electrical Installation Contractors was held at the Institution of Electrical Engineers, on April 25th, when the chairman, Mr. P. V. Hunter, presided. The accounts were presented by Mr. W. R. Rawlings, hon. treasurer, who stated that the expenses were being met by renewal fees, interest on investments and by appropriating £2 of each £5 entrance fee. Mr. H. Willoughby Ellis, President of the E.C.A., moved that the Executive Committee should raise the annual renewal fee from one to two guineas, and this was adopted. The following were elected to the Registration Board: Messrs. J. A. Lee, F. W. Purse, E. E. Hoadley and Dr. W. T. Walsh. Messrs. P. V. Hunter and A. H. Dykes were re-elected chairman and vice-chairman respectively. Messrs. W. A. Walker, E. Calvert and D. S. Munro were re-elected to the Executive Committee.

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ELECTRICAL GOLFERS.

I.E.E. Northern Centres Benevolent Fund Golf Competitions.

THE third annual golf competition in aid of the I.E.E. Benevolent Fund, for the trophy presented by Messrs. W. L. Winning and Andrew Hutcheson, will be held at Gleneagles on May 22. This competition is open to members of all classes and played against "bogey." Each entrant for the competition is required to pay a fee of 2s. 6d. towards the Benevolent Fund. It is recognised, however, that many members would possibly wish to contribute, although it may be impossible for them to attend, and in such cases it is hoped that they will give their support by sending a non-player's contribution of 2s. 6d. The cost of the outing, including transit from Gleneagles Station to the course and back, green fee and lunch, but excluding railway ticket and entrance fee of 2s. 6d., will be 9s. Members should purchase their own railway tickets in the ordinary way. Arrangements will be made for a saloon carriage to be attached to the 9.15 a.m train from Buchanan Street station, Glasgow, due at Gleneagles at 10.30 a.m., and the competition will start immediately after the arrival of that train. Members taking part from other districts should endeavour to arrive at Gleneagles as near 10.30 a.m. as possible. A saloon carriage will also be attached to the 8.15 p.m. train for the return journey from Gleneagles to Glasgow. Entrance forms, obtainable from Mr. J. Miller, 53, Pitt Street, Glasgow, C.2, should be returned not later than May 15.

The Mersey and North Wales (Liverpool) Centre of the I.E.E. announce that the competition and play for the G. P. Dennis Trophy will be held on May 22, on the Links of the Prenton Golf Club, Birkenhead. The tournament will be a bogey competition under handicap, and will be open to members and their friends. The player, being a member of the I.E.E., returning the best net score against bogey will receive the G. P. Dennis Trophy and Replica, the Trophy to be held by the winner for one year. A two-ball foursome competition will be played for four prizes under medal play rules. Members of the Home Club will be penalised two strokes off their full handicap for local knowledge. A putting competition will be arranged, and competitors may take out as many cards (18 holes) as they wish upon payment of one shilling for each card. The competitor handing in the best score on any card will receive the prize. One half of the entrance fees to go to the Benevolent Fund, the balance to take the form of a sweepstake to be divided between the competitors returning the second and third best scores in the proportion of two-thirds and one-third. In the event of a tie the competitors will play it off over 9 holes. Competitors must arrange their own partners and may start from 10 a.m. onwards, all cards to be returned by 6 p.m. The net proceeds will be handed over to the I.E.E. Benevolent Fund. The prizes have been presented by British Insulated Cables, Ltd., the British Thomson-Houston Co., Ltd., the Callender's Cable and Construction Co., Ltd., the Edison Swan Electric Co., Ltd., the English Electric Co., Ltd., the General Electric Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., and other friends.

RAILWAY SIGNALLING SYMBOLS.

New B.E.S.A. Specification Relative to Electrical Equipment to be Issued Shortly.

THE British Standard Railway Signalling Symbols (Part I), dealing with schematic symbols, has just been issued by the B.E.S.A. The symbols are intended for use on general plane showing signalling requirements, and therefore none of them attempts to show the component parts of the apparatus to be used. They have been so designed that they may be combined with each other where one does not adequately represent the complete device. For convenience of reference the symbols have been divided into the following seven sections: (1) signals, semaphore and light; (2) points; (3) track details; (4) apparatus; (5) controls; (6) level crossings and (7) buildings. Part 2, which it is hoped will be completed in a few months' time, will cover the wiring symbols, *i.e.*, the symbols for the actual apparatus used with their electrical connections, and written circuits or simplified wiring diagrams.

Copies of this new British standard may be obtained from the B.E.S.A., 28, Victoria Street, London, S.W.1., price 2s. 2d., post free.

THEATRE LIGHTING.

Details of the Illumination Arrangements at the New Richmond Cinema.

IN connection with the lighting of the stage and the atmospheric portion of the auditorium of the Richmond Cinema carried out under the direction of Messrs. Wingfield Bowles and R. C. Clay, with Messrs. Locke and Soares as electrical contractors, it is interesting to note that Holophane, Ltd., have supplied a 36 ft. 4-colour footlight claimed to be remarkable for its distribution and light intensity, particularly with the colour circuits. The same firm also supplied two No. 4 type top battens, each with four colours. Besides the distribution and intensity of light, these battens are sufficiently strong to be suspended from three points only, without the use of shackles. The colour circuits are arranged for the usual Holophane colours—white, red, green and blue, and a rich chrome yellow can be obtained on the stage, from the use of red and green circuits. Holophane also provided an up-to-date back of board type stage switchboard, with back of board contact stud dimmers (each having over 60 contact studs). The dimmers are arranged in four sets, each of four dimmers and each set has individual or master control. The individual dimmers can be set on the master controls at various positions as they trip off when they have reached the limit of their travel. The four colours are also each controlled by a colour master switch and there are coloured pilot lamps to indicate which circuits are on, and whether or not the dimmers are in check. The atmospheric portion of the auditorium is provided with a white plaster dome sky. This has been lighted all round by means of special 3-colour reflector equipment, and the lighting is so arranged that scores of different colour lighting effects can be produced on the sky alone, ranging from a sunrise to a storm setting. Imaginative and colour hues of every colour can also be obtained, these changing and blending as desired. The proscenium arch and side walls of the atmospheric portion of the auditorium are illuminated by batteries of concealed spot lights and flood lights. The outstanding feature of the installation, however, is perhaps the new Holophane automatic control. This provides: (*a*) 672 sequences of colour lighting effects each lasting over five minutes, by setting the indicators of the sequence meter and operating the master switch (this represents one different sequence every week for thirteen years); (*b*) a special lighting effect may be pre-set on a control panel while the automatic dimmer gear is working and by the operation of the master control wheel; the lighting will immediately merge into the pre-set effect; (*c*) if desired, the house may be lighted in any desirable manner by hand operation of the switches which control the automatic dimmer gear; (*d*) under ordinary circumstances, the operator needs simply to dial to any particular sequence and to operate the master control wheel whereupon the lighting will gradually come up and continue to go on changing until such time as the operator wishes to take the lights down again, ready for the films; (*e*) it is intended that the lighting shall be worked in this manner so that the control equipment shall provide colour effects which are artistically and properly blended, instead of leaving the choice of the effects to the operator, who, in the ordinary way will also have to work the dimmers; (*f*) at no time does one actually touch a dimmer when working the lighting effects, as all the dimmers are electrically operated either from the automatic control or from the hand switches on the control panel; (*g*) a number of indicator dials on the control panel which are illuminated by coloured lamps in reflectors show the approximate position of any dimmer at any time; (*h*) the footlight colour circuits and also the colour circuits in No. 1 batten may also be controlled by the automatic control gear and may be worked either at the same time as the auditorium colour lighting or by themselves.

DEVELOPMENTS AT BRIGHTON.

Sanction is sought by Brighton Lighting Committee to borrow £6 500 of the £10 000 required to defray the cost of the necessary cable extensions in connection with the extension of buildings and plant at Southwick works, and £3 382 for the provision of mains and sub-station equipment. The T.C. has received sanction to borrow £1 275 for public lighting on the Grand Junction Road and Madeira Drive.—The Central Board has informed the Corporation that the Board has made arrangements for the interconnection of the Brighton station with other generating stations before the winter of 1930-31.

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POWER PLANT.

New Equipment and Apparatus of Interest to Manufacturers.

ALTHOUGH descriptions of the recently introduced products of a great number of electrical manufacturers were included in our review of exhibits at the British Industries Fair, we are able to give below particulars of further apparatus.

MAVOR AND COULSON, LTD. (of Castle Chambers, Castle Street, Sheffield, and 47, Broad Street, Mile End, Glasgow, S.E.), have sent us details of their new driving gear for electric shaker conveyors for coal. Though the height of this driving gear is only 16 in., it is claimed that nothing is sacrificed to the essentials of an ideal gear. For starting, the B.E.S.A. plug is standard, while an alternative plug can be supplied whenever desired.

Switching Convenience.

The switch handle is conveniently placed, but well protected; the starter can break the standstill current, and its heavy barrel contacts and finger tips are renewable, the barriers being removable. The motor is stated to be as powerful as that on the 22 in. gear; it is supported from the gearcase in such a way as to prevent distortion and misalignment. Starter and motor are contained in a flameproof enclosure. The gearbox is heavily cross-ribbed, and the use of solid bushes eliminates loose bearing cups with the chance of nuts slacking back. The bushes are of the firm's special phosphor bronze which is claimed to be superior in quality even to that called for under Admiralty specifications. The gearbox is bolted to an angle iron frame which carries steel pockets. The gearing is case-hardened; the motor pinion drives a countershaft carrying a level pinion which meshes with a bevel wheel mounted on a sleeve running on a fixed shaft; the sleeve also carries a pinion which drives a spur wheel on the crank shaft. The connecting rod is turned out of a solid billet; the character of the conveying stroke may be adjusted to individual requirements by selecting the appropriate length of connecting rod. Crank shaft, spur wheel and crank pin are machined out of one forging, heat treated, and ground. The spur wheel is hollowed to bring the main bearing to one inch from the crank pin, thus reducing the overhang of the crank pin to a negligible value. As the main journal is 11 in. long by 6 in. in diameter, the large bearing area is hard wearing.

Turning to the fulcrum shaft, each lever is forced up its locking taper on the shaft by a fine thread nut, a key being provided only as an extra precaution. A sleeve which fits tightly in the right-hand end of the shaft forms one journal, and acts as a distance piece between nut and driving lever. For the M. and C. trunnion block a patent has been applied for. The block prevents backlash from developing and subjecting the gear to the strain of repeated hammer blows. The pin on the driving lever passes through a bush in a case hardened block on which trunnions are formed to receive eyes drilled in the end of the coupling rod. The semi-universal joint thus formed is stated to give sufficient sideways freedom to the coupling rod to enable the gear to work when out of exact line with the troughing—without the resultant side thrust causing undue heating. As regards lubrication the motor and first reduction shaft run on ball and roller bearings which require practically no attention. The first reduction gearing runs in its own oil bath, the level of which is maintained from the main gearbox.

Electric Drive.

Those interested in small motors may be glad to learn that the NORMAND ELECTRICAL CO., LTD., of 3, North Side, Clapham Common, London, S.W.4, has put on the market the "Neco," universal motor which develops $\frac{1}{6}$ H.P. at 2 800 r.p.m. It is built throughout from steel pressings, and is claimed to be lighter, stronger and cheaper than any other motor of its size. The frame consists of two steel pressings which butt together on the centre line of the motor, enclosing the fields and forming the end covers. The complete motor weighs 12 lbs. 14 ozs. Since no castings are used in the motor, no machining is required, and it can be sold at a low price. The motor is mounted on a detachable pressed steel base; for users who wish to mount the motor by one end, or vertically, a flat ($\frac{1}{2}$-in. wide and $4\frac{1}{4}$-in. diameter) is provided on the end covers, forming a spigot concentric with the shaft. Separate windings are provided for a.c. and d.c. The armatures are hand-wound, with double-covered wire. The field coils are former wound, insulated with three layers of tape, stoved, and impregnated. The $\frac{1}{2}$-in. diameter shaft runs on double row self-aligning ball bearings. The bearings are $1\frac{5}{16}$ in. in diameter and allow the motor to be mounted on floor, wall, ceiling, or vertically without alteration.

The commutator is $1\frac{1}{2}$ in. in diameter, with 32 segments, and a radial wearing depth of $\frac{1}{8}$ in. The brushgear consists of two extruded brass brush boxes bolted to a bakelite slab mounted inside the end cover. Except for the actual brush boxes, the whole brushgear is made of insulating material, and it is claimed that all possibility of shorts and earths is eliminated. As in all "Neco" motors, the only openings are underneath, and the motor is claimed to be proof against falling water and dirt. Ventilating air is drawn through the windings by a large pressed steel centrifugal fan, and two large cover plates give access to the brushgear.

The speed of the motor can be varied by means of the "Neco" control unit, consisting of a suitable adjustable resistance mounted in a cover together with a starting switch. It is tested in accordance with British Standard Specification 170/1926. Temperature rise will not exceed 50 deg. C. after six hours on full load. The standard finish is black crystalline stove enamel, with all outside nuts, etc., heavily nickel plated.

TELEPHONE REFORM.

Scheme for the Control of Telephone Service by New Statutory Control Board.

A SCHEME for the control of the telephone service by a new statutory Telephone Control Board, on the lines of the British Broadcasting Corporation or the Port of London Authority, was launched on Monday, the details being embodied in a booklet entitled "The Stranglehold on Our Telephones: A Practicable Remedy." The pamphlet deals fully with the difficulties inherent in the present system, and makes the following recommendations:—

1. The telephone system, at present the property of the Post Office, should be transferred to a statutory body—the Telephone Control Board. This would be a perpetual corporation, similar in legal status to the Port of London Authority and the B.B.C.

2. The entire present personnel of the telephone service would (subject to mutually acceptable conditions) be transferred to the T.C.B.

3. The T.C.B. would exercise complete financial responsibility in regard to telephones, and would run them as a commercial undertaking with reference not to the principle of maximum profit, but of maximum service.

4. The telephone system (worth to-day £100 000 000) would be taken over, with liabilities and assets, from the State by the T.C.B. on terms to be arrived at after valuation on some agreed basis.

5. Provision should be made for an appropriate annual payment to Parliament as compensation for loss of annual revenue (for the last four years an average of about £350 000).

6. Provision would also be made for the apportionment between Parliament and the T.C.B. of the costs of common service.

7. The T.C.B. would be a body, consisting of a chairman and, say, six other members. The chairman's would be a whole-time appointment, carrying with it a salary commensurate with his responsibilities. The other members would serve, and would be remunerated on a part-time basis.

8. The T.C.B. would meet at frequent intervals, and would run their business much on the lines ordinarily pursued by the executive of any large concern.

9. The members of the T.C.B. would be appointed, in the first instance, by the Crown, on the recommendation of the Postmaster-General. The appointment of the chairman would be for a period of five years, and would be renewable. Of the other members, four would be appointed by the Crown and two would be annually elected by a Telephone Advisory Council.

10. For the subsequent appointments of the chairman and all but the two elected members, the Crown would continue to be responsible.

11. The Telephone Advisory Council, to which reference has just been made, would be a statutory body representative of every interest concerned in the effective administration of the telephones.

Copies of the booklet are available, free of charge, on application to the office of the Telephone Development Association, at 10, Bedford Street, W.C.2. (Tel.: Temple Bar 6824.)

OVERHEAD LINE EQUIPMENT.

Overhead line equipment materials for power, traction and telephones form the subject of a new issue by BRITISH INSULATED CABLES, LTD., of Preston, Lancs. The catalogue consists of 200 pages of well-described and illustrated matter. At the end of the book is published a collection of data and formulæ useful in overhead work.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

FIFE COUNTY COUNCIL.—Electric lighting work in new police stations at Newburgh and East Wemyss. Specifications from Messrs. Walker and Pride, architects, Church Square, St. Andrews; deposit £2 2s.

WREXHAM CORPORATION.—Electric wiring of 57 houses on Huntroyde estate. Specification, etc., from Mr. J. W. Williams, borough electrical engineer.

Electrically-Driven Pumps.

DUNDEE CORPORATION, May 10.—Supply and erection of two electrically-driven, vertical spindle, main circulating water pumps, in pump room, in connection with Carolina Port generating station. Specification, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee; deposit £2 2s.

GLASGOW CORPORATION, May 10.—Twelve months' supply of electrical fittings to the public health department. Specifications, etc., from the Superintendent of Stores, 20, Cochrane Street, Glasgow.

BILSTON URBAN DISTRICT COUNCIL, May 12.—Electric light installation in Market Hall and Yard. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s. Only firms on the National Register are invited to tender.

CENTRAL ELECTRICITY BOARD, May 12.—Supply and erection of 66 kV and lower voltage switchgear. Specification (No. M.E.E.-G.S. 1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12.—Supply and erection of 66 kV and lower voltage transmission lines, under the Mid-East England scheme. Specification (No. M.E.E.-S.L. 2) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, May 12.—Supply of 33 kV and other cables, in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.-G.C.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CLEETHORPES URBAN DISTRICT COUNCIL, May 12.—Supply of l.t. and e.h.t. underground cables. Forms of tender, etc., from the Clerk, Council Offices, Cleethorpes.

DUNDEE CORPORATION, May 12.—Electric lighting work in connection with the erection of 84 houses on Tullideph Road site. Particulars from Mr. G. Baxter, 91, Commercial Street, Dundee.

EBBW VALE URBAN DISTRICT COUNCIL, May 12.—Supply and erection of automatic rectifier plant of 300 kW capacity, with switchgear cables, etc. Specifications from the Electrical Engineer, Council Offices, Ebbw Vale, Mon.

EPSOM URBAN DISTRICT COUNCIL, May 12.—Kiosks and converting plant (section I); e.h.t. and l.t. cables and laying (section II); and supply only of l.t. cables (section III). Specification and form of tender from Mr. H. W. Watts, Electricity Works, Depot Road, Epsom; deposit £2 2s.

GLASGOW EDUCATION AUTHORITY, May 12.—Electric lighting installation in Drumoyne School, Shieldhall Road, Govan. Specifications, etc., from the Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s.

MANCHESTER CORPORATION, May 13.—Supply and erection of electric passenger lift at town hall. Specification from the City Architect, Town Hall, Manchester; deposit 10s. 6d.

MIDDLESBROUGH CORPORATION, May 13.—Twelve months' supply of cables and meters. Specifications from Mr. R. H. Scotson, borough electrical engineer, Snowdon Road, Middlesbrough.

PLYMOUTH MENTAL HOSPITAL, BLACKADON, May 15.—Supply of 750 Ah, 200 V battery of 110 cells, in lead-lined wood cases. Further information from the Medical Superintendent.

GLASGOW CORPORATION, May 16.—Six months' supply of electrical fittings, to the public assistance department. Specifications, etc., from the Contracts Department, 266, George Street, Glasgow.

TOTNES CORPORATION, May 16.—Electric motor and centrifugal pump. Particulars from the Borough Engineer.

WARWICKSHIRE AND COVENTRY JOINT COMMITTEE FOR TUBERCULOSIS, May 16.—Supply of a.c. motors, switchgear, wiring, etc., at the King Edward VII Memorial Sanatorium, Hertford Hill, near Warwick. Specifications, etc., can be seen at the offices of Mr. A. B. Mallinson, consulting engineer, 44, Brazennose Street, Manchester, and will be supplied to contractors furnishing references of similar work carried out; deposit £2 2s.

CHERTSEY RURAL AND CHERTSEY, WALTON, WEYBRIDGE AND WINDLESHAM URBAN COUNCILS' HOSPITAL COMMITTEE, May 17.—Electric light installation at Ottershaw Isolation Hospital. Specifications from Mr. F. J. Wareham, clerk, Council Offices, West Byfleet, Surrey.

ECCLES CORPORATION, May 17.—Twelve months' supply of single phase house service integrating watt hour meters. Specification, etc., from the Borough Electrical Engineer Electricity Works, Cawdor Street, Patricroft; deposit £1 1s.

SALFORD CORPORATION, May 17.—Transfer of existing X-ray apparatus and installation of new apparatus. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

CENTRAL ELECTRICITY BOARD, May 19.—Construction of site works, foundation works and buildings in the area of the South East England Electricity Scheme (London Area). Specification (No. S.E.E.-L.F.4) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

NORTH WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, May 20.—Outdoor type static transformers (contract A.105); and outdoor 33 kV switching station (A.106). Specifications from Chairman of Engineers' Committee; deposit £2 for each.

SLOUGH URBAN DISTRICT COUNCIL, May 21.—Electrically-driven vertical-spindle pumps, etc. Particulars from Messrs. Allan Bromley and Arthur Gladwell, Denmark House, Windsor Road, Slough.

STAFFORDSHIRE EDUCATION COMMITTEE, May 24.—Electric light installation in existing Infants' Council School, Pelsall, near Walsall, which is to be enlarged and converted into a Senior Mixed Council School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

BELFAST WATER COMMISSIONERS, June 4.—Electrically-operated pumping plant. Specification, etc., from the Secretary, Water Office, Belfast, deposit £1.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15 kW motor-generator set, battery-trickle charger, milking booster, and spare parts. Specification (No. 10) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of works supply sub-station 3 300 V and 400 V metal clad switchgear. Specification (No. 9) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., LTD., May 9.—Supply of track bands, in connection with electrification of Madras suburban services. Specifications, etc. (10s., not returnable), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

COPENHAGEN MUNICIPALITY, May 10.—Supply of switchgear and rectifier plant for Eskildsgade sub-station (Reference B.X. 6 271.)

COPENHAGEN MUNICIPALITY, May 12.—Supply and erection of two turbo generators. (Reference B.X. 6 297.)

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VICTORIAN ELECTRICITY COMMISSION, May 12.—Supply of 22 000 V pin type supporting insulators for the year 1930-31 (specification No. 30/12). (Reference B.X. 6 179.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 13.—Supply of 110 kV, single-phase, oil immersed, self-cooled, transformers, suitable for outdoor service. (Reference B.X. 6 096.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13.—Supply of terminal strips (P. and T. 151/2 000). (Reference B.X. 6 209.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 13.—Supply of dials. (No. P and T. 151/2 280). (Reference B.X. 6 379.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 13. Galvanised line, binding and jointing and stranded wire. (schedule No. C. 594). Reference A.X. 9 461.)

NEW ZEALAND POSTS AND TELEGRAPHS, May 14.—Supply of 100 000 lead alloy clips, 3¼ in. in length, for cleating four or five 0·25 in. lead-covered cables on poles; 30 000 ditto 2¼ in. in length for cleating one or two similar cables; and 400 lb. of fixing nails. (Reference B.X. 6 375.)

CHILEAN MINISTRY OF MARINE, May 15.—Supply of three-metric ton travelling electric crane and four-metric ton tationary electric revolving crane. (Reference A.X. 9 186.)

s POWER SECURITIES CORPORATION, May 15.—Works and materials in connection with Pykara hydro-electric scheme, including transmission line towers (specification E2; price 22s. 6d.); (insulators E5; 7s. 6d.); steel-cored aluminium conductors (E6; 4s. 6d.); steel earth wire (E.7; 4s. 6d.); guying materials (E13; 4s. 6d.); generating plant (E14; 37s. 6d.); crane (E16; 7s. 6d.); and transformers (E18; 7s. 6d.). General conditions, 3s. 6d. Specifications, etc., from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

SOUTH INDIAN RAILWAY CO., LTD., May 16.—Supply of electrical fittings and materials. Specifications, etc., from the Company's Offices, 91, Petty France, Westminster, S.W.1, upon payment of 5s. (not returnable).

CAIRO MAIN DRAINAGE DEPARTMENT, May 17.—Supply of electric lamps, etc., for one year. Particulars from the Department, 2, Sharia Maleka, Nazli.

VICTORIAN ELECTRICITY COMMISSION, May 19.—Twelve months' supply of triple braided, h.d. copper aerial cable. (Reference B.X. 6 325.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 20.—Supply and erection of one 25 kVA, three-phase, 400/230 V, 50 cycle generator. (Reference B.X. 6 307.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20.—Supply of terminal strips (schedule No. C. 578). (Reference B.X. 6 247.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20.—Supply of telegraph instruments (Schedule C. 579). (Reference B.X. 6 248.)

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO, May 21.—Electric overhead travelling cranes. Specifications (10s., not returnable) from the company's offices, 91, Petty France, Westminster, S.W.1.

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22.—Supply of three electric horizontal centrifugal pumping sets, piping, control switchboard, etc. (Reference A.X. 9 212.)

INDIAN STORES DEPARTMENT, May 26.—Two vertical and two horizontal centrifugal pumps, switchgear, etc. (Reference A.X. 9 416.)

CAPE TOWN MUNICIPALITY, June 4.—Supply of heavy current d.c. testing motor generator, and starting gear (specification No. 494/1930). (Reference B.X. 6 341.)

AUCKLAND HARBOUR BOARD, June 10.—Supply of submarine cable (contract No. 902). (Reference B.X. 6 354.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, June 12.—Supply of 2 000 V switch units and l.t. switchboards (tender No. 1 649). (Reference B.X. 6 365.)

Sub-Station Equipment.

MADRAS GOVERNMENT, June 15.—Complete electrical equipment of three 66/110 kV outdoor sub-stations, in connection with Pykara hydro-electric scheme. Specification (No. E.26) (price 30s.) and general conditions of contract (price 3s. 6d.) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4, on payment of the respective fees (not returnable).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of indicators (schedule No. C.588.) (Reference B.X. 6 333.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of multiple twin cable. (Reference B.X. 6 349.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of loading coil pots. (Reference B.X. 6 350.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24.—Supply of 110 kV outdoor steelwork and switchgear for, Waitaki power scheme—section 71. (Reference B.X. 6 238.)

CAPE TOWN MUNICIPALITY, June 25.—Supply of single phase transformers (specification No. 495/1930). (Reference B.X. 6 378).

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of condensers (P. and T. 151/2 240.) (Reference B.X. 6 308.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, August 17.—Supply and erection of 15 electric pumping stations, with pumps, motors, switchgears, etc., in the Isolated Basins, Oswin Province. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (£10 5s. per set, not returnable.)

Tenders Accepted.

MILTON NEW CHURCH.—E. A. Kitchen, electric light installation.

PLYMOUTH CORPORATION.—Albion Clay Co., Ltd., the supply of conduits, £222 4s.

BURY ST. EDMUNDS CORPORATION.—Mather and Platt, rotary convertor, £1 236 4s.

BASINGSTOKE CORPORATION.—British Thomson-Houston Co., Ltd., motor generator, £3 715.

ILFORD CORPORATION.—Crompton Parkinson, Ltd., supply of kiosk, £492. (Recommended).

AYRSHIRE COUNTY COUNCIL.—Campbell Banks, electrical work in connection with new County offices, Ayr.

WOKINGHAM CORPORATION.—Wallwin Co., electrical pumping machinery at proposed pumping station, Toutley, £1 370.

PRIMITIVE METHODIST TRUSTEES, MIRFIELD.—H. Senior, electrical work in new Sunday schools, Greenside, Mirfield.

ABERDEEN CORPORATION.—Forbes Gordon, electric lighting work of new shelter and public conveniences at Sea Beach, £42.

BERWICK-ON-TWEED CORPORATION.—Urban Electric Supply Co., Ltd., electrical work in 16 houses at Prince Edward Road, Tweedmouth.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—A. C. Woodrow and Co., supply of 100 cast-iron fluted lamp columns, £2 18s. each.

SHROPSHIRE EDUCATION COMMITTEE.—G. H. Smallwood and Co., generating plant, electrical installation and pump, at Council School, Harlescott, £373. (Recommended).

LONDON COUNTY COUNCIL.—Dyer and Young, Ltd., Player and Mitchell, E. Showell and Sons, Ltd. and Yorkshire Switchgear and Engineering Co., Ltd., tramcar controller segments, fingers, lips, etc.

WILTSHIRE COUNTY COUNCIL.—Western Electricity Supply Co., electric light installation at Chippenham Police Station, £50 10s.; James Bros., electric light installation at Malmesbury police station, £39 10s.

CONGLETON CORPORATION.—A. Reyrolle and Co., Ltd., and C. Ellison, switchgear; Metropolitan-Vickers Electrical Co., Ltd., and Ferranti, Ltd., transformers; Electric Cables, Ltd., kiosk; Macintosh Cable Co., Ltd., cables.

METROPOLITAN WATER BOARD.—J. White and Co., electric light installation, etc. at 80, Tubbs Road, Harlesden, £128. (Recommended). Also tendered: Sims and Sims, £164; J. Myring and Co., £190; Collins and Co., £220.

FAVERSHAM CORPORATION.—Philpott and Son, wiring houses under assisted wiring scheme, £1 2s. 6d. per point for four lights; £1 1s. 6d. per point for five lights; £1 1s. per point for six or more lights; and £1 4s. 6d. extra for a power point.

BOURNEMOUTH EDUCATION COMMITTEE.—Brook Motors, Ltd., three-phase induction motor, £10; British Electric Transformer Co., Ltd., three small transformers, £18 15s.; and Crompton Parkinson, Ltd., potentiometer, £18, for Municipal College.

DUMFRIES CORPORATION.—Worthington-Simpson (sub-contractors for British Thomson-Houston Co., Ltd.), piping, jointing materials, bolts and supports, in connection with new water cooler tower, £500; Glenfield and Kennedy, five cast-iron valves, £57 12s. 6d.

WESTMINSTER CITY COUNCIL.—Barlow and Young, electric light installation in tenements, £187 (Recommended.) Also tendered: Gaillard, Robinson and Co., £205; Edmundson's Electricity Corporation, Ltd., £205; Coleby and Co., £225; Rashleigh, Phipps and Co., Ltd., £230.

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BIRMINGHAM EDUCATION COMMITTEE.—Electric lighting installations—Thornton Road junior school and Sparkhill junior commercial school, Lea Son and Co., Ltd.; Bleakhills school and Erdington secondary school, Harrison and Searle, Ltd.; Severne Road School, Walker Bros.

CAPE TOWN CORPORATION.—Siemens Bros. and Co. (British), Ltd., supply of service cut-outs, £517 10s.; British Insulated Cables (S.A.), Ltd., supply of copper and galvanised iron wire, £5 132; Dowson, Dodson and Behr, Ltd., supply of 30 miles of insulated wire, £568 10s. (All recommended).

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—A. Woodrow and Co., supply of 100 c.i. fluted lamp columns, £2 18s. each. (Recommended). Also tendered: F. D. Bird, £3 4s. 6d.; F. Bird and Co., £3 18s. 6d.; Mackenzie and Moncur, Ltd., £3 10s.; W. Lucy and Co., Ltd., £3 3s., and subsequent quantities, £2 18s. each.

LEEDS CORPORATION.—Igranic Electric Co., Ltd., supply of switch starter for asphalt plant motor, £30 5s.; W. T. Glover and Co., Ltd., telephone cable, £124 16s. and 0.6 sq. in. single cable, 10s. 10.8d. per yard, subject to rise or fall in cost of copper or lead; W. T. Henley's Telegraph Works Co., Ltd. (£4 436 10s.); Macintosh Cable Co., Ltd. (£3 127); Enfield Cable Works, Ltd. (£800); and Derby Cables, Ltd. (£1 999 17s), cables.

CAPE TOWN CORPORATION.—Associated Engineers, Ltd., automatic sprinkler apparatus, at power station, £1 235 12s.; South African General Electric Co., Ltd., fittings, etc., in connection with second instalment of street lighting improvement scheme, £1 733 12s.; Cape Battery Co., Ltd., constant potential charging set, £123, and motor-generator set, £97.

"HOW TO SEND AND SAVE."

As announced in our issue of April 11, the Great Western Railway now publishes a useful guide to the best ways and means of despatching goods over its system. This book, the title of which is as above, is issued free of charge on application to Mr. E. Ford, Chief Goods Manager's Office, Development Department, Great Western Railway, Paddington, London, W.

BUSINESS ITEMS.

MR. GEORGE S. GARTON, electrician, has opened premises in the Bull's Head Yard, Beast Market, Huddersfield.

The telephone number of the Maidstone branch of SUPER-LAMP, LTD., 11-13, Union Street, Maidstone, is now Maidstone 3033.

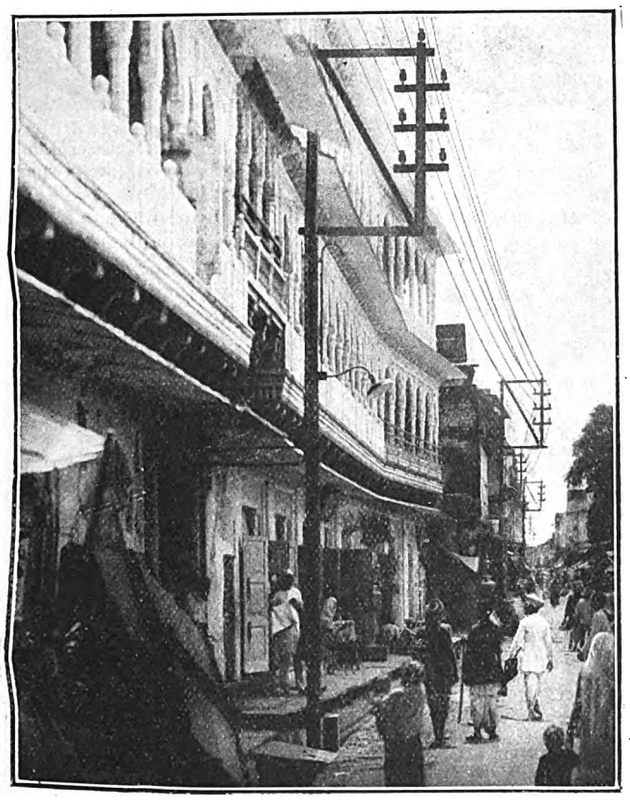
MR. RAY FURSE, electrical engineer, of Holland Street, Barnstaple, has taken into partnership MR. H. CORK, and the business will be carried on under the style of FURSE AND CORK.

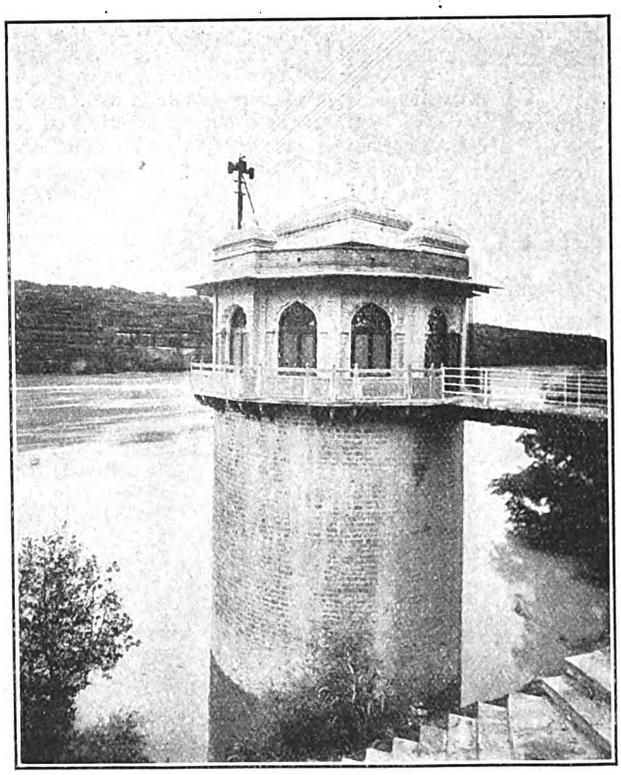
We are informed that the CHLORIDE ELECTRICAL STORAGE CO., LTD., of Clifton Junction, has now established 13 000 "Exide Service Stations" throughout the world, of which 600 are in the British Isles.

BULPITT AND SONS, LTD., of Birmingham, have appointed Mr. W. T. Rawcliffe, of Craven Bank, Osborne Road, Levenshulme, Manchester, as their representative for electrical cooking and heating appliances, in Lancashire, Cheshire and North Wales.

A confidential report on the market for secondary and primary batteries in New Zealand has been prepared by the Department of Overseas Trade (London) from information furnished by H.M. Trade Commissioner at Wellington, and issued to firms on the Department's special register. Copies of the report, with particulars of the special register, can be obtained from the Department. (Reference B.X. 6 334.)

In connection with the arrangements made by IMPERIAL AND INTERNATIONAL COMMUNICATIONS, LTD., for the handling of news, the following letter from Mr. T. Dunbabin, manager and editor of the Australian Newspapers Cable Service, to Sir Basil Blackett, chairman of Imperial and International Communications, Ltd., is of interest: "I should like to express my thanks to Imperial and International Communications, Ltd." wrote Mr. Dunbabin, "for the most excellent arrangements for handling traffic at St. James's Palace. I cannot speak highly enough of the work of your staff generally. The messages were handled expeditiously, and our staff have nothing but the pleasantest recollections of their association with your officers at St. James's Palace."





ELECTRICAL development in India is proceeding apace, and we have received from W. T. Henley's Telegraph Works Co., Ltd., details of the contract which they have just completed in Kotah State. It comprised the supply and complete installation of h.t. and l.t. underground feeder-cables and overhead feeders, l.t. distributors and street lighting fittings. The system is 3 300/400 V three-phase, 50 cycles. High tensile weldless tubular steel poles manufactured by the British Mannesman Tube Co. were used exclusively. The type of overhead construction adopted is illustrated in the picture of the Kotah main bazaar on the left; the l.t. house service and street lighting mains are also shown. The second illustration depicts the filtered water pumping station in Kotah, and shows the Henley terminal pole with 3 300 V three-phase overhead main.

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ELECTRICITY SUPPLY.

Expansion of Colchester System—Stoke-on-Trent Mains Extensions—Assisted Wiring at Edinburgh—Unemployment Grant for Hull Extensions—Bulk Supply at Reigate.

POPLAR (London) Electricity Committee seeks sanction to borrow £10 000 for minor network extensions.

West Ham Electricity Committee has instructed the Borough Engineer to submit an estimate for the erection of the Plashet sub-station.

Hackney (London) Electricity Committee seeks sanction to borrow £20 000 in connection with free-wired prepayment installations.

Dronfield U.D.C. has consented to the granting of a Special Order to Sheffield Corporation for the supply of electricity within its area.

Heston and Isleworth U.D.C. is to extend mains in Sutton Lane, Woodlands Road, in a new road to Duke's River, and in Cecil Road, at a cost of £1 328.

Glasgow Dean of Guild Court has passed plans for the erection of an electricity sub-station at Calder Street, and a transformer house at Chancelot Mills, Dalmeny Street.

The Borough Engineer of Southwark (London), has been authorised by the Highways Committee to experiment with a centrally suspended 1 500 W lamp in Walworth Road near the Town Hall.

Bridlington R.D.C. has consented to the supply by Scarborough T.C. of electricity to Hunmanby Hall school and the parish of Hunmanby. The supply is expected to commence by the end of September.

Burton-on-Trent Electricity Committee has obtained the sanction of the Ministry of Transport to the placing of overhead 11 000 V lines between Hartshorne and Repton, and 400/230 V lines at Hartshorne.

Grimsby Electricity Committee seeks sanction to borrow £12 300 for high-pressure feeders, transforming equipments and low-pressure cables, required for the supply of electricity to North Thoresby, Waltham and Humberstone.

Hastings Electricity Committee has obtained sanction to borrow £2 440 for a transformer, cable connections, etc.; £1 981 for sub-station plan, building work and sites and £22 571 for steam raising plant and building work.

Bradford Electricity Committee is to provide a district transformer station at Nelson Street, at a cost, including mains, of £7 850.—A compressed air supply is to be provided at the Valley Road power station at a cost of £1 050.

Erchfont (Wiltshire) P.C. recently held a meeting of ratepayers to discuss a proposal for electric street lighting by the Western Electric Supply Co. Voting on the question was equally divided, so that the proposition was not carried.

The Minister of Transport proposes to confirm an Order made by the Electricity Commissioners to be granted to the Central Electricity Board increasing their borrowing powers. Any objections must be sent to the Ministry of Transport by May 12.

Guildford Electricity Committee seeks sanction to borrow £10 000 for extension of mains and £2 000 for meters.—The electricity department is to extend mains, at an estimated cost of £169, to supply electricity to the Portsmouth Estate, Rydes Hill.

Colchester Electricity Committee is arranging for the erection of transmission lines to St. Osyth and Kirby, at a cost of £3 270.—The Committee is to provide screens to prevent dust from the bunkers and coal conveyors spreading to the boiler house, at a cost of £230.

It is proposed by Maidstone Electricity Committee to extend the mains to Linton at an estimated cost of £1 350, a guarantee of sufficient revenue having been obtained. The Housing Committee recommends that the houses being erected on the Mote Park Estate be wired for electricity.

Bexhill Electricity Committee has approved the plan for a sub-station in the northern district, to cost £480, and has decided to invite tenders for its erection. The Committee recommends extension of cable to supply proposed new houses in a new road off Haddocks Hill, at a cost of £136.

Lord St. David's Committee for unemployment grants has made a grant of £88 489 to the Sheffield City Council for electricity supply works. Schemes to be carried out consist of work which would not yet have been undertaken without the grant, but which would have been necessary in the future.

The Electricity Commissioners have been consulted regarding a proposal to install an additional oil driven generating set at Llandrindod Council's electricity works, and a reply had been received directing the Council to ascertain whether the Shropshire, Worcestershire and Staffordshire Co. would supply electricity in bulk and on what terms.

Darlington Electricity Committee has received from the Borough Electrical Engineer an estimate of the cost of laying mains in all streets which have been built up. There are about 12¼ miles of streets in which mains can be laid, and approximately 4 000 houses which can be supplied. The Committee will apply to the Unemployment Grants Committee for approval of the scheme.

The new electricity supply for Tain was formally switched on by Mrs. Ewen, the wife of Coun. Ewen, convener of the Electricity Committee, on May 1. The capital cost has been about £5 000. Energy is supplied from the hydro-electric station of the Ross-shire Supply Co. at Lochluichart, 40 miles distant, and a consumption of 60 000 kWh is expected, to cost the burgh £700 per annum.

Reigate T.C. has decided to take a bulk supply of electricity from the Home Counties Electricity Authority, at a charge of £6 2s. 1d. per kW, plus 2·487d. per kWh, for at least seven years. From the time the bulk supply is available the Authority will repay to the Council the cost involved in running the station and managing the machinery and the annual loan charges outstanding on the plant.

Kensington (London) Street Lighting and Street Safety Sub-Committee expresses the opinion that the new system of lighting in Redcliffe Road is satisfactory and should be adopted for residential streets in the borough in which conditions are similar. The lamps in this street have been fitted with asymmetric refractors supplied by the General Electric Co., and the cost is 11s. 6d. per lamp. The Works Committee concurs in the sub-committee's views.

Stoke-on-Trent electricity department is to extend mains at a cost of £600 to afford a supply to the L.M.S. Railway at Chatterley. Mains are to be laid to give an alternative supply to the Tunstall and Burslem areas, at a cost of £3 500, to supply 23 houses to be erected on the Vivian Road estate, Fenton (£220), and to the Chatterley-Whitfield Collieries housing estate at Chell (£2 000). Mains are to be extended in Wolstanton at a cost of £2 600, and in the Basford district (£1 700).

Members of the committee in charge of the scheme for Liverpool Corporation's Clarence Dock power station inspected the works last week. Mr. F. C. Wilson, chairman of the committee, said the station would contain, in the first instance, one 50 000 kW turbo alternator, and a second turbo alternator would probably be commenced within two or three months. The ultimate capacity of the station would be 400 000 kW. There was every prospect of the station being in operation at the end of this year or early in 1931.

Edinburgh Electricity Committee has received a report from Mr. E. Seddon, engineer and manager of the electricity undertaking, on a proposal by Coun. Crawford that a scheme of assisted wiring be adopted in the poorer districts. Mr. Seddon is of opinion that such a scheme should apply to houses with an assessed rental not exceeding £50, and that three lights should be the minimum installation, that the work should be done at agreed rates by local contractors, and that the consumer should pay the net cost, plus 10 per cent., by instalments. Representatives of the Electrical Contractors' Association Edinburgh Branch have quoted 36s., 33s. 9d. and 31s. 6d. for installations of three points, four to six points and over six points, respectively, and Mr. Seddon considers these figures fair and reasonable.

The City Electrical Engineer of Hull has been authorised to obtain tenders for two make-up circulating water pumps of 100 000 gallons per hour each. Sanction has been received from the Unemployment Grants Committee to the application for a grant in respect of an estimated expenditure of £120 000 for the laying of supply mains in various streets in the city.—The Electricity Commissioners have informed the Corporation that, while they would not be in a position to sanction the borrowing of money in respect of those works required solely for the bulk suppy purposes in the Hornsea area, until the arrangements for the bulk supply have been formally approved, they would be prepared to consider forthwith the issue of a loan sanction in respect of works in connection with the supply of electricity to the villages of Swine and Skirlaugh.

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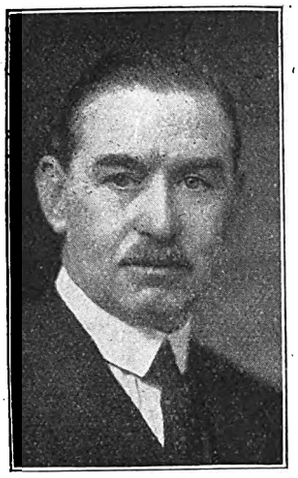
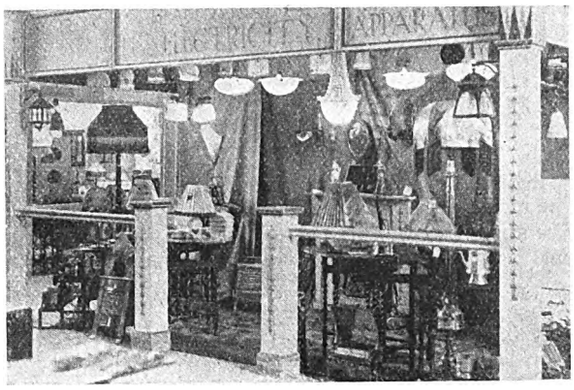
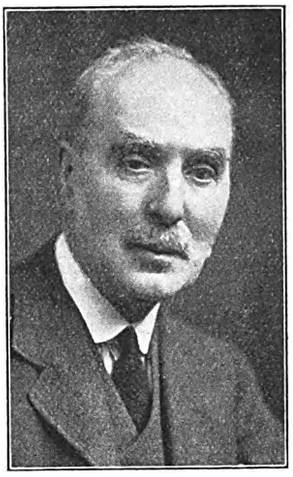
ELECTRICAL PICTURES.



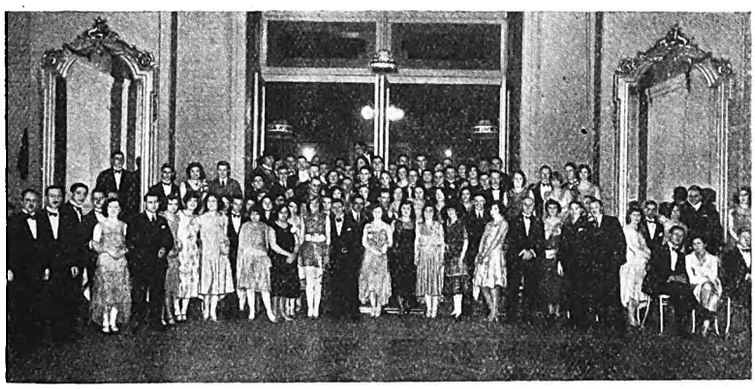
Sir Benjamin Longbottom, member of the Council of the I.E.E., joint managing director of Laurence, Scott and Electromotors, Ltd., whose death on May 1 is referred to on page 590.



The first of a series of electrical exhibitions to be held throughout Herefordshire by the Shropshire, Worcester and Staffordshire Electric Power Co. was opened on Monday at Hereford. The company had a large block of stands in the centre of the Shirehall, one of which is seen above, and washing, cooking and ironing demonstrations were given.

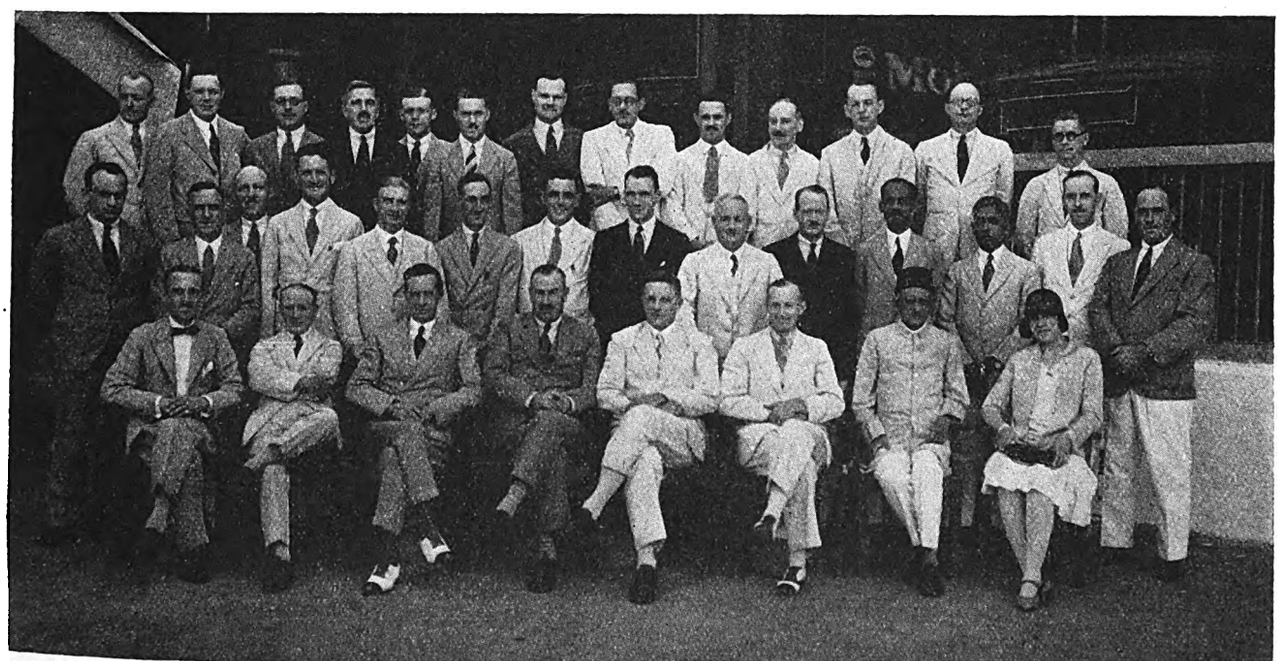


Mr. Dane Sinclair, chairman of British Insulated Cables, Ltd., whose death on Tuesday is reported on page 590. Mr. Sinclair was also a director of the Automatic Telephone Co., Ltd.



One of the most successful electrical dances held recently was that organised by the Social and Sports Club of Philips Lamps, Ltd. The dance was held at the Portman Rooms, London, and many of those attending wore fancy dress. The guests numbered well over 200 and some of the revellers are here seen assembled before the camera.

Lord Provosts Whitson, of Edinburgh (left) and Kelly, of Glasgow, joined hands last week, while Mr. H. Morrison closed the switch which energised the Scottish grid. A full report was given in our last issue.



A conference of the representatives of a number of electricity supply and transport undertakings throughout India and Burma was held recently at Bombay. This group, taken outside the works of the Bombay Electric Supply and Tramways Co., includes Mr. C. W. Moberly, the company's general manager. [Photo: "The Tramway and Railway World."

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FINANCIAL INTELLIGENCE.

Particulars of Accounts of Electricity Supply Companies for Last Financial Year—Recent Quotations and Yields upon Investments.

By "AUDITOR."

Bank Rate (1929–1930).

1929				1930	
Feb. 7	.. 5½%	Nov. 21	.. 5½%	Feb. 6	.. 4½%
Sept. 26	.. 6½%	Dec. 12	.. 5 %	Mar. 6	.. 4 %
Oct. 31	.. 6 %			Mar. 20	.. 3½%
				May 1	.. 3 %

THE following table shows the profits realised by certain supply companies during the 1929 (or 1929-30) accounting period, together with the dividends and some recent prices and yields :—

ANALYSIS OF RESULTS OF CERTAIN SUPPLY COMPANIES WHOSE 1929 OR 1929–1930 ACCOUNTS HAVE BEEN SUBMITTED.

1929 Accounts	Brought Forward £	Profit £	Total £	Carried Forward £	Ann. Div. %	Recent Price	Par Value £	Yield	Remarks
Adelaide Elec. Supply	31 902	331 534	363 436	32 030	12	—	£100	--	In September, 1929, the debenture debt was
,, ,, 5% Deb.	—	—	—	—	5	104½	£100	4¾	increased by the issue of £250 000 6% "D"
,, ,, 5½% Cons. Deb.	—	—	—	—	5½	98	£100	5⅝	consolidated stock. At the annual meeting
,, ,, 6% Cum. Pref.	—	—	—	—	6	104	£100	5¹⁹/₂₀	a resolution was passed for the conversion of
,, ,, 6½% "C" Pref.	—	—	—	—	6½	107	£100	6¹/₁₆	all shares into stock.
Brompton & Kensington Electy. Supply	16 579	35 639	52 218	6 485	8·6275	26/-	£1	6·64	Current purchased from London Power Co.
,, ,, 7% Cum. Pref.	—	—	—	—	7	—	£1	—	amounted to £41 316, against £55 843 during
									1928.
Charing Cross Elec. Supply—West End	79 706	174 231	253 937	87 581	8·151	27/-	£1	6·04	The company is allowed to charge prices suffi-
,, ,, 4% Deb.	—	—	—	—	4	79	£100	5 1/16	cient to cover all its expenses, including cer-
,, ,, 4½% Cum. Pref.	—	—	—	—	4½	17/-	£1	5 1/16	tain ordinary share dividends and reserve
Charing Cross Elec. Supply—City	18 227	122 472	140 699	—	8·90	--	£1	—	funds for the repayment of capital at par in
,, ,, 4½% Deb.	—	—	—	—	4½	89	£100	5 1/16	1971. The ordinary shares of the City under-
									taking are held by the West End.
Chelsea Electricity Supply	24 039	61 594	85 633	21 817	8·833	26/-	£1	6·79	The sum of £4 639 was received from invest-
,, ,, 4½% Deb.	—	—	—	—	4½	82½	£100	5 7/11	ments.
,, ,, 6% Pref.	—	—	—	—	6	—	£1	—	
Chiswick Elec. Supply	2 653	34 174	36 827	3 828	16	55/6	£1	5 13/32	Owns Electric Lighting Orders for Chiswick (1891)
									and Aberystwyth (1892).
City of London Elec. Light	7 657	264 638	272 295	6 974	10	33/9	£1	5 29/37	The net revenue amounted to £473 972, as com-
,, ,, 6% 1st Cum. Pref.	—	—	—	—	6	23/3	£1	5 7/16	pared with £462 221 in 1928, and £416 983 in
,, ,, 8% 2nd Cum. Pref.	—	—	—	—	8	28/-	£1	5⅝	the previous year.
Clyde Valley Elec. Power	84 586	354 495	439 081	88 288	8	37/-	£1	4⅜	The entire system is in process of change to the
,, ,, 6% Cum. Pref.	—	—	—	—	6	23/6	£1	5⅛	Board's standard frequency of 50 cycles.
,, ,, 8% Cum. 2nd Pref.	—	—	—	—	8	28/-	£1	5⅝	
Electrical Distrib. of Yorkshire	21 905	96 482	118 387	23 657	9	35/-	£1	5¼	There are no debentures.
Hendon Elec. Supply	9 628	53 474	63 102	10 405	15	70/-	£1	4¾	Repairs reserve amounts to £7½ 000, and the
,, ,, 6% Cum. Pref.	—	—	—	—	6	21/9	£1	5 5/16	general reserve to £60 000. The profit figure
									includes £56 interest.
Isle of Thanet Elec. Supply	6 203	59 074	65 277	8 358	4	30/-	£1	2⅔	£15 270 was expended during the year mainly in
,, ,, 4% Deb.	—	—	—	—	4	77	£100	5⅛	the development of the lighting undertaking.
,, ,, 6% Cum. Partg. Pref.	—	—	—	—	6	23/6	£1	5⅛	
Isle of Wight Elec. Light & Power	1 032	20 365	21 397	397	8	--	£5	—	Controlled by Edmundsons' Electricity Corpn.,
,, ,, 4½% Mort. Deb.	—	—	—	—	4½	88	£100	5⅛	Ltd. It is intended to increase the capital to
,, ,, 5% Cum. Pref.	—	—	—	—	5	—	£5	—	provide for extensions.
Keswick Elec. Light	117	3 084	3 201	92	10	—	—	—	All shares are held by Windermere & Dis. Elec-
									tricity Supply Co., Ltd.
Leatherhead & Dis. Electry.	3 648	21 198	24 846	3 843	7½	—	£1	—	£5 745 was provided for depreciation, and £2 214
									allocated to reserves.
London Elec. Supply Corp.	25 437	161 284	186 721	46 832	9	29/6	£1	6 1/10	The London Electricity (No. 2) Act, 1925, pro-
,, ,, 4% Deb.	—	—	—	—	4	95	£100	4 3/16	vides for the transfer of this undertaking to the
,, ,, 6% Pref.	—	—	—	—	6	5½	£5	5 5/11	Joint Electricity Authority in 1971.
Melbourne Elec. Supply	21 287	99 009	120 296	236	10	172	£100	5⅝	The £21 287 was transferred from reserve, and
,, ,, 5% Deb.	—	—	—	—	5	93	£100	5⅜	the surplus of £236 must be paid over to the
,, ,, 5% Cons. Deb.	—	—	—	—	5	95	£100	5 1/19	Commission who are taking over the Mel-
,, ,, 6% Mort. Deb.	—	—	—	—	6	100	£100	6	bourne and Geelong undertakings as from Sep-
,, ,, 8% Cum. Pref.	—	—	—	—	8	5½	£5	7 5/11	tember, 1930, on the basis of the book value,
									less depreciation.
Metropolitan Elec. Supply	87 149	281 766	368 915	84 746	10	41/-	£1	4⅞	The total output from the company's sub-sta-
,, ,, 4½% Mort. Deb.	—	—	—	—	4½	89	£100	5 1/14	tions in 1929 was 167 000 000 units, compared
,, ,, 7½% Extension Deb.	—	—	—	—	7½	106	£100	7 1/13	with 126 000 000 for the previous year.
,, ,, 4½% Cum. Pref.	—	—	—	—	4½	17/6	£1	5⅛	
Midland Counties Elec. Supply	5 676	211 079	216 755	4 578	7	30/4	£1	4 11/16	Further extensions are in progress.
,, ,, 5% Deb.	—	—	—	—	5	95	£100	5¼	
,, ,, 6 % Cum. Pref.	—	—	—	—	6	23/1	£1	5 5/16	
Midland Elec. Corp. for Power Distrib.	24 550	151 365	175 915	35 590	8	32/6	£1	4 11/16	Supply in bulk from West Midlands Joint Elec-
,, ,, 7% Cum. Pref.	—	—	—	—	7	26/-	£1	5⅜	tricity Authority.
Newcastle & Dis. Elec. Light	15 564	68 361	83 925	15 055	7	25/6	£1	5½	£5 020 2nd mortgage debentures and £59 700 3rd
,, ,, 4½% 1st Mort. Deb.	—	—	—	—	4½	83½	£100	5 1/22	mortgage debentures were redeemed during
,, ,, 7% 2nd Mort. Deb.	—	—	—	—	7	—	£100 / £20	—	the year.
Newcastle-upon-Tyne Elec. Supply	80 653	687 784	768 437	96 029	6	24/3	£1	4 31/40	During the year the additional connections
,, ,, 5% Pref.	—	—	—	—	5	19/3	£1	5⅛	amounted to 22 677 H.P., and 7 802 new
,, ,, 7% Pref.	—	—	—	—	7	26/-	£1	5 7/13	domestic consumers were connected.
,, ,, 4½% Deb.	—	—	—	—	4½	96	£100	4 13/16	
,, ,, 6% Deb.	—	—	—	—	6	104	£100	5 1/19	
North Metro. Elec. Power Supply	28 202	400 225	428 427	28 146	10	47/6	£1	4 1/10	On February 25 last, resolutions were passed for
,, ,, 5½% Deb.	—	—	—	—	5½	105	£100	5 1/11	the creation and issue of further cumulative
,, ,, 6% Cum. Pref.	—	—	—	—	6	23/-	£1	5 5/23	preference shares and debenture stock.
Northampton Elec. Light & Power	9 690	64 455	74 145	9 770	10	44/6	£1	4½	Sale of current provided £190 917, as compared
,, ,, 5% Deb.	—	—	—	—	5	96	£100	5¼	with £158 487 for the previous twelve
									months.
Oxford Elec.	6 449	72 380	78 829	42 803	7	—	£1	—	Profits earned from the purchasable portion of
,, ,, 4% Deb.	—	—	—	—	4	96½	£100	4⅛	the undertaking since the service of the notice
,, ,, 6% Deb.	—	—	—	—	6	99	£100	6 1/16	by the Oxford Municipal Corporation belong
,, ,, 6% Cum. Pref.	—	—	—	—	6	20/-	£1	6	to the Corporation.
Rushden & Dis. Elec. Supply	1 250	7 696	8 946	1 259	8	—	£1	—	The share capital was increased to £75 000 in
									1929.
St. James & Pall Mall Elec. Light	112 377	75 339	187 716	100 462	7·894	27/6	£1	5⅜	In 1931 the standard rate of 7% will come into
,, ,, 3½% Mort. Deb.	—	—	—	—	3½	70	£100	5	force.
,, ,, 7% Pref.	—	—	—	—	7	24/-	1	5⅝	
Salisbury Elec. Light & Supply	152	10 913	11 095	94	10	—	£1	—	Controlled by Edmundsons' Electricity Corpora-
									tion, Ltd.
Scottish Power	3 399	132 530	135 929	6 710	8	29/-	£1	5 5/16	Hydro-electric station at Rannoch is expected to
,, ,, 6% Cum. Pref.	—	—	—	—	6	23/3	£1	5 7/11	come into operation during the present year.
Shropshire & Worc. & Staff. Elec. Power	—	180 520	—	—	8	29/6	£1 (A &B)	5½	Over 5 000 additional services to domestic pre-
,, ,, 5½% 1st Deb.	—	—	—	—	5½	102	£100	5⅜	mises were connected during the year.
,, ,, 6% Cum. Pref.	—	—	—	—	6	22/8	£1	5 7/17	
Smithfield Markets Elec. Supply	2 508	8 572	11 080	2 781	8	25/-	£1	6⅜	Concession extended to 1972.
Swanage Gas & Electricity	1 916	5 683	7 629	2 671	A 7½ / B 5½	--		—	Dividends not subject to sliding scale.
Tees Power Station	759	60 290	61 040	2 791	5½	—	£1	—	Share capital was increased to £1 012 975 in
									1929.
Wellingborough Elec. Supply	1 690	2 103	3 793	1 544	5	—	£10	—	£5 500 was added to depreciation acct.
Westminster Elec. Supply	29 022	161 292	190 314	25 574	8·8	26/6	£1	6·6	There are no debentures.
,, ,, 4½% Pref.	—	—	—	—	4½	17/6	£1	5⅛	

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COMPANY NEWS.

Weakness in Transatlantic Securities—Johnson and Phillips' Satisfactory Year—Associated Electrical Industries' Increased Profit—Reports and Dividends.

THE break in the American market has led to further pronounced weakness in the transatlantic favourites. American Telephone and Telegraph capital stock has lost a further 6 points, to under 250, International Telephone and Telegraph Stock is 9 points down at 65½, and Radio Corporation of America shares have also dropped sharply from over 65 to nearly 50. Hydro-Electrics at a couple of points down are comparatively firm, and International Holdings are only fractionally below last week's quotation. Cables and Wireless stocks have been irregular and finish up much about the same as a week ago. Marconi International Marine are 1s. 3d. down at £2.

In the manufacturing department, General Electrics at just under 47s. have lost 1s. 3d.; Ever Readies at 18s. 9d. are 1s. 9d. lower; and Associated Electrical Industries shares are 1s. down at 27s. Enfield Cables have fallen 2s. 6d. to 87s. 6d., but Henley's have recovered the 1s. 3d. lost a week ago. Electric Construction 7% preference shares are 7½d. to the good, at nearly 19s. 6d.

Midland Counties Electric Supply shares have more than lost their recent gain, and are down to 28s. 6d. Bournemouth and Poole are 1s. 3d. down and Newcastle shares are also lower. Victoria Falls shares have further advanced 1s. 3d. to 63s. 9d. Calcutta Electric Supply shares have shed 1s. 3d., but Calcutta Tramways shares have recovered somewhat. British Electric Traction 6% preference stock is a point up, as also is Central London Railway 4½% preferred. London Electric Railway 4% preferred and debenture issues are lower, and Underground Electric Railways ordinary shares at 23s. have shed 6d. Metropolitan Electric Tramways debentures have been bought recently, and the official quotations have been marked up, the 5% stock 6½ points to 79½ and the 4½% 2½ points to 75½. London and Suburban Traction "A" debentures are up a point, and Metropolitan Railway ordinary stock is slightly harder at 67.

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98½
6½	" " "C" 6½% Cm. Pf. Stk.	106	106	117½	98½
15	B'mouth & Poole El. S. Ord. ..	61/3	62/6	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(f) 12	Calcutta E. Sup. Ord.	48/1½	49/4½	60/-	32/6
5	" " " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	82½	82½	81	77½
4	Central Elec. Sup. 4% Deb. ..	95½	95½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	27/6	27/6	31/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord..	36/10½	36/10½	44/6	26/6
8	" " " 8% Pref.	28/-	28/-	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	48/9	48/9	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord.. ..	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	90	90	92	80½
—	Hydro Electric Securities.. ..	47½	49½	87	20
—	International Holdings	6⅞	6⅞	35½	6
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	28/-	28/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	29/6	29/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	28/6	30/-	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	26/3	26/9	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord..	23/9	24/4½	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(c)	St. James' & P.M. Ord. (£1) ..	27/6	27/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	95	95½	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	63/9	62/6	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	93½	93½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	" " " " 6% Pf. Stk.	130½	129½	133	105½
6	Calcutta Trams Ord.	11/10½	11/10½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(h)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	77	77	74½	54
4½	" " " 4½ Pf.	80½	79½	85½	78
4	" " " 4% Deb.	80	81	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	78	78	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	" " " " 4% Pf. Stk.	71½	72	77	68
4	" " " " 4% Deb. ..	79	80	83	76½
5	Lon. & Sub. Trac. 4. Deb. ..	95	94	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	75½	73	75½	62
5	" " 5% Deb. ..	79½	73	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	67	66½	81	54½
3½	" " " 3½% Pf. Stk. ..	64½	64½	76	60½
3½	" " " 3½% Deb. ..	71½	71½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77½	77½	81½	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	88½	88½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9(i)	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/-	23/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	86	86	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	27/-	28/-	58/6	26/3
8	" " " 8% C.P.	53/1½	53/1½	56/9	49/6
4	" " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	66/10½	77/6	99/4½	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/6	23/6	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	127½	127½	153½	120
15	Callender's Cable Ord.	75/-	75/-	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref. ..	26/10½	26/10½	28/3	25/-
12	Consolidated Signal Ord.	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	22/6	22/6	27/-	14/-
6	" " " 6% Cum. 2nd Pf.	19/-	19/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	11/3	11/3	32/6	23/6
7	" " 7% C.P. ..	19/4½	18/9	22/9	20/-
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord. ..	87/6	90/-	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P. ..	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	89	89	103½	86
6	" " Conv. Deb... ..	66½	66½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	20/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	30/-	29/6	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	46/10½	48/1½	81/3	26/6
6½	" " "A" C.P. ..	23/6	23/6	26/-	22/-
7½	" " "B" C.P. ..	26/-	26/-	27/9	22/9
7	" " 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	132/6	131/3	136/10½	69/3
12½	International Auto. Telephone Ord	35/-	35/-	50/6	35/-
10	Johnson & Phillips Ord.	40/-	40/-	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	23/9	23/9	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	92½	92½	95	88½
10	Telegraph Const. Ord. (£12) ..	22½	22½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	$249	$255	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	59½	59½	63½	56½
6	" " 6% Prefd. Stk.	102½	102½	105½	91
1½	" " Deferred Stk.	25	25	27	22
8	Anglo Portuguese Tele. Ord. ..	23/1½	23/1½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	52½	52½	90½	73½
—	"B" Ord. Stk.	26½	27½	104	33
—	5½% Cum. Pref. Stk. ..	94½	94½	99	90
3½	Eastern 3½% Pref. Stk.	64½	64½	70½	58½
4	" 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	32	32	43½	26
—	International Teleph. & Teleg. ..	$65½	$74½	161½	48½
15	Marconi Int. Mar.	40/-	41/3	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	100½	102½	95
12	Oriental Telephone Ord.	55/7½	55/7½	65/-	42/-
—	Radio Corporation of America ..	51½	65½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
	Western Tel. 4% Deb. Stk. ..	78	78	82	73

(a) 19⅝d. per share. (b) 1s. 9·2d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·477d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅛d. per share. (h) 88s. 2·136d. (i) 9%, plus special bonus of 30% from sale of omnibus company's shares.

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Directors' Reports, etc.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.—Fin. div. of 3½%, actual, is recommended, makg. 6% for year.

SEAHOUSES AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Gross pft. for past year, £465; net pft., £46. Debit blce., after deductg. year's pft., £385.

DUBILIER CONDENSER CO. (1925), LTD.—Directors regret that pfts. do not permit of paymt. of half-yearly div. on 7½% cum. pref. shs. due May 31 next.

SIMMS MOTOR UNITS, LTD.—Net pft. for 1929, £44 651, agst. £42 946. Fin. div. 5%, makg. 10% for year. To gen. res. £12 500; to staff benevolt. fund, £1 000. Fwd. £27 958, agst. £27 141.

PHILIPS' GLOWLAMPWORKS, LTD.—Div. on ord. shs. 21% and on pfd. shs. 9% (same as last year). Div. on new ord. shs., issued on Oct. 30, 1929, 5¼% and on new pfd. shs, issued on same date, 2¼%.

PHILIPS' INCANDESCENT LAMP WORKS HOLDING CO., EINDHOVEN.—An issue has been placed privately of 400 000 units representing ord. shs. of this company at £3 7s. 3d. a unit. On the basis of the present div. of 21%, the yield is over £5 3s.%.

ROTHESAY TRAMWAYS CO., LTD.—Receipts for 1929, £16 622, agst. £18 914. Pft., £2 461, agst. £4 513. To depreciatn. £2 000 agst. £4 022. Div. on 5% pref. absorbed £500 (same). Fwd. £1 807, agst. £1 846.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly div. of 50 cents p. sh. on ord. shs. will be payable on June 2. London agents: Canadian and General Finance Co., Ltd., 3, London Wall Bdgs., London, E.C.2.

CONSTANTINOPLE TELEPHONE CO.—Int. of 3½% (3s. 6d. p. sh.), less Turkish tax of 11%, is to be paid to shhldrs. Int. to hldrs. of coupon No. 6 attached to sh. certificates to bearer is also payable at Ottoman Bank, 123, Old Broad Street, London, E.C.2.

CRAIGPARK ELECTRIC CABLE CO., LTD.—Pft. for year ended March 31, 1930, £22 526, plus £1 200 brt. in. To depreciatn., £3 500; to res., £10 000. After paying pref. divs. to March, 1930, div. of 10% on ord. shs. for year is recommended. Fwd., £3 626. Works have been fully employed throughout year.

ELECTRICITY DISTRIBUTION OF NORTH WALES AND DISTRICT, LTD.—After providg. £7 563, agst. £5 693, for deb. int., and placing £7 113, agst. £5 419, to depreciatn. res., net pft. for 1929 was £9 113, agst. £4 259. Pref. div. for year required £10 786, wh. necessitates reductn. in carry-fwd. from £2 310 to £637. Rev. from sales of energy, £41 099, represents increase of 49%.

NATIONAL ELECTRIC CONSTRUCTION CO., LTD.—Pft. for 1929, £30 316, agst. £23 466. After deductg. deb. int., sinkg. fund premium, depreciatn. and special provision agst. sundry debtors, blce. is £17 850, agst. £17 949. To gen. res., £10 000, agst. £2 200. Div. 10% and bonus 2½%, less tax (agst. 10%). Fwd. £5 221, agst. £5 605. Directors have placed further £7 000 to special res. in respect of debt due by subsidiary company.

FERRANTI, LTD.—Circular has been issued to shhldrs., giving details of scheme to increase authorised cap. from £300 000 to £900 000. The present pref. shs. are to be converted so as to become 200 000 7% cum. 1st pref. shs., and with 300 000 7% cum. pref. shs. now to be created will form one class of 500 000 7% cum £1 1st pref. shs., and ord. shs. will be divided into two of 10s. each, forming, with 600 000 10s. ord. shs. to be created, one class of 800 000 10s. ord. shs.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Rpt. for year to March 31, 1930, states that three qrtly. intm. divs. of 15s.% on ord. and £1 10s.% on pfd. and fin. div. for year amtg. to £1 10s.% on ord., £1 10s.% on pfd. and £1 10s.% on dfd. stks. have been paid. These, with £52 500 for income-tax, absorbed £262 500, being rent paid by Western Union Telegraph Co. for year, equal to 3¾% on ord., 6% on pfd. and 1½% on dfd. Blce. at credit of rev. acct. (£65 625) is available for paymt. of divs. for qtr. to March 31, 1930.

NORTH WALES POWER CO., LTD.—Rev. from sales of energy in 1929, £208 464, agst. £180 416; tradg. pft. £147 115, agst. £76 635, int. £5 628 agst. £15 160, makg. total pft. £152 743, agst. £91 792. After placing £5 000 to renewals fund, and paymt. of int. charges, trustees' fees, etc., blce. was £30 262. To depreciatn. £14 992. Fwd. £15 270. By means of reorganisatn. scheme, new money was provided to extent of £729 588 for redemptn. of "B" debs., and for working cap., and also for purchase from Aluminium Corporation of their hydro-electric generatg. plant at Dolgarrog, which was effected as at July 1, 1929.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Gross rev. for 1929 £1 058 629, agst. £955 129. Pft., after provisn. for depreciatn., £461 121, agst. £401 803, plus £41 130 brt. in. After paying deb. int., pref. div., intm. ord. div. and stamp duty on additional cap., and makg. contributns. to sinkg. fund on 2nd mtge. debs. and res. for taxation, res. fund £75 000, premises acct. £25 000, insurance fund £3 000, and retiring gratuity fund £10 000, it is proposed to pay div. on ord. shs. for second half-year of 7% actual, less tax, making 12% for year, plus bonus of 5d. p. sh. To res. for distributn. to domestic consumers, £28 188; fwd., £41 621.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—Total rev. for 1929, £277 066, agst. £272 477. After provisn. for generatn. and distributn. costs, rents, rates, taxes, etc., blce. to net rev. acct. was £158 361, agst. £170 382, makg., w. £6 267 brt. in. ,a total of £164 628. After deductg. deb. int., allocatns. to leasehold and special redemptn. funds and int. to res. for depreciatn. (£35 000) res. for taxatn. (£3 000), and gen. res. (£15 000), blce. is £103 678. Intm. and fin. divs. on 4½% and 6% pref. shs. and intm. div. on ord. shs. have been paid. Fin. div. of 9% on ord. shs., less tax, recommended, makg., w. intm. div., 15% for year. Fwd. £7 798.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Net rev for 1929, £99 521, after charging £27 142 for depreciatn. and renewals, plus £34 425 brt. in. Fin. div. of 3½% on pref. shs., less tax, and fin. div. of 8%, tax free, on ord. shs. recommended. To res. for depreciatn., £12 500, increasing fund to £78 685. The Bombay and Madras Telephone companies are still makg. progress. The Hongkong Telephone Co. has paid divs. amtg. to 8%, which has enabled the China and Japan Telephone and Electric Co. to declare div. of 15%, tax free. The Bengal Telephone Corporation paid a div. of 8% last year, agst. 7½% for previous year. The automatic system hs. bn. put into operatn. at Singapore.

Company Meetings.

CABLE, TELEPHONE AND GENERAL TRUST, LTD.—At an extraordinary general meeting on April 30, resolutions were passed increasing the capital to £1 100 000 by the creation of 390 000 £1 shares, of which 250 000 are to be preference shares, 5 000 "A" preference and 135 000 ordinary shares; raising the rate of annual dividend on the preference shares from 6% cumulative to 7% cumulative; changing the title of the "A" preference shares to "preferred ordinary shares"; and adopting new articles of association.

BABCOCK AND WILCOX, LTD.—At the meeting on Monday, Sir John Dewrance, chairman, said that once again the company was able to show a satisfactory year's working. The reserve accounts, carry-forward and dividend equalisation fund represented 30% of the total capital. There was a reduction in the net profit for 1929, but it was a matter for congratulation that their earnings had been so well maintained during the last four or five years. There was an exceptional accumulation of uncompleted orders, and in this connection he should explain that the character of the business was changing. Previously the great bulk of the business was in standard boilers and their equipment. This now represented a small proportion of the turnover, and the bulk of their orders was for boilers built to special design. As a result, the volume of orders secured was in excess of the normal, and certain delays occured which prevented the work being executed. The report was adopted.

EINSTEIN'S ELECTRO CHEMICAL PROCESS, LTD.—Major G. M. Kindersley, M.P., presiding at the meeting last week, said the profit and loss account showed a debit of £21 554. The period up to December 31, 1929, covered by these accounts, was one of construction and development, and the company was not trading. Over half this sum was in respect of development charges which would be largely non-recurring now that the factories were completed. In regard to the patent situation, the strength of the position had, in their opinion, been substantially improved since the inception of the company as a result of further applications which had been lodged during these past months. They were now treating thousands of articles weekly for motor manufacturers, locksmiths, makers of gramophones and optical apparatus, and others. This treatment lay chiefly in rendering the articles corrosion proof by suitable preparation and finishing with a coating of chromium of a special nature and excellent appearance. It was hoped that the Slough works would arrive at a profit-making stage before the end of 1930.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—At the meeting on April 30, Sir Frederick Hall, who presided in the unavoidable absence of Sir Harry Renwick, said the

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total receipts were £267 552 compared with £258 367 in 1928. The units sold showed an increase of 3 237 821, an increase of over 16 %. The balance carried to net revenue account was £124 380, compared with £115 385. Adding the balance brought from revenue account and the amount brought forward from 1928, there was a total on the credit side of this account amounting to £219 777. The dividend on the ordinary shares was the same as last year—namely, 8½%. This represented the standard dividend under the No. 1 Act. Progress was not only well maintained, but a satisfactory advance had been made in the increase in kilowatts applied for and the units sold. The progress indicated by the business done in the first three months of the current year showed an increase on the corresponding period of last year. Their shareholders were able to look forward to the future with confidence. The report and accounts were adopted.

JOHNSON AND PHILLIPS, LTD.—Mr. John Macgregor, presiding at the meeting on Monday, said the profits for the year amounted to £155 191, compared with £106 416 for the previous year. He had no doubt that the shareholders would regard the result as being highly satisfactory. The net profit was £102 514. The reason they were not recommending a higher dividend for the year than 10% was that they had in hand a record volume of business, and to carry out those contracts a substantial liquid capital was required. They had decided to increase the carry forward to £123 417. The substantial increase in profits was due partially to an increased turnover, but principally to the great economies effected in the cost of production. Competition had remained very acute throughout 1929, and productive capacity had kept well ahead of demand, so that efficiency in manufacture, and active and enterprising salesmanship had been necessary to secure a reasonable share of business at an adequate profit. They were at present commencing work on an important contract for the Central Electricity Board, the erection of " grid " lines in mid-east England. During the year they had again carried out a large amount of railway electrification work, and the directors looked forward to considerable expansion in that direction. They were also busily engaged in telephone work. The report and accounts were adopted.

ASSOCIATED ELECTRICAL INDUSTRIES, LTD.—Sir Felix J. C. Pole, residing at the meeting on April 30, said the issued capital consisted of 3 498 900 £1 ordinary shares and 616 525 £1 preference shares, all fully paid. The general reserve fund had been increased from £575 000 to £800 000 by a transfer to that account of the premium on share account, £209 726, and a transfer from profit and loss account of £15 273. Profit for the year, including dividends from subsidiary companies and after deducting all expenses and charges other than debenture interest and depreciation, amounted to £365 961, against £258 772 last year, plus £101 851 brought forward. After providing for interest on debenture stock, depreciation and the amount transferred to special reserve, profits available for distribution amounted to £348 389. The board recommended dividends of 8% on the preference shares and 6% on the ordinary shares, both less tax, leaving £109 241 to carry forward. Notwithstanding the large orders placed by the Central Electricity Board, there was still an excess of manufacturing capacity, and there was a wide field for co-operative effort within the industry. The steps taken to co-ordinate the activities of the companies embraced in Associated Electrical Industries had already been fruitful of some results, and they looked hopefully to the future. An important development during the year was the decision to utilise the Edison Swan Electric Co. as the merchandising section of the group, and the business in wiring supplies, fittings, and radio apparatus formerly handled by the merchandising sales department of the British Thomson-Houston Co. had been taken over by the Edison Swan Electric Co. This would be followed in the course of the next few weeks by the transfer to the Edison Swan Electric Co. of the Metropolitan-Vickers merchandising business. The chairman then referred to large units completed or under construction by the Metropolitan-Vickers Co., including turbo-generators for Sydney Council, the Victorian Government, Liverpool Corporation, the Uruguayan Government, the London Power Co., Manchester Corporation and the Ellerman steamships and electric locomotives supplied for numerous railways. They had recently completed negotiations with the International General Electric Co. for an exchange of patent rights and manufacturing information between all the companies of the Associated Electrical Industries and the General Electric Co. of America. The report and accounts were adopted.

NEW COMPANIES.

FITZPATRICKS, LTD.—Cap., £1 000. Merchants, dealers in metals, machinery, plant, electrical goods, etc. Reg. Office: Junction Mill, Burnley.

WESTERN ENAMELLED IRONWORKS, LTD.—Cap., £100. Manufacturers of refrigerators, electric and gas cookers, etc. Reg. Office: Eastgate House, Eastgate Street, Gloucester.

LONG EATON CABLE CO., LTD.—Cap., £3 000. Manufacturers of, and dealers in, electric and other cables, bell and fuse wire, flexible cords, insulating materisls, etc. Solicitors: Flint, Marsden and Bishop, Derby.

VERART, LTD.—Cap., £1 000. Manufacturers of, and dealers in, glass, porcelain, glassware, lampshades, glass and metal fittings, electricians, etc. Solicitor: J. E. M. Crowther, 23, Abingdon Street, Westminster, S.W.1.

H. FITZPATRICK, LTD.—Cap., £25 000. To acquire business carried on at Junction Mill, Burnley, as H. Fitzpatrick, and to carry on the business of merchants and dealers in metals, machinery, plant, electrical goods, wireless instruments, etc.

MAMCO, LTD.—Cap., £100. Agents for the purchase or sale of British, Colonial or foreign goods; manufacturers of, and dealers in, electrical goods, wireless apparatus, etc. A director: W. B. Heskins, 26, Carlton Road, Walthamstow, London, E.17.

PECONA, LTD.—Cap., £500. To acquire business of manufacturer and merchant now carried on by B. Nodin, of 8, Camp Street, Manchester, as " The Decone Co.," and to carry on business of novelty manufacturers, radio engineers, electrical suppliers, etc.

BRITISH SANAFONE SYNDICATE, LTD.—Cap., £67 500. To adopt an agreement with D. S. S. Steuart, to acquire the trade mark " Sanafone " No. 480 981, of August 13, 1928, to acquire licences of any patents relating to telephonic, telegraphic or wireless apparatus, etc. Solicitors: Ashurst Morris, Crisp and Co., 17, Throgmorton Avenue, London, E.C. (Public co.)

SIR W. G. ARMSTRONG WHITWORTH AND CO. (IRONFOUNDERS), LTD.—Cap., £130 000. To acquire from Armstrong Whitworth Securities Co., Ltd., business of ironfounders carried on at the Close Works, Gateshead, and to carry on said business and that of engineers, manufacturers of, and dealers in, railway carriages, tramcars, etc., electricians, electrical engineers, suppliers of electricity, etc. Solicitors: Roney and Co., 42, New Broad Street, London, E.C.2.

COMING EVENTS.

Friday, May 9 (To-day).

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Savoy Place, Victoria Embankment, London. Annual general meeting. Paper by Messrs. J. W. Moffatt and J. C. Emerson on " The Rotary Automatic Telephone System." 6.15 *p.m.*

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington, London, S.W. Ordinary meeting. 5 *p.m.*

Saturday, May 10.

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Visit to the Brookman's Park Regional Station of the British Broadcasting Corporation. 2.30 *p.m.*

Monday, May 12.

ELECTRICAL CONTRACTORS' ASSOCIATION (LIVERPOOL BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (HASTINGS BRANCH).—Lewcock's Restaurant. Ordinary meeting.

Tuesday, May 13.

ELECTRICAL CONTRACTORS' ASSOCIATION (BOURNEMOUTH BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (LEICESTER BRANCH).—Corridor Chambers. Ordinary meeting. 2.30 *p.m.*

INSTITUTION OF CIVIL ENGINEERS.—Great George Street, London, S.W.1. Annual general meeting. 6 *p.m.*

Wednesday, May 14.

ELECTRICAL CONTRACTORS' ASSOCIATION (SHEFFIELD BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (EASTBOURNE BRANCH).—Ordinary meeting.

POLYTECHNIC ELECTRICAL ENGINEERING DEPARTMENT.—307-311, Regent Street, London. Lecture II (course of six lectures) by Mr. W. H. Date on " Thermionic Valves." 6.30 *p.m.*

ROYAL SOCIETY.—Conversazione, Burlington House, London. 8.30 *p.m.*

Thursday, May 15.

INSTITUTION OF ELECTRICAL ENGINEERS (HAMPSHIRE SUB-CENTRE).—Southampton. Summer meeting.

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment, London. Annual general meeting. 6 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—Fifth Annual Conference. Park Lane Hotel, Piccadilly, London. Luncheon, 1 *p.m.*; annual general meeting, 11.15 *a.m.*; visit to the Home Office Industrial Museum, Horseferry Road, S.W., 3.30 *p.m.*; reception by the London Executive Committee, at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, 8 *p.m.* to 10.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (IRISH CENTRE).—Physical Laboratory Trinity College, Dublin. Annual general meeting. 7.45 *p.m.*

Friday, May 16.

ELECTRICAL ASSOCIATION FOR WOMEN.—Fifth Annual Conference. Visit to Messrs. J. Lyons and Co.'s Factory at Greenford, 10.30 *a.m.*; ball at the Park Lane Hotel, Piccadilly, London, 9 *p.m.* to 2 *a.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH CENTRE).—Technical College, Dundee. Twenty-first Kelvin Lecture by Mr. R. H. Fowler, F.R.S., on " Some Recent Advances in the Electron Theory of Metals." 7.30 *p.m.*

Saturday, May 17th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—Porthcawl. Annual meeting.

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Visit to the Brookmans Park Regional Station of the British Broadcasting Corporation. 2.30 *p.m.*

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BRIGGS, George W., 18, Central Arcade, Great Yarmouth, wireless dealer. £16 10s. 5d. February 18.

EDWARDS, Mr. G. J., 236, Central Market, Cardiff, wireless dealer. £10 4s. 10d. March 14.

HILL, Mr. T. W., 15, Bruce Road, Sheffield, wireless dealer. £17 6s. March 6.

KAY, W., AND SON, Andsell Road, Blackpool, electrical engineers. £12 9s. 7d. March 10.

KELTY, Mr. A. G., 48, Huddersfield Road, Oldham, electrical contractor. £22 15s. 3d. March 22.

LANSDOWN, Mr. G., 20, Market Parade, Chalfont St. Peter, electrical contractor. £10 8s. March 15.

MORRIS, A. Samuel, 3, North Park Terrace, Bradford, wireless dealer. £19 1s. 2d. March 14.

PHELAN, Mr. H., 6, Lansdown Street, Coventry. £10 4s. 6d. March 5.

SAVAGE BROS., 100, High Street, Putney, electrical engineers. £17 2s. March 10.

RAYBOULD, Walter James, 54, Clerkenwell Road, E.C., wireless factor. £21 3s. 11d. February 13.

THOMPSON, Ryland George, 819, Rochdale Road, Queen's Park, Manchester, wireless supplier. £14 15s. 3d. March 18.

WHYGAR ELECTRICAL CO., 838, London Road, Thornton Heath, engineers, £40 5s. 3d. March 18.

London Gazette, etc.

Company Winding-up Voluntarily.

ELECTRODRIVES, LTD. By reason of its liabilities, April 29. D. R. Evans, 29-30, King Street, Cheapside, London, E.C.2, chartered accountant, appointed as liquidator.

Bankruptcy Information.

BAINTON, Joseph, 86, Wheelock Street, Middlewich, Cheshire, electrician and radio engineer. Receiving order, May 1. Debtor's petition. First meeting, May 15, 11.30 a.m., Official Receiver's Office, 12, Lonsdale Street, Stoke-upon-Trent. Public examination, June 5, 11 a.m., Petty Sessional Court House, Edleston Road, Crewe.

WILEMAN, Norman Arthur, trading as A. WILEMAN AND CO., 141, Commercial Street, Maesteg, Glamorgan, electrical engineer and contractor. Receiving order, April 29. Debtor's petition.

Notice of Dividend.

DEAN, Joseph Holcombe, electrician, 4, Gogerddan Place, Aberystwyth. Supplemental dividend, 2s. per £, payable May 9, 4, Queen Street, Carmarthen.

Partnerships Dissolved.

ANDERSON ANGELL AND CO. (Frank ANGELL and Henry Baron ANGELL), electrical engineers, 8 and 8a, Paul Street, E.C.2, by mutual consent as from April 11, 1930. Debts received and paid by H. B. Angel, who continues the business.

"CHESTERS," (Albert Ernest CHESTERS and Thomas Henry CHESTERS), electrical engineers, 139, Victoria Road, New Brighton Cheshire, by mutual consent as from April 30, 1930. Debts received and paid by T. H. Chesters, who continues the business.

POWERPLUS ELECTRIC PLANT COMPANY (Frank ANGELL, Henry Baron ANGELL and Edgar DUVAL), electrical engineers, 8, Paul Street, Finsbury, London, by mutual consent as from April 11, 1930. Debts received and paid by H. B. Angell and E. Duval, who continue the business.

Bankruptcy Proceedings.

COX, Bernard Luther, Holmes Yard, Shirland Street, Chesterfield, electrical engineer. The first meeting of the creditors herein was held on May 2 at the Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. According to the statement of affairs submitted by the debtor there were liabilities amounting to £1 227 and a deficiency of £857. Debtor attributed his failure to an unprofitable agency in batteries, bad trade, and heavy trade expenses. It appeared that the debtor commenced business in February, 1927, as an electrician at the above address with a capital of £50. Debtor obtained contracts for the wiring of Council houses and other local buildings. The debtor stated that about July, 1928, he was appointed agent for a firm of battery manufacturers. Owing to this agency, the debtor neglected his own business. Books of account showed that for the year ending March 31, 1928, there was a net profit of £403, but for the following year a net loss of £108 had been incurred. A resolution was passed for the appointment of Mr. Lewis Barnes, chartered accountant, of Chesterfield as trustee, with a committee of inspection.

HOEY, Frank Walter Charles, wireless and electrical dealer, late of 29, Sicilian Avenue, London, W.C. This debtor attended in the London Bankruptcy Court, on May 1, for his public examination. His statement of affairs shows liabilities £5 063, of which £5 049 is returned as due to 135 unsecured creditors, and his assets are valued at a net sum of £40. It appeared that in 1912 the debtor joined the Army, in which he served until October 1919. In March, 1926, he bought for £1 150 the goodwill stock, etc., of the business of a dealer in wireless and electrical accessories carried on at the above address. He also acquired the lease of seven years of the premises. Of the purchase price he borrowed £200. He afterwards traded in partnership with another person who brought in £50 capital, and they conducted the business under the style of Scientific Appliances. In April, 1927, however, his partner retired receiving £280 in respect of his interest in the business. The debtor continued the trading alone until last December, when he found that he was unable to obtain payment of a debt of £2 369 in respect of goods supplied during November and December. He then sold his business for £400 which he paid into his banking accounts in reduction of overdrafts. The debtor attributed his insolvency to his inability to obtain payment of the book debt mentioned, to ill-health, and to other causes. The examination was adjourned until June 19.

MELVILLE, Ernest James, lately trading as JAMES MELVILLE AND CO., Sutherland House, Forest Road, lately Dudley Chambers, Angel Row, Nottingham, electrical contractor. The public examination of this debtor was held on May 1 at Nottingham. According to the statement of affairs filed there was a deficiency of £1 576, and the debtor attributed his position to lack of capital, heavy extraneous trade expenses, and bad debts. It seemed that at the end of 1923 a balance sheet prepared showed the debtor to be in financial difficulties. He continued trading, and in May, 1929, took into his employment a person who contributed £200 capital. The business, however, was unsuccessful, and at a meeting of creditors held in February last an offer of 4s. in the £ was not accepted. The debtor, it was stated, commenced trading with a capital of £20 in 1920. The hearing was concluded.

SHEPHERD, Cyril, 69, Micklegate, previously 73, Acomb Road, formerly Coffee Yard, Stonegate, York, radio engineer and dealer in wireless accessories. The statutory first meeting of creditors was held on May 1 at the Official Receiver's Offices, Duncombe Place, York. According to the statement of affairs submitted there were liabilities amounting to £821 against assets estimated to produce £280, a deficiency of £541. Debtor attributed his failure to bad trade, during the past two years, to keen competition, and to lack of capital. The case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate.

METAL AND CHEMICAL PRICES.

TUESDAY, May 6.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£58 10 0	—	10s. 0d.
Electro Wirebars	,,	£63 0 0	—	£3 0 0
H.C. Wire, basis	per lb.	9 1/16d.	—	—
Sheet	,,	9 1/2d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0 1/16d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	9 1/4d.	—	—
Wire ,,	,,	9 3/8d.	1/16d.	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£18 10 0	—	£1 0s. 0d.
Foreign or Colonial	,,	£17 0 0	—	17s. 6d.
Tin—				
Ingot	per ton	£148 17 6	—	£8 7s. 6d.
Wire, basis	per lb.	2s. 1d.	—	1d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£16 5 0	—	17s. 6d.
Mercury	per bottle	£22 12 6	—	2s. 6d.

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2 1/2d.
Sodium Bichromate—Per lb., 3 1/2d.

Rubber—Para fine, 8 1/16d.; plantation, 1st latex, 7 1/16d.

∴ The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

According to James Forster and Co., the lead market continues to show weakness, prices declining daily and closing at the lowest. The small backwardation at the end of April has disappeared and given place to a contango, which is certainly a more natural position in view of the excess of supplies. The American price remains unchanged at 5.50 cents, but conditions are dull, and any further weakness in London would force a price recession in New York. Closing prices on May 2 were £17 5s. for May and June, £17 6s. 3d. for July, and £17 7s. 6d. for August, a fall of 12s. 6d. per ton on the week.

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THE ELECTRICIAN

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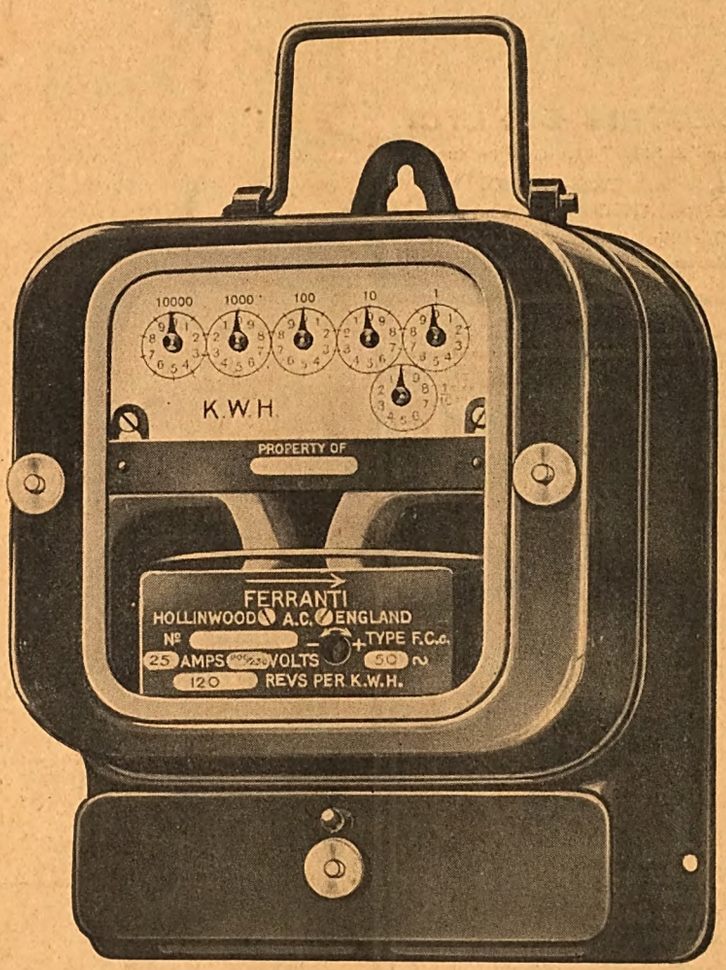

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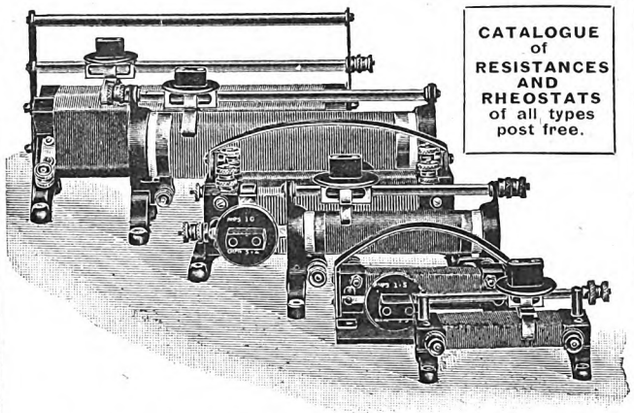

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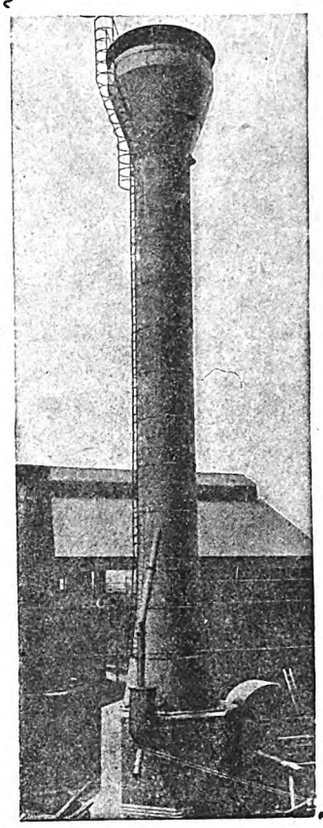

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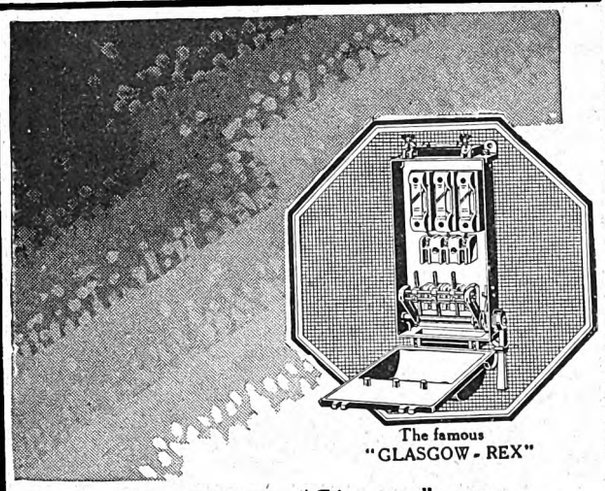

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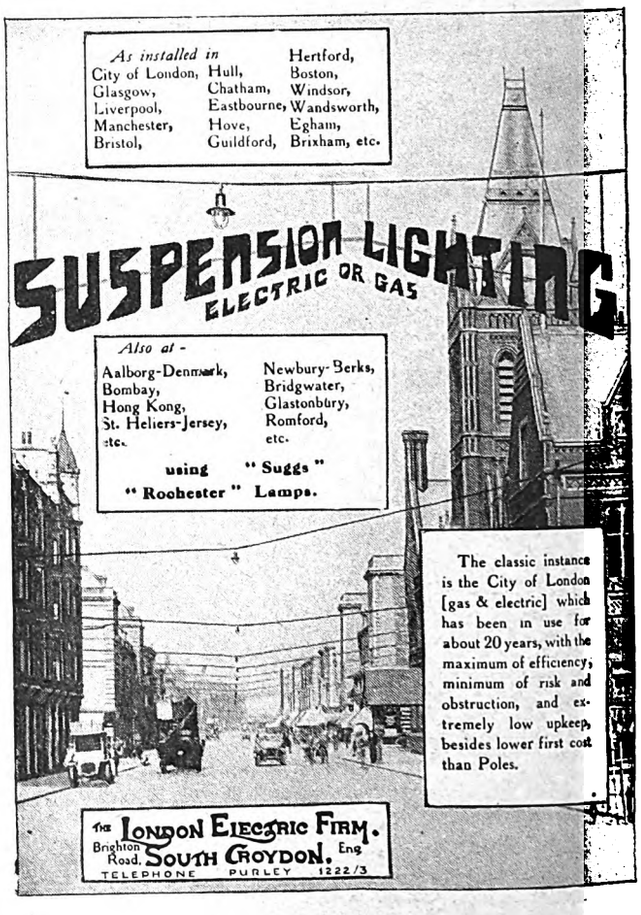

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

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Electrical Manufacturing Progress.

IT was not to be expected, in view of the intensity of the economic crisis in our best overseas markets that exports of electrical manufactures could continue to show a contrary trend to the general run of British exports as they have done in recent months. The Board of Trade returns for April indicate that electrical exports have begun to suffer from the same adverse influences which have been affecting other industries for some time. For the first four months of the year exports of electrical manufactures are still ahead of the figures for the corresponding period of 1929, but unless there is a speedy recovery from the prevailing conditions, manufacturers will have to depend much more on the home market for orders than has been the case during the past fifteen months. Meanwhile imports of electrical goods are still steadily rising.

It is pleasing to turn from contemplation of the intra-Empire and international trade situation to two very important developments in the British electrical manufacturing industry to which we devote a good deal of space this week. First let us mention the opening by Lord Melchett yesterday of the research laboratory which has been established at the new Stourport works of Steatite and Porcelain Products, Ltd. This high tension and mechanical research department is provided with equipment which, it is claimed, can produce voltages in excess of 1 800 000—greater than any other laboratory in the British Empire, though still some way behind what has been achieved in this direction in Germany and the United States. The laboratory has been established with the intention that it shall exchange results with associated undertakings in this country and in Germany; it is also to be at the disposal of the entire electrical industry. The undertaking of which it forms an essential part is a notable enterprise. It is a serious and successful effort to make up the leeway lost by this country in the technical development of electrical insulators. With the friendly co-operation of two German companies which had carried out extensive work in this field, a thoroughly modern and efficient factory is now at work in Great Britain, turning out large quantities of the high tension insulators and bushings required for the grid and a wide variety of low tension porcelain and steatite products. Having an exclusive licence for the British Empire to manufacture under the important patents owned by the German Hermsdorf-Schomburg and Steatit Magnesia Companies, the British undertaking, in association with Imperial Chemical Industries, has secured such a volume of business that works extensions have become necessary, and its future appears assured. British industry has been enriched by a valuable accession to its list of up-to-date factories, and Mr. CHARLES GARLAND and his fellow directors and their associates are entitled to all credit for their enterprise.

The other development to which reference has been made, also relates to high tension transmission of power. On another page we give a description of the complete new range of oil circuit breakers of high rupturing capacity, which has been produced by Ferguson, Pailin, Ltd. In this field also German and American engineers had advanced further than our own. In this country we are just reaching the critical stage which was attained in the United States some time ago, and the need for a more robust type of circuit breakers is becoming increasingly felt. Ferguson, Pailin, having noted the solution of the problem abroad by the installation of exceptionally robust circuit breakers incorporating the three phases in a common cylindrical tank, have adopted a design of this type which has now been proved satisfactory by an extensive series of rupturing tests. The breaking capacity ratings range from 100 000 kVA upwards. Breakers of this type made at Manchester have stood up successfully to exacting short circuit tests under service conditions in America, and there is no room for doubt that a thoroughly efficient British made circuit breaker of high rupturing capacity is now at the disposal of supply engineers in this country and elsewhere.

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Current Topics.

A Lesson from Lewisham.

THERE is ample excuse for the raising of the pæan by the gas industry on its success in securing the verdict of the Lewisham Borough Council's Works Committee as the result of a competition between gas and electricity undertakings in which each had a free hand to carry out experimental installations over two successive miles of roadway. The electricity undertaking favoured standards on the footway. The gas company, on the other hand, profiting by the admitted success of the lighting carried out by the G.E.C. on the Thames Embankment, suspended its lamps centrally above the roadway and by doing so secured a victory which would probably have gone to its rival had the latter been more alive to the definite trend of opinion among road users in favour of central lighting. We may depend upon the wideawake gas industry to take full advantage of this success. Much too little attention is paid to the subject of adequate street lighting and there is no doubt that bad lighting is a frequent cause of accidents.

Jubilee Supplement.

NEXT week's issue of THE ELECTRICIAN, in common with those of the other weekly journals belonging to the Bouverie House group, will include a special illustrated Jubilee Section of 40 pages descriptive of the founding and development during half a century of steady progress of the firm of Benn Brothers, Ltd. This round dozen of trade and technical newspapers has become a powerful force in the development of British industry and trade, and we feel certain that the story of fifty years of achievement from the humblest beginnings to the substantial success of the present day—an advance which is still far from having lost its impetus—will be read with more than ordinary interest. Among the contributors to the ordinary issue of THE ELECTRICIAN next week will be Colonel Sir THOMAS F. PURVES and Colonel CROMPTON.

Rating Burden on Power Stations.

AN instance of the very burdens placed on power stations by the new rating assessments levied under the Rating and Valuation Act of 1925 was given by Lord ERSKINE, who deputised for Sir HARRY RENWICK at the ordinary general meeting of the Bournemouth and Poole Electric Supply Company last week. This Company's liability for local rates has been raised from £19 174 to £46 797, an increase of 144 per cent. The chairman's speech rightly pointed out that this very heavy increase really amounts to payment by the company of a surtax on all units sold to consumers. There are extraordinary and quite incomprehensible variations in the fixing of assessments by different local authorities some of the increases being as high as 700 per cent. Concurrently pressure is brought to bear on supply undertakings to reduce their charges. We agree that the subject calls for thorough overhauling.

Mr. Beauchamp's New Post.

As the South West England and South Wales Grid Scheme has not yet been finally adopted by the Central Electricity Board—probably this will happen very shortly—it would be premature for the Board to announce appointments to posts which as yet have no official existence. It is, however, no longer a secret that Mr. J. W. BEAUCHAMP, the engineer and general manager of the South Wales Power Company, has accepted an important position under the Central Electricity Board in connection with the above-mentioned scheme. May we add our congratulations to those of Mr. W. NORTH LEWIS, the chairman of the South Wales Power Company, who referred to the matter in his speech at the ordinary general meeting of the company last week.

Muscle Shoals.

EVER since the Armistice there has been heated discussion as to what should be done with the great Muscle Shoals development on the Tennessee river which was undertaken during the war by the American Government in connection with the manufacture of nitrates for munitions. Seven years ago Mr. HENRY FORD offered to lease Muscle Shoals but personal attacks on Mr. FORD in the Senate after the House of Representatives had ratified the proposed base caused him to withdraw his offer. Now a Bill for Government operations has been passed by the Senate but disapproved by the Military Affairs Committee of the House of Representatives which is to draft an alternative measure directing the President to lease Muscle Shoals for private operation on properly safeguarded terms. In view of the prejudice which has been aroused and the strength of the two opposing groups which favour government operation and private operation, respectively, it does not seem likely that anything definite will be done. Meanwhile improvement of the Tennessee Valley, which is of vital importance to a large area of the South, is held up while politicians continue their wrangling. Muscle Shoals is in fact an American counterpart of the Charing Cross bridge.

Telephone Contrasts.

THE two chief topics in the telephone world during the last week show a remarkable divergence. One has been the continual expansion of the Post Office's wireless telephone service. Australians can now ring up the mainland of Europe, and the purser of an Atlantic liner can talk to a friend in Buenos Aires. The other has been the question of supervision in telephone exchanges. According to complaints at the Belfast conference of the Union of Post Office Workers, exchange supervisors are often excessively active—sometimes almost to the extent of reducing operators to tears. If this occurs it is certainly very unfortunate for all concerned, yet we hesitate to say that telephone supervision is overdone. At all events it seems a serious pity that, with a telephone service which engineering skill has made world-wide, the Englishman cannot enjoy a certain reliability at home. It is not unusual for a private subscriber in the London area to have one call out of every three a " wrong number." This is bad enough, but when wrong numbers are obtained from the modern public telephone matters are even worse. Button "A" has been obediently pressed, and the twopence is beyond recall—unless, indeed, one waits patiently for a chat with the " exacting " supervisor. One has heard of fortunate individuals who, on pressing Button " B " more in curiosity than in expectation have been rewarded with a shower of coppers, but these are rare if not legendary incidents. The call box whale does not relish giving imitations of the sea beast which disgorged Jonah.

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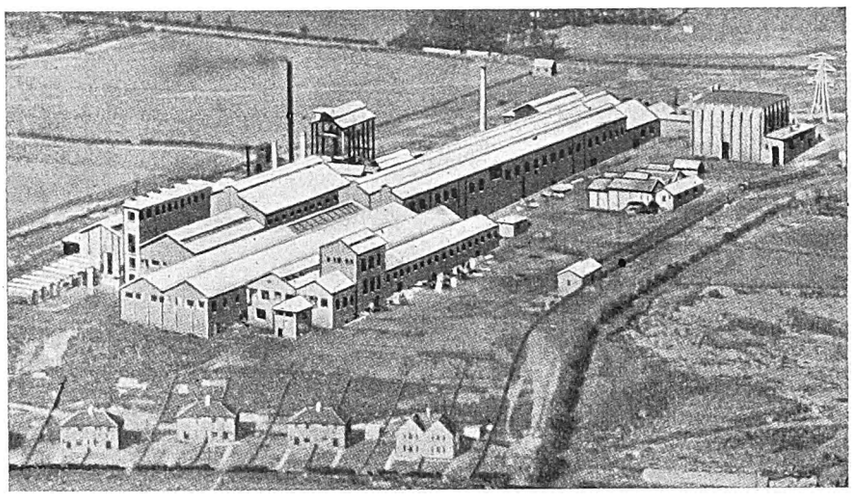
STEATITE AND PORCELAIN INSULATORS.

New British Industry Established at Stourport—Works Already Employing 650 Hands—Official Opening of Research Laboratory Yesterday.

YESTERDAY the new research laboratory of Steatite and Porcelain Products, Ltd., at the firm's works, Stourport, was officially opened by Lord Melchett, in the presence of more than 300 guests. The factory at Stourport has been established by the company, in association with Imperial Chemical Industries, Ltd., for the manufacture of electrical, porcelain and steatite goods, particularly the high tension insulators and bushings required in connection with the national electricity scheme.

On Monday, representatives of the Press were given an opportunity of inspecting the works and laboratory which stand on an island site of 70 acres, bounded by roads on the bank of the Severn at the head of navigation by large barges. It has its own railway station and sidings and a housing estate has been arranged for 300 dwellings, of which 142 are already occupied. The laboratory, which is to be at the disposal of the entire electrical industry, is claimed to be capable of producing higher voltages than any in the British Empire.



Aerial view of the new Stourport factory of Steatite and Porcelain Products, Ltd. The research laboratory can be seen at the top right hand corner.

Speaking at a luncheon in the works on Monday, Mr. Charles Garland, managing director of Steatite and Porcelain Products, Ltd., said that this was an attempt to establish an entirely new industry in Great Britain. The making of porcelain in this country had previously been mainly in the hands of people manufacturing tea cups, baths, cooking vessels and so on. His firm were tackling the matter from the electrical and engineering ends, which were much more important. They had embarked upon this venture with the aid of the knowledge that had been acquired by the Hermsdorf-Schomburg and Steatit-Magnesia Companies, with whom, in association with Imperial Chemical Industries and Falk, Stadelmann and Co., Ltd., it had been arranged to establish an up-to-date factory in Great Britain for the manufacture of electrical, porcelain and steatite insulators. The company held an exclusive licence for the British Empire covering the many valuable patents owned by the companies named, in addition to a reciprocal arrangement for exchange of the results of research work.

In America it was the practice to go round transmission lines every two or three years, test the insulators and replace those broken or defective. In Great Britain we looked for greater dependability.

There was no other factory of the same kind in the Empire, and a notable feature was the smooth flow of products from one end of the factory to the other.

In this country we had lagged very seriously behind in electrical development, as any traveller who looked out of the windows of a train could notice. The grid schemes were an effort to make up leeway. The company had business on hand for every one of the Central Electricity Board's schemes that had been promulgated since the company was formed. They had provided a new type of electrical insulator in steatite which was stronger and better than anything made before. The works which were now employing nearly 700 people would ultimately give work to 1 200 or 1 500. A number of the employees were miners from Wales and Durham, with an average of about seven children apiece.

* * *

The site selected at Stourport has a number of advantages. It is close to the fireclay deposits at Stourbridge and to coal pits supplying coal of the required quality. It is in easy communication by waterway and rail with Birmingham, Manchester, Gloucester and Avonmouth, and the clear atmosphere is well suited to the manufacture of high grade porcelain. The Shropshire, Worcestershire and Staffordshire Power Co. showed commendable enterprise in earmarking the best industrial sites in the area when their new power station was established at Stourport, and it was one of these sites that was acquired for the new works. The first unit of the factory covers a floor area of more than four acres, and it has been designed with a view to eventual duplication of its output. There is room for a second factory on the other side of the railway siding.

The company was originally formed in 1907 to manufacture magnesia rings and nozzles for incandescent gas mantles, and subsequently added the production of refractory insulating materials of the kind required for electrical heaters and cookers. Extensions to the works at Earlsfield were made in 1914 and 1920, and the Nottingham business of W. A. Ward and Co. was acquired in 1917. In 1928 the decision was made to extend the scope of the business to cover the whole range of ceramic electrical insulating materials.

The raw materials used include china clay, plastic kaolin (ball clay), quartz and felspar, of which the chief supplies come from Cornwall and Dorset. Steatite of the composition required for electrical insulators is only obtainable in Bavaria.

Analysis are made of the china clay at several stages as it passes from the trucks to the storage bins, from the bins to the breaking machines and thence to the 22 concrete silos each holding 30 to 40 tons. Effective precautions are incorporated in the layout to prevent any raw materials other than those which have been carefully weighed to become accidentally mixed with the body. The automatic weighing machines weigh up to 2 tons of mixture at a time with an accuracy of 0·01 per cent. There is an absolute mechanical control of the body composition, each charge being thoroughly tested; standard test pieces are also made from each batch of raw material and their electrical and mechanical properties determined.

Passing through the porcelain lined grinding mills and mixing vats and the filter presses, the material, now in the form of cakes of uniform mixture and known water content goes to the storage cellars, where it is kept for some time under conditions of constant humidity to increase its plasticity. It then passes through kneading machines before being moulded into the final insulator shapes. The exactness of the shape is of the greatest importance in the case of suspension insulators. The insulators are afterwards placed in drying stoves, glazed with a highly refractory felspathic glaze and then fired, enclosed in fireclay saggars, made in the factory, in a producer gas-fired tunnel kiln 320 ft. long. There are also two round kilns for large pieces up to 8 ft. high and 3 ft. 6 in. diameter.

When removed from the kilns the h.t. insulators are carefully examined for mechanical or glazing faults. They are then listed for 15 minutes at their flashover voltage by the routine testing plant. There are four testing tables at which tests with normal frequency current up to 150 kV against earth or 300 kV between insulated poles can be carried out. One of these is of special construction for testing exceptionally large pieces such as bushings for voltages up to 220 kV. There is also equipment for continuous h.f. and impulse tests and a special machine for routine mechanical tests. The impulse and h.f. tests, although not usually specified as routine tests in this country are generally used on the Continent and in

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America and are specified in the testing regulations of the A.I.E.E. The maximum peak voltage obtainable from these two equipments is approximately 300 kV in each case. For higher voltages plant is available in the h.t. laboratory. By the use of a rotating table continuous tests can be carried out so that several thousand pieces a day can be passed. The testing transformers (of 300 kV) are fed normally from a single-phase generator, the driving motor being connected to the factory mains. The primary voltage of the transformers was chosen so that they could be connected directly to the mains in case of a breakdown of the motor generator. Each testing field is closed by doors which cannot be opened while an electrical connection exists between a testing transformer and that particular field.

In the impulse plant two high-voltage condensers are charged by an unsmoothed unidirectional current which is obtained from a mechanical rectifier fed from the high-tension side of one of the transformers. For the high frequency plant a special bank of oil-filled glass condensers is used which is charged directly with alternating current. The discharge in this case takes place through a quenched spark gap and the primary of a Tesla transformer both of which are connected in series across the condenser bank. The quenched spark gap is so built that the voltage can be easily regulated, and so designed that it can be used for continuous tests. A very simple switching operation is required to change immediately from impulse tests to high-frequency tests.

The 50-ton tensile testing machine is placed in such a manner that should it be necessary to carry out simultaneous electrical and mechanical tests on this machine a connection can quickly be made to one of the high-tension busbars. However, to avoid the complicated safety devices which would be required no permanent connection is made to this machine.

Testing High Voltage Bushings.

For temperature cycle tests two immersion tanks (see picture on page 607) are available in which a large number of insulators can be simultaneously put through the temperature cycle test and in which exceptionally large porcelains such as high-voltage bushings, etc., can easily be dealt with.

Each piece of steel and malleable iron used to make up the assembled insulator or insulator string-caps, pins, etc.—is tested to 50 per cent. above its working load. The porcelain is mounted—in the case of suspension insulators with a patent spring ring fixing—with a pin and malleable iron cap.

With the old type of cemented insulator it was found that the unavoidable tendency of the cement to expand produced after a shorter or longer period stresses in the porcelain resulting in fine cracks and ultimate puncture and failure of the line. Most of the difficulties of the early high-tension lines have been traced to this cause. In the spring-ring insulator a spiral spring ring of steel wire of high tensile strength carried on the stem of the pin is forced through the neck of the hollow cylindrical space in the head of the insulator and allowed to expand into the wider cavity, the shape of which is specially designed to conform in curvature with that of the spring itself. The spring is retained in position by means of a serrated collar and clip. In order to protect it from the weather, to prevent any possibility of relative movement of the two parts, and to secure a better distribution of the mechanical and electrical stresses over the insulator, the inter-space is filled with a lead alloy. The tension on the pin is converted into uniform compression stress over the whole of the inside of the insulator, and even without the lead filling the insulator has a much higher mechanical strength than is attainable with cement. Moreover, it is impossible without actually breaking away the whole of the porcelain for the pin to come out of the insulator and allow the conductor to fall.

Every insulator is, after assembly, tested mechanically to 25 per cent. above its working load, and is subjected to an impulse voltage of up to 200 000 V and a high-frequency test of 150 000 V at 120 000 to 150 000 cycles. After these tests, in which any failures are rejected, the insulators are again tested as a matter of routine on the testing tables for fifteen minutes at their flashover voltage.

In addition, a definite proportion of each batch of insulators is sent to the Research Laboratory for flashover, ultimate electro-mechanical strength, ultimate mechanical strength, and porosity tests. They are finally punctured under oil.

After inspection by the consulting engineers the insulators are packed in crates which have been designed to admit of the easy assembly of the insulators by the contractors and are dispatched either by railway truck or by road lorries.

In the case of steatite, advantage is taken of the fact that when finely powdered it can be pressed in a dry state to give an article sufficiently strong to be dropped on a travelling band. Automatic presses are used in the case of sufficiently large orders to warrant the making of the accurate and costly stamping tools for these machines; steatite contracts much less than porcelain on firing at 1 450° C., the difference being 8% against 18%. Steatite articles can be supplied commercially with a tolerance of only 2%, compared with 5% and upwards in the case of porcelain.

A feature of the factory is the continuous chain conveyors over half a mile long which travels at a speed of two miles an hour through all departments. It is brought down to table level at all points where goods are taken from it or delivered to trays.

The H.T. Laboratory.

The h.t. laboratory has a floor area of 4 300 sq. ft. and a height of 45 ft., with side buildings having an additional area of 3 200 sq. ft. A single-phase 500 kVA generator feeds a transformer set consisting of two cascade-connected transformers. From these voltages up to 1 000 000 can be obtained. Open air isolating switches are mounted on the roofs of the side buildings.

Normal frequency a.c. voltage up to 1 000 000 V is attained from two 450 kVA cascade connected Ferranti transformers fed by a 500 kVA 6 000 V generator.

For the generation of h.f. voltage there is a Tesla transformer, the h.f. circuit being set in oscillation either by a.c. or d.c. excitation. Up to 1 500 000 V peak against earth is obtainable, with provision for doubling this voltage between poles at a later date. For such high voltages the secondary winding of the transformer must be oil-immersed. The primary is entirely air-insulated. Only the four lowest condensers of the bank illustrated on page 607 are normally used for h.f. tests.

The laboratory impulse plant, like that in the routine testing room incorporates the Marx voltage multiplication impulse circuit. The condensers are charged in parallel through high resistances and discharged on to the object under test in series on the simultaneous breakdown of the intermediate spark gaps. Voltages in excess of 1 800 000 have been obtained. To obtain the unidirectional current for charging the condensers and having regard to the high stresses applied to the rectifier when used in conjunction with such an impulse generator, it was decided not to use thermionic rectifying valves, but to employ a Delon mechanical rectifier. Such a rectifier, when caused to revolve at the correct speed, enables two condensers to be charged up against earth, so that a voltage which is double the peak voltage of the transformer supplying the current for rectification is obtained. The rectifier is direct-coupled to the generator supplying the transformers in order to avoid the necessity for synchronisation.

Some impressive displays of h.f. and impulse flashovers on strings of insulators were given on Monday, both within the laboratory and on the grid-type pylon specially erected outside the works.

The machines for carrying out vibration, torsion and tension tests are housed alongside the high tension laboratory, and outside there is an open-air endurance testing plant on which four strings of insulators can be tested simultaneously.

In the fog room any atmospheric conditions can be reproduced, and there is also a smoke or sooting chamber. A rain frame in the main h.t. laboratory allows artificial rain to play on insulators in wet flashover tests, and transportable oil tanks are available for tests under oil. Tests of insulators under power arcs of several hundred amperes can also be carried out.

NICKEL-COPPER SHEETS.

The B.S.S. for non-ferrous metals and alloys have recently been extended by the issue of two specifications relating to nickel. The first, No. 374-1930, "Nickel-copper (Cupro-Nickel) Sheets and Strips," standardises sheets and strips of four different chemical compositions. In this specification the physical properties of the material are laid down, tensile and bend tests being prescribed, whilst tolerances on thickness are specified for sheets and strips of various widths and gauges. The second specification, No. 375-1930, "Refined Nickel (Grade A,)" provides for a nickel of 99 per cent. purity.

Copies of these two specifications may be obtained from the British Engineering Standards Association, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

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NEW DEVELOPMENT IN BRITISH SWITCHGEAR.

Oil Circuit Breakers of High Rupturing Capacity—Short Circuit Tests—Tank and Top Plate—Operating Mechanism—Contacts and Bushings—Venting and Insulation.

THERE is considerable activity at the present time in experimenting with entirely new methods of breaking high power, high voltage circuits. Whilst the results of these experiments may be seen in commercial form in the course of time, it would be unwise in the interim to refrain from improving the oil circuit breaker, which has served the industry for so many years. Tests on the new devices have indicated that at present they leave much to be desired, and it may ultimately be found that the devil we know is better than the devil who is a stranger. Concurrently with the trying-out of these new ideas, every effort should be made to bring the oil circuit breaker to a high state of perfection.

The problem in this country will very shortly be how to substitute higher rupturing capacity breakers for those already installed, in view of the more onerous duties to be imposed on this class of equipment, due to rapid plant extensions, the Grid supply, and the extension of overhead transmission, with its consequent increased frequency of faults. Our problem is very similar to that which is constantly facing American supply authorities. So rapid are the developments that some American supply engineers state that every five years the system outgrows the rupturing capacity of the breakers installed, and necessitates changes. They also say that up to a certain point they experienced little or no trouble with oil circuit breakers, but after passing that point they had such constant interruptions and failures that it was necessary for them to give the matter of installing breakers of greater known rupturing capacity their closest consideration. They were driven to calculate carefully the maximum short-circuit power that could be obtained in any particular location, and to install breakers with corresponding rupturing ability.

We, in this country, are now reaching the same critical stage, and unless supply authorities install circuit breakers of ample rupturing capacity under the revised conditions, they are courting trouble. One example occurred within the last few weeks illustrating this point. A municipal power station installed circuit breakers some twenty years ago, which, according to modern ratings, would have a rupturing capacity of not more than 25 000 kVA. In spite of considerable developments in plant, the original oil breakers were not changed, with the result that when a short circuit occurred immediately outside the generating station, the switch failed to clear, and an explosion occurred, the doors of the cells being blown across the engine-room. The most serious aspect of this trouble was the liability of fire due to the oil being thrown about the station, including the cable trench. The supply was, in consequence, shut down, for some time, but luckily the fire did not get a hold.

American and German engineers have solved the problem of rupturing ability consequent upon growth by installing exceptionally robust circuit breakers incorporating the three phases in a common cylindrical tank. After some tens of thousands of rupturing tests, this form of construction was found to be the most suitable for moderate rupturing capacities, and was found to occupy the minimum of space. Ferguson, Pailin, Ltd., of Higher Openshaw, Manchester, decided that circuit breakers of this class would have an application in this country, and have, therefore, adopted a design which has been proved by these extensive rupturing tests. A complete range has been developed comprising 16-in., 20-in., 24-in., 28-in., 32-in. and 36-in. diameter tank breakers, and further developments are in progress for increasing the range, both in an upward and downward direction. The breakers now described are of proved rupturing ability, each type of breaker having been tested. Because of this, it is believed that they will appeal to British engineers who are keen on installing a product which has withstood the most onerous conditions of tests within its range. The design was evolved only after a large number of tests, and though in some directions it runs counter to theories which have been advanced by many engineers in the past, yet " the proof of the pudding is in the eating."

The particular range of breakers is known as the " R " series, the breaking capacity ratings ranging from 100 000 kVA upwards .These ratings are not mere estimates, and it will be of interest to give a brief outline of the nature of the tests which led up to the final design of these breakers. The test generator is capable of delivering 500 000 kVA under three-phase short-circuit conditions for several seconds by direct generation at 14 500 V at frequencies up to 60 cycles per second. The power ruptured by the breakers is controlled by reactors capable of adjustment to suit each investigation. Oscillographs are used to record the current, line voltage, arc voltage, breaker speed, etc., and in addition several special instruments are used to record speed of break, arch energy, gas formation, pressure and so on during interruption. As many as six three-element oscillographs have been used simultaneously to record the phenomena during short-circuit tests. In addition to the exhaustive testing of the lines of breakers, from which the Ferguson Pailin breakers have been developed, many experimental sample breakers have been tested to obtain data and formulæ. Samples of each new commercial design have been tested thoroughly to determine its breaking capacity rating before it was finally approved for production, and, in addition to the factory tests referred to above, the parent line of breakers has seen considerable service in actual commercial operation, and has proved eminently satisfactory. It has always been observed that short circuits produced in the factory are more serious and impose a more drastic test than those produced under actual service conditions. This is probably because the distribution over a wider area of all items which contribute to the short circuit conditions in the case of service operations introduces something comparable to a damping action.

The purpose of the large number of tests was, first, to demonstrate with certainty that the breakers could rupture

TABLE I.

THREE-PHASE SHORT CIRCUIT TESTS AT 13 200 V ON TYPE " R " 11 kV, 600 A OIL CIRCUIT BREAKER TANK, 28-IN. DIAMETER.

Test No.	Ext. React. in Ohms.	Current Amperes. Max. Loop. Peak Value.	Current Amperes. Max. Loop. RMS Value.	Initial in Arc RMS.	Dur. of S.C. in ½-Cycles.	Arc Length in ½-Cycles.	Pressure Above Oil in lb./sq. in.	Remarks.
7	0·75	14 700	8 520	5 600	30	10	34	Breaker cleared. Very slight gas discharge from separator.
		21 500	8 000	6 950	28	8		
		14 400	8 300	6 080	30	10		
8	0·75	10 600	8 850	6 560	29	4·4	26	Cleared. Very slight gas discharge from separator.
		14 700	8 650	5 120	30	6·8		
		18 800	11 300	6 180	31	6·8		
11	0·02	61 000	37 000	14 000	24	4·5	46	Cleared. No perceptible gas discharge.
		49 000	28 400	15 100	25	5·0		
		44 000	25 000	13 800	25	5·0		
12	0·02	65 000	39 400	15 400	22	3·0	32	Cleared. No perceptible gas discharge.
		38 700	23 200	13 500	24	4·0		
		56 500	34 000	14 400	23	4·0		
19	0·	65 300	39 600	17 700	21	5·0	57	Cleared. Very little gas.
		40 000	24 200	14 600	21	6·0		
		55 000	32 600	15 500	21	6·0		
20	0·	62 200	37 100	15 700	20	3·0	28	Cleared. Slight amount of gas.
		71 000	43 400	16 800	20	3·0		
		38 800	23 200	14 100	21	3·0		

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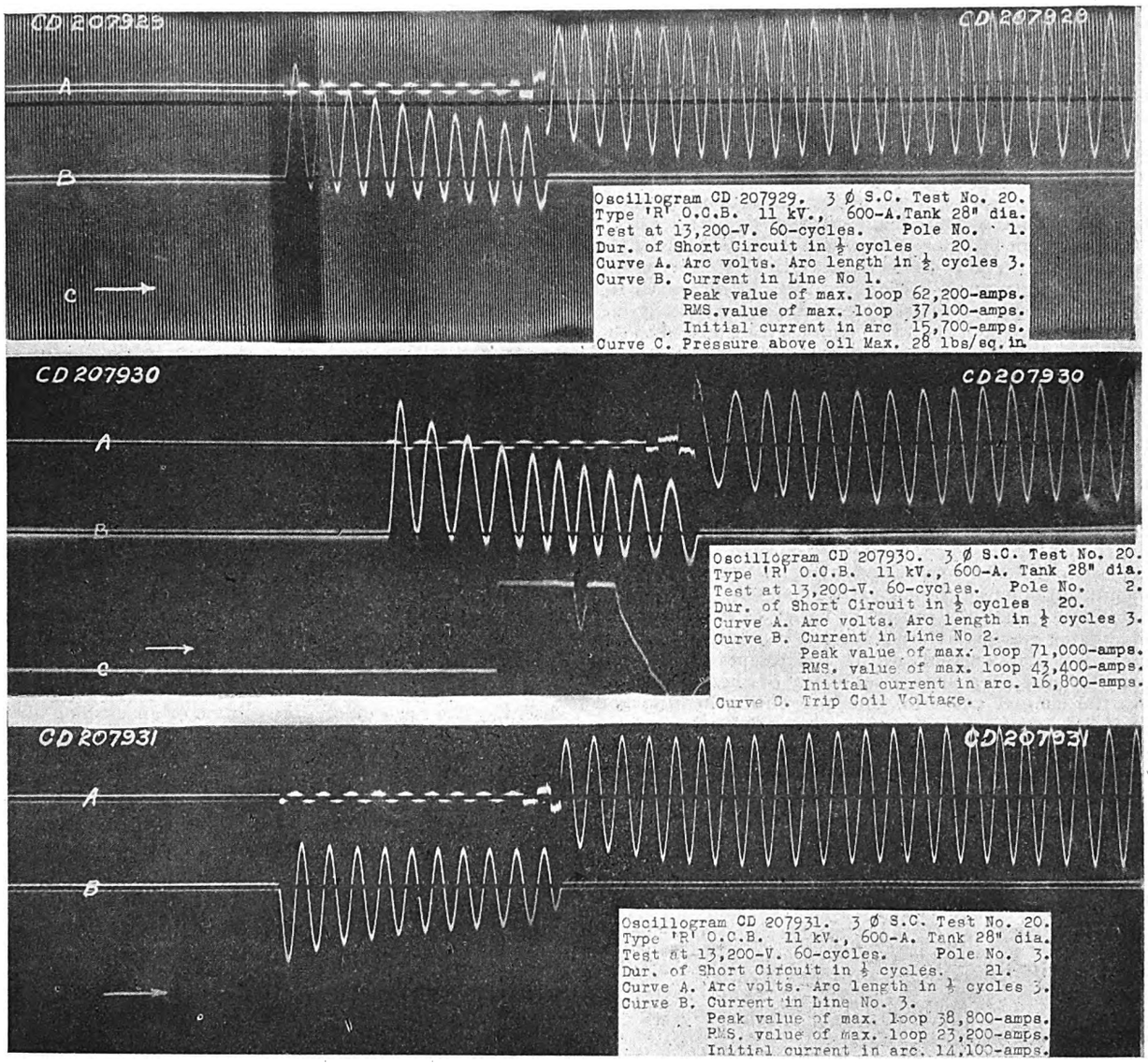

Fig. 1.—Oscillographs of test No. 20 on type "R" 11 kV oil circuit breaker.

the definite interrupting values assigned to them, and, secondly, by variation of certain physical features, to produce breakers having well balanced characteristics with small dimensions and weights, but at the same time, possessed of a liberal factor of safety. An example of the kind of information obtained under test conditions is given in Table 1 opposite. The data tabulated are abstracted from results obtained at different stages of a series of three-phase, short-circuit tests at 13 200 V 60 cycles on a 600 A breaker having a 28-in. diameter circular tank. This was a final trial after preliminary investigations had been concluded. The table gives data obtained with differing amounts of reactance in the external circuit of the test generator, and includes results obtained with the lowest to the highest arcing current broken in the series. In every case the breaker successfully cleared the short circuit. The oscillograms CO. 207 929, 207 930 and 207 931 (Fig. 1) correspond to test No. 20.

Although the tests involved the clearing of fifteen short circuits, in seven of which the ruptured kVA was between 300 000 and 422 000, the arcing surfaces were only moderately affected, and to an extent which would not have prevented continued operation in service before adjustment of the contacts. From the photograph (Fig. 2) it may be seen that the arcing had been restricted to the arcing contacts. Throughout the whole series of tests only a very small discharge of oil vapour was noticeable but no oil was thrown. This conforms with the A.I.E.E. Rules, which state that an oil breaker shall perform at or within its rupturing rating without emitting oil or flame. This is an important consideration of which account has been taken in the design.

Typical circuit breakers designed on similar lines to the parent American breaker, but manufactured by Ferguson, Pailin, Ltd., have been forwarded to America and short circuit tests applied. In all cases approximately 30 over rated and under rated short circuits were interrupted successfully. In short, the supply engineer will know that when installing this type of breaker the switch will definitely interrupt the short circuit current for which it was designed.

Figures 3a and 3b show a typical breaker of the series and each size is designed on generally similar lines so as to give a uniform appearance. It will be noted that the three phases are contained in a common cylindrical tank, this design giving the most compact arrangement.

The tank consists of a rolled steel plate with pressed steel bottom, which in all cases is dished out from the inside, a skirt ring being fitted to the outside enabling the complete breaker, when withdrawn from its fixings, to stand in an upright position. A rolled steel clamp ring, with a turned upper lip, is shrunk on to the outside of the tank rim. All the parts are heavily electro-welded, inside and out, to form a rigid tank. On sizes for heavier currents, steel pipes are welded to the tank sides in order to assist cooling of the oil. The tank is closed in by a domed shaped top plate complete with self-contained fixings. A rolled steel fixing ring is shrunk and welded to the dome. The lower surface of this fixing ring has a machined annular groove for the reception of a gasket ring. The weight of the complete breaker is carried from the fixing ring, and the tank is fastened to the top plate by means of clamp bolts which are short in order to eliminate troubles due to elongation, when the breaker is under short-circuit stress. These bolts are of solid drawn steel of uniform size but varied in number to suit particular breaking capacity ratings. A gasketed, gas and oil-tight joint is obtained between the lip on the tank clamp ring and the bottom of the groove in the dome fixing ring. In addition, the lip and groove interlock and render mutual support when internal tank

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pressures occur. The construction of a cylindrical tank with dished bottom and top dome is the nearest commercial approximation to a spherical shape, a form which is ideal for a balancing of stresses with the minimum of weight. The switch dome referred to above is of pressed steel construction, fabricated in the smaller ratings, but with inserts of high strength, non-magnetic material round the terminal bushings in the larger current sizes. These inserts minimise the heating due to magnetic causes. For the higher currents in the series the entire dome is made of non-magnetic steel.

The operating mechanism of the breaker is housed in the upper portion of the top dome so that the exterior of the breaker is free from complications and easily accessible for cleaning. The mechanical parts, therefore, are protected and self-oiling. The external operating effort is transmitted to the moving contracts via a rotating shaft and simple parallel motion, powerful closure and quick opening characteristics are thus obtained. All parts of the dome are electro-welded together, inside and out, so as to obtain the maximum rigidity. Fulcrum pins and links employed in the operating mechanism are of rust-resisting material. The movement is controlled by oil dash pots and adjustable stops which bring rapidly moving parts to rest without undue shock.

The terminal bushings are of the solid bakelite variety and are fixed to the top dome by means of " shrunk on " flanges. A gasket is provided between the flange and the top dome in order to prevent oil or gas leakage at this point.

The stationary contacts consist of heavy copper fingers of the self-aligning wedge pattern arranged in multiple pairs to suit the particular current rating. With parallel fingers arranged in pairs, the magnetic effect of heavy current increases the contact pressure, thus preventing heating and welding of the contact surfaces. The arcing fingers are longer and heavier than those for contact surfaces, thus ensuring that the current is shunted from the main contacts. The large amount of metal embodied in the arcing contacts increases

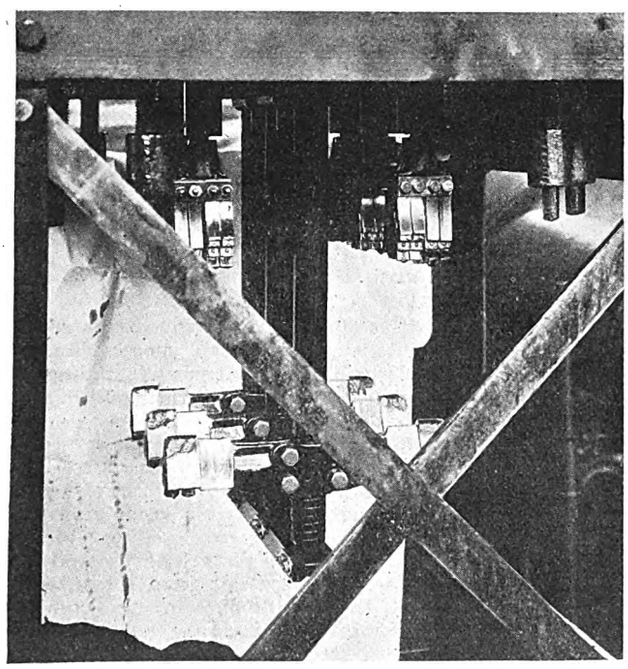

Fig. 2.—Type "R" oil circuit breaker, 11 kV, 600-amp., 28 in. diameter tank. View of contacts after test No. 20 of a series involving the clearing of 15 short circuits.

their thermal capacity and so helps to reduce the temperature at the root of the arc. The moving contacts consist of heavy copper angle bars and arc resisting metal tips, so arranged that they can be replaced when excessively burnt. The contact surfaces are arranged at such an angle that the finger pressure assists the parting of the contacts. The features ensuring a quick rupture of the circuit are gravitational opening, magnetic repulsion due to the current passing at the instant of the break, pressure of the throw-off springs and the contact finger pressure referred to above. Internal tank pressures cannot retard rupture owing to the operating mechanism being internal to the breaker, therefore, there can be no unbalanced piston effect tending to close the breaker. The terminal bushings and the impregnated wood operating rods are strongly braced with reinforced wooden clamp bars to ensure rigidity under the electro-magnetic stresses produced by the flow of short circuit current through the breaker. All wood used in the construction is specially selected, kiln dried, treated and rigidly tested and any part which shows only slight mechanical or electrical uncertainty is ruthlessly rejected.

A minimum amount of oil is used consistent with the positive rupture of the circuit, and loss through oil throw and

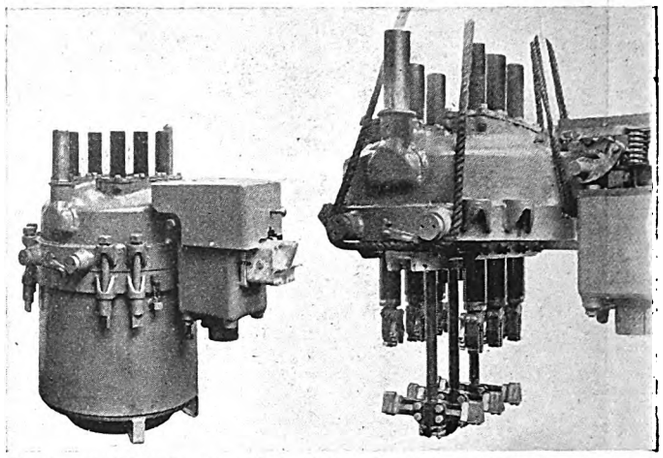

Fig 3.—*a* (left) Exterior view of round tank breaker. *b* (right) View of contacts and top-plate (on larger scale than *a*).

leakage is almost negligible, fire risk, therefore, being practically absent. The head of oil and volume of air cushion above oil level are proportioned to minimise oil surging and tank pressure, while the length of break between stationary and moving contacts is ample to ensure the arc being broken before the limit of travel has been reached. In order to relieve any pressure of arc gases that may manifest itself in the tank, a small shielded vent hole is provided in the breaker dome. This communicates with a spacious pebble-filled chamber acting as an oil separator and gas cooler. The chamber is coupled to an ample outlet pipe for the conveyance of gases to a safe distance, entrapped oil returning to the tank after circuit rupture has been effected. Auxiliary insulation between phases and from live metal to the tank, under oil, is provided in the form of a heavy arc resisting insulating lining, fitting close to the tank, together with two " U " shaped pieces of similar material which shroud the contacts of the centre phase and form effective arc barriers between phases. A protected glass oil sight gauge is fitted.

The breakers are intended to serve a number of mounting requirements into each of which a breaker is interchangeable. A number of banks of units have been exported for an installation in South America. This installation is of the vertical isolation metal-clad design, but the breakers are equally adapted for truck type units, stationary steel cubicles, masonry cubicles, self-supporting and for panel or wall mounting. Provision is afforded so that any breaker can be turned through 90 degs. in either direction to suit a particular mounting.

Due to the fact that the material in the design of the breakers is used to its highest efficiency, it will often be found that these can be installed in the space now occupied by breakers having a much lower rupturing capacity. This feature is of special importance in that existing breakers will have to be changed in accordance with the exacting conditions brought about by the grid connection. Ferguson, Pailin, Ltd., have already carried out a number of installations where the type of breaker dealt with in this article has been used in cellular gear, replacing older switches of smaller rupturing capacity. Electrical and mechanical interlocks, auxiliary contacts for indicating devices, etc., can be provided to suit the usual requirements of practice. A mechanical indicator is fitted on each breaker to show whether the breaker is closed or open. All breakers comply with the B.S.S. No. 116/1929 and will meet all the tests specified therein.

In connection with the Jubilee Achema VI which will be held at Frankfurt a/M. from June 10 to 22, the Achema Year Book, 1928–30, edited by Dr. Max Buchner, will be sent to anyone interested in chemical apparatus on receipt of two international postage coupons, so long as a supply is available. This year's Achema will have a floor space of 20 000 sq. m., and will form, according to the organisers, the largest show of chemical apparatus that has yet been held anywhere.

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TRANSPORT FOR CONTRACTORS.

Running Costs of the Two-ton Van—Numerous British Models Available—Economy of Employing a Skilful Driver.

By W. A. GIBSON MARTIN.

ALTHOUGH the small delivery van and the one-ton lorry are both very useful vehicles for all-round transport purposes, many contractors require a van capable of two-ton loads and giving more body accommodation than can be provided on a one-ton chassis. Until a year or two ago, most of the two-ton vehicles on the market were of foreign origin (often inadequately supported by service depots) or of British manufacture at double and treble the price of foreign products. To-day, however, there are quite a number of British vehicles about the two-ton mark, and the table given below shows the full operating costs of a representative van in this class.

RUNNING COSTS FOR THE 35/40 CWT. DELIVERY VEHICLE.

PETROL: 13 m.p.g., 1s. 5d. per gallon.
OIL: 700 m.p.g., 5s. per gallon.
TYRES: 15 000 miles per set of five: £45 3s. per set.

List Price	£355
Painting	35
Total Cost	£390

	Number of Miles Per Annum.								
	5 000		10 000		20 000	
	Actual Cost	Cost Per Mile	Actual Cost	Cost Per Mile	Actual Cost	Cost Per Mile
	£ s. d.	d.	£ s. d.	d.	£ s. d.	d.
RUNNING EXPENSES:						
Petrol	27 4 0	1·30	54 8 0	1·30	108 16 0	1·30
Oil	1 15 0	·08	3 10 0	·08	7 0 0	·08
Tyres	15 1 0	·72	30 2 0	·72	60 4 0	·72
	44 0 0	2·10	88 0 0	2·10	176 0 0	2·10
STANDING CHARGES:						
Tax	25 0 0	1·20	25 0 0	·60	25 0 0	·30
Insurance	15 2 6	·72	15 2 6	·36	15 2 6	·18
Depreciation at 20% p.a.	75 0 0	3·60	75 0 0	1·80	75 0 0	·90
Garage	26 0 0	1·24	26 0 0	·62	26 0 0	·31
	141 2 6	6·76	141 2 6	3·38	141 2 6	1·69
TOTAL RUNNING COSTS:						
Running Expenses	44 0 0	2·10	88 0 0	2·10	176 0 0	2·10
Standing Charges	141 2 6	6·76	141 2 6	3·38	141 2 6	1·69
Driver's wages	156 0 0	7·48	156 0 0	3·74	156 0 0	1·87
Allow for repairs	10 0 0	·48	15 0 0	·36	20 0 0	·14
TOTALS	351 2 6	16·82	400 2 6	9·58	493 2 6	5·80

The example upon which the table is based is designated a 35/40 cwt. van and is specially intended for commercial, as distinct from passenger, traffic. Many of the two-ton chassis offered at the present time are claimed to be equally suitable for a goods lorry or for charabanc coachwork. The 35/40 cwt. chassis selected, however, is not a compromise, but has been designed as a goods vehicle from the very beginning. The engine is a four-cylinder unit with cylinder-block cast integral with the crankcase, of 2½ litres capacity, developing 35 B.H.P. The crankshaft has three main bearings, lubrication is by cam-shaft driven pump and splash, and ignition is provided by magneto.

First Cost.

Cooling is by thermo-syphon, assisted by a water impeller in the cylinder head and a large three-blade fan driven by a self-tensioning belt. Four forward speeds are provided by a gear-box designed in unit with the engine, some of the trans-continental vehicles being fitted with only a three-speed gear-box. Disc wheels shod with 34 by 7 tyres are fitted to the rear, and 32 by 6 to the front wheels. The petrol tank carries fuel for 120 miles without refilling. A 12 V electrical system operates five lamps and an electric starter, while the chassis equipment includes a spare wheel with tyre and an engine-driven tyre pump. At £355, with an ash body panelled in metal-faced plywood, driver's cab with plate glass windows in rattle-proof channels, sprung seat, double doors with lock and key, and a capacious tool box, this 35/40 cwt. van is an outstanding example of good value in the British commercial vehicle world.

The question is, what does it cost to run? In view of the greater load, is it much more expensive than the one-ton van, running costs for which were given in THE ELECTRICIAN of April 18.

In order to present a fair comparison, the table reproduced with this article has been compiled in exactly the same form as the one previously published, and reference will show that the one-ton van cost 5·07d. per mile inclusive of every charge, for 20 000 miles per annum, whereas the two-ton vehicle under the same conditions, will cost 5·80d. With a lower mileage the difference is, of course, greater. On the 5 000 miles per annum basis, the one-ton van costs 14·91d.; the corresponding figure for the two-ton vehicle is 16·82d.

The New Road Bill.

The increased cost is due to the heavier tax and the greater amount set aside for depreciation. In regard to tax, the new Road Bill is being debated in the House of Commons, and at the moment of writing it is impossible to say what effect the Bill, if passed, will have upon commercial vehicles. The non-tariff insurance companies accept this particular 35/40 cwt. van as coming under the 30 cwt. unladen class, while the tariff companies place it in a higher category. For the purpose of this article, however, the rate quoted by a non-tariff insurance company has been taken.

The manufacturers of the 35/40 cwt. vehicle claim 18 m.p.g. of petrol and 900 m.p.g. of oil, these figures having been obtained in an R.A.C. test officially carried out. It is unlikely, however, that any commercial firm would attain such economy in practice, and therefore 13 m.p.g. and 700 m.p.g. respectively are allowed.

In preparing these tables of running costs, the calculations have been based upon thoroughly reliable data, and the final figures may be taken to represent the maximum cost of operating the vehicle to which each table refers. Unless there are unusual circumstances, these costs should not be exceeded. On the other hand, there are numerous ways in which transport costs can be reduced below the figures mentioned. For instance, 15 000 miles have been taken as the maximum obtainable from a set of five tyres, but many firms are experiencing much better results. In one instance, two front tyres on the 35/40 cwt. vehicle have covered 26 000 miles and are still in service. If an additional 10 000 miles can be had from a set of tyres, the cost per mile would be reduced by almost a third of a penny; or, on the 20 000 miles per annum basis, the tyre bill would be reduced by some £30. Obviously, it is worth while spending a little time in checking tyre pressures, and worth while giving a small bonus to the driver, if this amount can be saved on one item alone. It is not desirable, however, to reduce the amount spent on oil.

Consumption of petrol can be reduced by frequent inspection of all unions, by having the carburetter tuned for economy, and by fitting an extra-air valve which the driver must use when driving at 20 m.p.h. and over on top gear, or at corresponding speeds on the lower ratios, if the valve is of the usual type controlled by lever from the driving compartment. There is at least one entirely automatic extra air-valve on the market, and if cross-country journeys are the rule, this type is preferable to one depending upon manual control.

The greatest aid to economical operation, however, is a careful and skilful driver. It is often good policy to select an employee whose character is known and who has proved reliable and conscientious in some less responsible position, and to have him trained as a driver by the motor agent supplying the vehicle, or in the manufacturer's service station or training school. To hand over a vehicle costing £390 to a new employee, is to risk large maintenance costs and big repair bills, for as a rule the result is careless driving, reckless use of gearbox and brakes and neglect of lubrication.

Costing System.

Large firms operating a fleet, will have their own transport costing system, and no difficulties will arise as to how expense can be controlled, nor will there be any doubt as to whether or not the vehicles are economical. Smaller concerns owning two or three vehicles, however, often find it impossible to obtain any satisfactory information to prove that their vans are being operated on an efficient basis, nor can it be proved that it is really worth while owning vehicles when an outside contractor could provide all the necessary transport at a low rate. In a subsequent article, therefore, it is proposed to outline a suitable costing system for the electrical contractor operating two or three motor vehicles.

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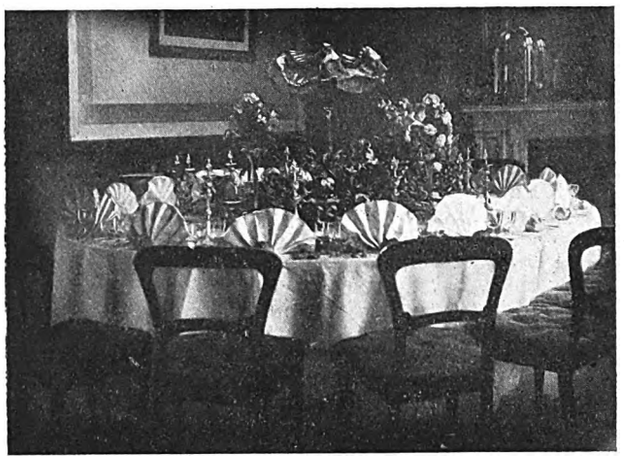
PIONEER ELECTRIC BANQUET OF 1894.

Reminiscences of a Historic Occasion—Chef Who Received a Shock—Progress in the Past 36 Years.

By CAPTAIN WILLIAM P. DURTNALL.

THE article by Mrs. Hilda L. Dover in THE ELECTRICIAN of March 21, on the "Growth of Electric Cooking," contained a slight error in regard to the date of the famous electrically cooked banquet at the Cannon Street Hotel, London, at which the then Lord Mayor enjoyed probably for the first time the advantages and delights of a delicious electrically-cooked meal. This function actually took place on Friday, June 15, 1894 (a year earlier than that mentioned by Mrs. Dover); it was practically the first demonstration of cooking by electricity on a large scale, the occasion being a banquet by the City of London Electric Lighting Company, to celebrate the linking up of their "East Side" generating station with their newly erected and then working "Bankside" station, for the supply of the City of London.

A distinguished assembly of civic and scientific gentlemen were present, who were not only judges of a good dinner but



Electrically lighted table at the Cannon Street Hotel in 1893.

appreciated the fact that it was cooked by electrical energy, which had already been revolutionising the country generally, as an illuminant. It was thought even then that it was destined to replace coal and gas, in great measure, for cooking, heating and general hotel engineering purposes.

At that period I was in the youthfully-hopeful and buoyant stage of my professional career and occupied the responsible position of Chief Electrical and Mechanical Engineer to the hotel company (having just finished fitting the hotel with a complete electric light and power installation, with Willans steam engines, generators and boilers), and was intensely interested in the possibility of recommending the use of electrical energy for cooking and water heating in the hotel. The current for the cooking of this historical banquet was, however, supplied from the mains of the City of London Company, who also supplied the necessary cooking plant, which was manufactured by the famous firm of Crompton and Co., then of 4, Queen Victoria Street, E.C.

The Lord Mayor was the guest of the evening. Sir David Salomons was in the chair, and among those present were. Professor (now Sir A.) Fleming, the late Professor S. P. Thompson, the late Sir William (then Mr. W. P.) Preece, C.B. and Mr. (now Colonel) Crompton.

Covers were laid for 112 persons and 100 sat down. Mr. J. W. Aptommas, the manager, provided an excellent menu, to which the chef, M. Bernard, tabled a very satisfying dinner.

The conditions entailed an organisation entirely new and quite different from those of the normal coal and gas cooking then in use at the hotel. The banquet was served in the Pillar Hall (on the second floor) and the arrangements gave a striking demonstration of the safety and convenience of electrical cooking appliances, for the cooking was actually carried out in the room next to the Pillar Hall, much of it being done in the presence of the guests.

Although cooking was in progress for 100 guests and the room was full of roasting and baking ovens, hot plates, fish kettles, frying pans, saucepans, hot water urns, vegetable cookers and so on, no smell or heat entered the dining hall, owing to the use of an electric fan in one of the top windows.

At that time the price of lighting current in the City of London was 8d. per unit; for cooking purposes it was to be 4d. per unit and this high price made it very difficult to put forward a commercial proposition for general application to the hotel cooking service. We did, however, go fully into the matter and a scheme for the extension of our generating plant was considered with a view to installing another 100 H.P. generator with a set of storage accumulators to meet the cooking "peak-loads" for the breakfast, lunch and dinner periods. The chef, however, was able to show that he was able to cook a similar menu (11 courses) with coal (which was very cheap at the time) for ½d. per head, so the matter was dropped as uneconomical.

We now have current available at a quarter the price per unit, and there has been a great advance in the thermal efficiency of all electric cooking apparatus, particularly in cases where a low voltage (say 100 V) can be used.

Thanks to the number of meters which Mr. Cordery had inserted in the various circuits, we were able to get an interesting record of the consumption of the various appliances used for cooking this meal. Four large electric ovens, working for four hours, used 14 units; one extra large hot-plate working six hours used 16 units. One smaller hot-plate, working four hours, used 4 units. Three fish-kettles, working for two hours, used 6 units. Six frying-pans, working for two hours, used 8 units. Six sauce-pans, working for six hours, used 18 units. The total energy consumption was 66 units, which, at 4d. per unit, amounted to £1 2s. net, or a fraction over 2½d. per head.

An amusing incident took place, which caused much merriment amongst the junior cooks. It seems that M. Bernard accidently allowed a small pricker to penetrate the insulation of one of the sauce-pan leads and received the full benefit of a 200 V a.c. shock at 100 periodicity; M. Bernard took it in very good part, muttering something in French which, I was told, was not exactly what such young and tender ears as mine should hear. This incident was one of the many things that I have witnessed, all indicating the advantages of a lower voltage. During the discussion the chef stated that he highly appreciated the use of electrical energy for cooking. Although he had received the shock (which I feared at the time would have put the lid on the matter) he was broad-minded enough to say that this was a trifling matter.

Use of Storage Accumulators.

As previously stated, electrical cooking apparatus has, during the last 36 years, been very greatly improved, not only in general design but also in appearance and insulation. I have travelled all over Europe in the pursuit of my various studies of this subject, and the most interesting types of hotel cooking plant that I have seen have been those which I inspected in Italy and Russia. Both the Russians and the Italians have, in my opinion, given the matter the most advanced attention, in fact, in thermal efficiency they have made much headway. They have reduced the consumption per unit of work done by giving the greatest possible attention to the essential value of thick insulation and the thermal storage which is so easily secured by this means, resulting in the reduction of the weekly consumption of electrical energy. Supply authorities should give every consideration to the possibilities of non-peak load demands which may be lurking around in the form of hotel cooking installations, with storage accumulators, not only enabling a lower voltage to be used in the apparatus, but the supply of say 400 V 3-phase a.c. at periods which may flatten the station load curve, etc. At say ½d. per unit for such off-peak supply, much can be done in the shape of large cooking installations. At the same time, the bogey of having the current off just as the hotel or restaurant service is about to begin, will be completely banished. In "Paragon" electric kitchens for very large hotels and public institutions, the use of an infinitely variable

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voltage supply can be arranged, providing from a constant storage battery voltage that essential heat regulation which is so much desired when cooking large volumes of food.

However, be that as it may, Mrs. Dover has certainly done good service in drawing attention to the pioneer position of England in the matter of large-scale electric cooking. I have received letters from many parts of Europe and even one from America inquiring if it was a fact that as far back as 1894 this banquet was really cooked by electricity, as it was much later before anything in this line was done abroad. Let us hope that in the interest of British trade, the example so well set will be continued with even more progressive spirit.

I have kept one photo taken 37 years ago of a type of electric table decoration which was always a great favourite with many of the hotel's patrons. The standard hotel silver fittings were used, and indeed formed part of the circuit (the voltage was only 110). On this table there were no fewer than 500 miniature deeply coloured lamps hung in festoons from the standards. Coloured silk floral decoration was also incorporated, each flower containing a small lamp, which made the whole table a very charming and popular feature. In some cases we had as many as 2 000 lights so arranged down the long " T "-shaped tables then laid out in the " Great Hall," in which many of the City companies used to hold their annual banquets. The silk floral effects, and the festoons of lights hanging between the highly finished silver standards, gave the hall a very pleasing appearance, especially when the top lights were turned down.

ROUND THE JOBS.

Some Remarks on Specifications—Rating of Fuse Wires—Position of Plug Sockets—Wear of Flexibles of Electric Irons—Untidy Additions to Office Installations—Evil Due to Buried Tubing.

By "CONTRACTOR."

IN company with many other contractors I have just been asked to tender for the electrical installation of a building. With the letter there arrived a " specification " which occupied about half of one sheet of quarto paper. This " specification " informed me that the work must be carried out " in the very best manner " and that the wires were to be of " very best quality " ; beyond that nothing was specified.

Such customers, of course, would deserve to have the very worst of installations put in, and if their premises should burn down " owing to the fusing of an electric wire " it would be poetic justice. Many contractors, however, have a reputation to maintain and they therefore fill in the gaps of the " specification " according to their own view of what is required to meet the case. On the other hand there is sure to be competing someone either without the knowledge or without the conscience to instal a good job, unless it is rigidly specified, and this man's price will probably make that of the reputable contractor look absurd.

How can any architect possibly maintain that he is earning his fees when he allows electrical installation work to be undertaken on a basis of this sort ? How does a client think he is going to get value for money if he employs an architect who knows so little about the job, or cares so little, that he is prepared to take such a big risk ?

There is only one gleam of hope for a remedy for this sort of thing that I can see. It lies in the insurance companies tightening up their conditions concerning electrical installations. At the present moment they do, in most cases, have certain regulations to which electrical installations must conform. On the other hand, in my experience, they do not take very much trouble to see that such regulations are followed, except in the case of very large buildings. Now the average customer has a deep respect for insurance companies, not only because the premiums he has to pay affect his pocket very materially, but because he regards them as a weighty authority on the subject of risks. Armed with this reputation the insurance companies could, if they so wished, improve the standard of electrical installation work to a surprising degree. At the moment, of course, their contention is that they would prefer to take the extra risk rather than incur the very costly expense of an elaborate inspectorate.

* * *

It seems to me to be time that something was done about the rating of fuse-wires. At present a very great deal of confusion exists when speaking of fuse-wire. The electrician classifies it in a satisfactory manner according to its size and composition, but the layman, who is more and more coming to use it himself, prefers to refer to it in terms of amperes. And this is where the confusion arises ; for there seems to be no definite rule as to whether the rating in amperes should refer to the safe current-carrying capacity of the fuse-wire or to the current at which it will blow. This can very easily be the cause of considerable annoyance to householders.

* * *

It is a curious convention which ordains that plug-sockets, both on the lighting circuit and on the heating or power circuit, should be placed on the skirting-board in a room. That they are so placed in the vast majority of cases is a fact. That there is no valid reason for doing this in most cases is also a fact. To my mind by far the best position for any switch-plug is about three feet from the floor level. The argument that, from a plug so placed the flexible cord hangs in a catenary to the piece of apparatus to which it is connected, may be easily answered by allowing an extra yard or so of flex on that equipment, so that the flex shall hang straight down to the floor from the plug and thence travel in the manner in which it does when the plug is on the skirting. This raised position for plugs has several distinct advantages.

* * *

I think the manufacturers of electrical appliances ought to set their minds to the devising of some better method of bringing flexible cord into the ordinary domestic electric iron. By far the weakest point in an excellent piece of apparatus is this entry of the flex into the plug-socket which connects it with the iron. The ordinary helical guard which is mounted at this point of connection is quite inadequate to preserve the life of the flex. Where dressmakers use a large quantity of these irons the repairing and renewing of flex, owing to its wearing when the iron is turned up on end, is a very large and quite unnecessary item in their expenditure. It is of no use saying that care should be taken to see that the flex is not unnaturally bent back when the iron is on end. The beauty of the electric iron is that it is, or should be, foolproof, and the type of labour employed in large dressmaking establishments is not capable of taking any great pains to prevent this wearing of the flex. It ought not to be a serious matter for manufacturers to produce a type of fitting which is incapable of abuse.

* * *

What a lot of money is wasted on elaborate lay-outs for the electrical installation of large blocks of offices ! Consulting engineers, architects, builders and electrical contractors spend a great deal of time on producing a lay-out for such offices based on a symmetrical arrangement of lighting points. They then spend a good deal of money in installing these points, and when the floor is eventually let, the various tenants split their premises up by partitions in such a way that the original positions of the lights are quite useless. The result is usually a nasty confused jumble of lead-covered cable, surface tubing and flexible cord hooked back by pieces of string in order to get the lights where they are needed. The other day I was appalled to see the condition of the electrical installation in a first-class block of offices in Regent Street. The original installation had been carried out excellently and provided that each floor had been let in symmetrical portions, that installation could scarcely have been improved upon. As it was, however, very few of the conduit runs were in use, the majority of lights being served by recently run—and in many cases abominably run—lead-covered cable which hung in festoons along the corridors. It seems to me that this sort of thing is largely due to the insistence on the burying of all tubing while the building is in process of erection. As far as the landlord's services are concerned there is no reason why the tubing should not be buried, but if the actual tenants' points are left until it is known what form the division of the floor is to take, then these can be conveniently and neatly run on the surface. One tube running across a ceiling is considerably less ugly than a multitude of lead-covered cables and diagonal flexible cords.

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BOOK-KEEPING FOR ELECTRICAL CONTRACTORS—VII.

Recording the Purchases Transactions—Method of Classification—Analysis of Management and Working Expenses.

By S. HOWARD WITHEY, F.C.I.

IT is a good plan to stamp all invoices by means of a rubber or other suitable impression designed to cover the different operations, with spaces for the signature or initials of the clerks or assistants responsible, a good form being as under:—

INVOICE STAMP

No:..... Date..... 19....
Goods Received by .....
Number, Quantity, or Weight Checked by.....
Price and Discount Verified by.....
Calculations and Additions Checked by.....
Approved by.....
Passed for Payment by.....
Entered in Inwards Book by.....
Stock Book Folio.....
Purchases Book Folio.....

In the case of the electrical contractor in business in a small way, the operations to be covered by the stamp will be few in number, but if several departments are in existence, the staff duties should be allocated in such a way as will ensure, as far as possible, that each operation is conducted by one person in the first instance, and afterwards checked by another.

The purchases made by the contractor will probably consist of both cash purchases and credit purchases, that is to say, some electrical goods, articles, accessories, etc., will be bought and paid for at the same time, while others will be purchased subject to payment some time in the future. Both these kinds of transaction will fall under the same general heading or headings in the final accounts, but the methods for recording the original items in subsidiary books will be different.

When meters, resistances, disconnecting boxes, electric fires, etc., are bought on a cash basis, the contractor's cash or bank balance will be decreased and his stock correspondingly increased, which means that the cost price should be recorded on the credit side of the cash book and posted direct to the debit side of the purchases account. This account will be kept in the impersonal ledger, each entry giving the date of payment, the words "To Cash" or "To Cheque," and the cash book folio, the page on which the account appears in the ledger, being inserted against each cash book item to show at a glance that the amount has been properly dealt with. Upon no consideration should a ledger folio be set down against a payment transaction until the amount has been actually posted.

If the contractor's sales have been classified under specific headings for the purpose of ascertaining the gross profit in each case, the purchases will have to be analysed in the same way. Instead, however, of opening separate purchases accounts, one account ruled with a sufficient number of cash columns will suffice, each payment being inserted in its proper column.

The credit purchases should be recorded in a purchases book, or bought journal, kept for the purpose. Some contractors use a guard book into which the invoices, after being checked, folded and endorsed, are stuck, the amounts being extended into a money column and posted direct to the ledger, but the drawbacks associated with this method are the difficulties in handling the book and sub-dividing the work, and the absence of any systematic analysis of the items. The majority find it necessary to keep a purchases book of the analytical type, with columns not only for the different electrical machines, goods and accessories bought from time to time, but also for the classification of the management and working expenses as these fall due. A very useful form is shown in the adjoining column.

The number of analytical columns, and also their headings, will naturally vary in individual cases according to the size of the business and the particular class of trade in which the contractor specialises, but in every case at least one column should be provided for the capital outlay in the form of test-room products, electrical units, shop fittings, etc. When goods of various kinds are enumerated on the same invoice, the cost price of each kind or description should be inserted, first in the "Details" column, then under its most appropriate heading, the total of the details being then extended into the "Total" column. Each amount shown in the "Total" column will have to be posted to the right-hand or credit side of the particular personal account kept in the purchases or bought ledger, with the date; the words "By Goods" or "By Sundries," and the folio. At the end of each month, the total of each classification column will be transferred to a debit side of an account bearing that name in the impersonal ledger, giving the date, viz., the last day of the month, the words "To Sundries per Purchases Book," and the folio, but before posting these totals the clerical accuracy of the figures should be verified by seeing that the analytical totals, added together, tally with the amount in the "Total" column.

Providing they are not numerous, the returns outwards transactions may be entered at the end of the purchases book, where a number of pages can be reserved for this purpose. Each amount should agree with that shown on the credit note received by the contractor, and will be classified in the same manner as the purchases transactions, the figure inserted in the "Total" column being posted direct to the debit side of their respective personal accounts, and the monthly totals either transferred direct to the credit side of the different impersonal accounts or deducted from the corresponding monthly totals of the purchases before the latter are posted. Allowances made by creditors and suppliers in lieu of actual returns should be treated as returns in the books of account.

Unlike the columns headed "Switch and Fuse Gear," "Implements and Apparatus," and "Materials and Stores"; the monthly totals of which will be transferred to goods or trading accounts, the totals of the expenses columns should be debited to separate nominal accounts, the final balances of which will appear on the debit side of the periodical profit and loss account, which will be prepared for the special purpose of ascertaining the amount of net profit made or the extent of the loss sustained. To avoid the need for dissecting the amounts at the close of each month's work, the classification

PURCHASES BOOK.

Date	Invoice No	Name etc.	Details	Ledger Folio	Total	Switch & Fuse Gear	Instruments & Apparatus	Materials & Stores	Rent, Rates Taxes, Gas Water etc	Capital Outlay

provided in the purchases book should be as detailed as possible, expenses of a similar nature being grouped together. If only one "Capital Outlay" column has been provided, the monthly totals of this column will have to be analysed for the purpose of determining the correct amount to be debited to each asset account opened in the private or general ledger, the final balances of these accounts being enumerated on the assets side of the contractor's balance sheet, subject to deductions to cover wear and tear, obsolescence, etc.

The next instalment of this series will show the correct method of recording cash payments and discounts obtained, and of keeping and balancing the creditors' accounts.

(To be continued.)

The summer meeting of the Western Centre of the I.E.E. will be held on May 23-26, at Sedbury Park Hotel, Chepstow, when visits will be made, among other places, to Lydney power station and the Lydrook works of Edison Swan Cables, Ltd. The annual competition for the Western Centre Past Chairmen's Golf Cup will be held on May 25.

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ELECTRICAL EQUIPMENT OF CINEMA THEATRES—III.

General Decorative Effects, Stage Equipment and Lifts—Value of Adequate Lighting—Control of Stage Equipment.

By CLEMENT D. BOND.

[Mr. C. D. Bond is the amusement engineering specialist for Messrs. W. J. Furse and Co., Ltd., Nottingham, the well-known firm of electrical engineers and lift manufacturers, who specialise in electrical equipment and lifts for theatres, cinemas, race tracks, skating rinks and dance halls. The previous articles appeared in our issues of March 21 and April 18.]

THE previous two articles dealt with the general wiring scheme and its allied equipment. To complete the installation there only remains the speciality plant; by this is meant general decorative effects, stage equipment and lifts.

The cinema for which the electrical installation has been described is to be atmospheric, but as this is only one type of

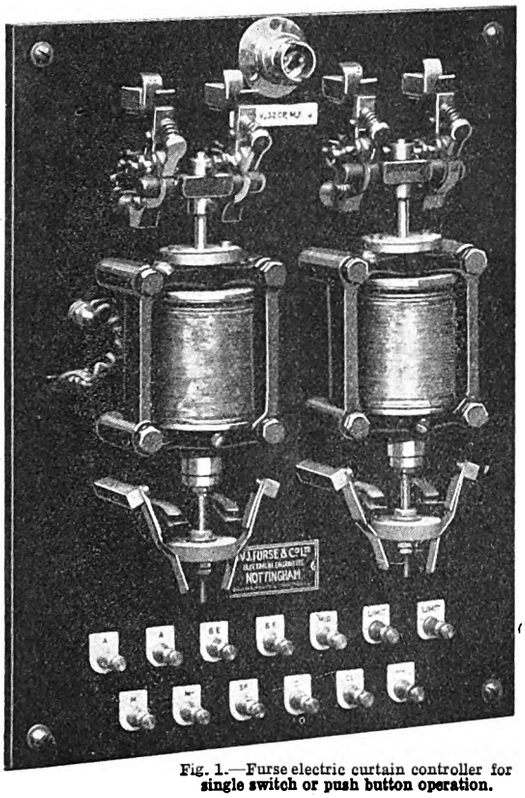

Fig. 1.—Furse electric curtain controller for single switch or push button operation.

decoration I shall try to generalise and give a few notes with regard to decorative effects irrespective of the style of decoration, be it Atmospheric, Grecian, Tudor or Futurist.

Whatever the scheme of decoration to be employed it is essential for the closest co-operation to be present between architect, artist and electrical engineer. The final lighting scheme should be decided early in the building operations. Whether the scheme adopted be single colour, multicolour, cornice lighting, lay lights, flush or hanging fitting or a combination of all, the following points should be borne in mind :—

(1) There cannot be too much light providing there is no glare—1¼ watts. per sq. ft. of floor space for white lighting, 1½ watts for red and green lighting, and 3 watts for blue lighting are good averages to aim at.

(2) Have the maximum amount of light at the stage end of the cinema and gradually reduce intensity towards the back of auditorium.

(3) If you use cornice lighting buy good and efficient troughing, it is far more economical in the end, owing to the current saved. Be sure that all such troughing is easily accessible for cleaning and re-lamping.

(4) If you use pendant or flush fittings remember a few good ones are far better than a multitude of cheap ones.

(5) Try to obtain balance throughout the hall and avoid spotty lighting.

(6) If capital expense will not allow for a good multi-colour scheme throughout, do not half-do it but be content with a single colour scheme generally with a multi-colour lighting effect round the proscenium. After all, this is the part of the hall of which the audience sees most.

(7) When showing pictures have your hall as dark as your Watch Committee will allow, as you will get a better picture, bigger contrast when lights are raised, and the British cinema-goer generally likes it.

Leaving the auditorium, we come to the stage. Here, accompanied by music, we can get " Entertainment " in itself. It must be remembered that entertainment is really just something different from everyday life. Be it legitimate stage or just pictures the audience is *shown* something different from the usual and led into a land of make-believe. The same effect can be produced by colour lighting accompanied by sympathetic music, the only difference being that the audience *takes* itself in its imagination into a fairyland of its own and is not led. Again, music and light are a further entertainment in that they are a *contrast* to the black and white of the picture. No cinema, therefore, should be without its efficient stage and a short description of an average arrangement may be useful.

Without adequate and good lighting a stage is valueless; as no matter how good the setting, how good the artistes and orchestra the effect cannot be put over without efficient illumination.

Generally speaking the cinema stage should have at least :—

One Footlight.
Two Battens.
Two Spots.
One Tab Curtain Gear.
One Screen Curtain Gear.
Two switch-plugs on stage.

The battens and footlights should be wired on four circuits and should be of the compartment all-metal type, preferably with prismatic glass reflectors, and arranged so that suitable colour media can be fitted to provide for required colours. Each circuit should be controlled by its own dimmer, preferably with colour master and cross grand master controls.

All equipment on the stage should be controlled from the stage switchboard fixed preferably on the stage. Frequently however, the stage board is now fixed in a room adjoining the operating box as this saves the expense of a stage operator. The curtain controls should be of such a design as to deal easily with the load. The weight of the curtains to be moved

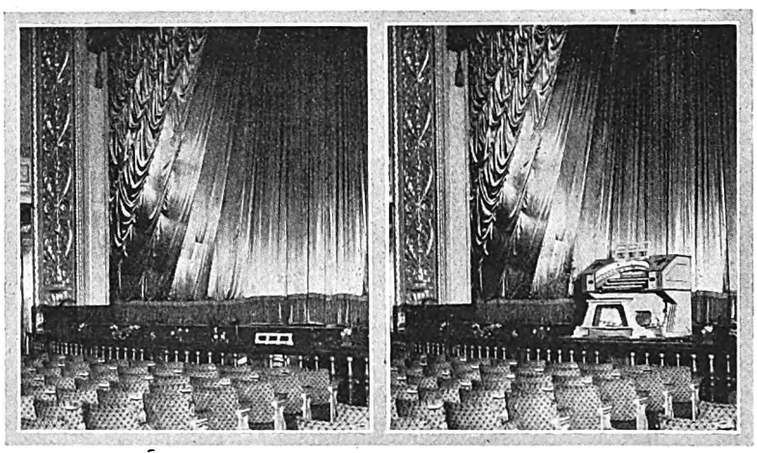

Fig. 2.—Furse organ lift at the Metropole Cinema, Victoria, S.W., in lowered and raised positions. (Architect, Mr. G. Coles, F.R.I.B.A. London.)

should be decided and given to the gear manufacturer, so that the proper installation can be put forward. Often a gear is ordered and then later on the curtains. The curtains are

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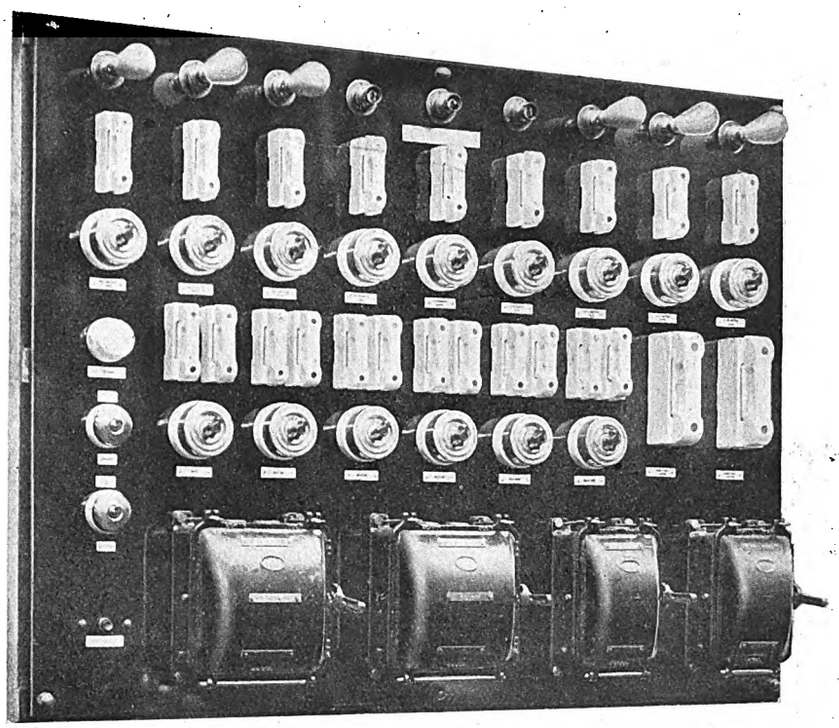

Fig. 3.—Stage switchboard for control of curtain mover, footlights, battens, etc.

then found too heavy for the gear with resultant trouble and sluggish operation.

Silent tracks should always be fitted irrespective of the travel or weight of the curtains, as it has been found by experience that strainer wires are far from satisfactory, and generally prove troublesome. The curtain controls can be either of the push button or single switch type; if the latter, they can be arranged for dual control with change-over switch, so that they can be operated either from stage or operating box.

Whenever possible the motors and gears should be fixed under the stage so as to deaden any noise there may be. The battens for the tracks should, when possible, be fixed to brackets and only slung when this method is not practicable. Where there is a considerable amount of room at the sides of the stage it is sometimes found desirable to the curtain gears to stop in two positions, this can readily be arranged on the controller with the necessary additional operating pushes.

Now that the large screen is coming to the front, proscenium openings should not be less than 45 ft. wide. The depth of stage should be not less than 10 ft. from proscenium to screen with an additional nine feet for sound reproduction horns behind the screen, unless of course a special horn box is built behind the back wall.

Few cinemas are now being built which do not incorporate an organ, and it is usual to install the console on an organ lift. This should always be of the multi-thread screw-jack type built on the cantilever principle.

In conclusion it should be remembered that the lighting of a cinema to-day is part of the "Entertainment" and a good impression of this part has a lasting effect on the audience, as it does not change from week to week according to whether the picture is thought good or bad. Begin with a good, pleasing, and efficient installation, and the first cost will be more than repaid.

SAFETY IN RURAL ELECTRIFICATION.

Fatal Voltages—Insulation the Primary Need—Other Precautions—Proper Construction of Flexible Cables—Danger of Appliances with Metal Handles.

By ALFRED EKSTROM, D.Sc., M.I.E.E.

IN a very interesting article on earthing which appeared in a recent issue of THE ELECTRICIAN, Mr. Gilbert mentioned my name in connection with some opinions about the difficulty of earthing in rural areas. In such areas, where a public water supply system is generally not available, it is very often impossible to obtain, without unreasonable expenditure, earthing connections at the different consumers' appliances which are of sufficiently low resistance to ensure protection should an earthed appliance develop a leakage fault. I propose to set out in this article the arrangements which I consider necessary for this protection.

In certain circumstances an electric installation can be the cause of fire, and can be dangerous both to persons and to cattle. Voltages of only 10 and 20 V are fatal for cattle. In the case of human beings, voltages of 230 d.c. and 50 V a.c. have proved fatal only in very exceptional circumstances. It may, therefore, be unnecessary for electric undertakings giving supplies of energy of 230 V d.c. and possibly up to 115 V a.c. to prescribe any special precautions, such as earthing and the like, for installations connected to their plant.

The case is quite different, however, for undertakings giving a supply of 230 V a.c. The consequence of a person being exposed to such a potential difference on touching two conductors with his hands, or a live conductor and earth, depends to a great extent upon the contact resistance between the person and the conductors, or between the person, the conductor and earth. If it be slight contact, i.e., a high contact resistance, the person can generally liberate himself from one or both the conductors. If, on the other hand, he should grip the conductors with damp hands a low contact resistance results and the person will be paralysed. In this case he will not be able to liberate himself from the circuit as his muscles will have contracted. This may prove fatal. Such a fatality may occur when a person touches with one hand the metal frame of an electric appliance which has a leakage fault, while touching with the other hand some other earthed metal-work. It may also occur when a person is standing on a concrete floor in contact with the soil, or in a bath in contact with earth through the water pipes, and touches the metal frame of an electric appliance which has a leakage fault. Electric undertakings supplying energy of this voltage (230 V) must, therefore, prescribe special precautionary measures in order to avoid fatal consequences due to the occurrence of faults in the connected installations.

The primary precaution in this respect is insulation. The wiring system with accessories and appliances should have all the current-carrying parts covered, as far as possible, with substantial insulating material. Rubber insulated conductors are, therefore, to be recommended:—

(*a*) for concealed wiring placed in conduits,

(*b*) for surface wiring placed in insulated beadings or channellings. C.T.S. cable is preferable in this latter case.

Accessories such as switches, outlets, joint-boxes, fuse-boxes, meter-boxes and meter-boards, should, if possible, be made of or have all current-carrying parts totally covered with bakelite or some similar insulating material.

Electric appliances for domestic use should also be covered with insulating material, wherever possible—e.g., with wood, bakelite, or rubber composition. Standard lamps and portable hand lamps for garages should be either totally covered with insulating material, or constructed entirely of insulating material.

Appliances which, for some reason, cannot be insulated should be placed in a position where anyone using such an appliance is unable to touch any apparatus or construction which is normally earthed, or which may become earthed through the occurrence of a fault. If this is impossible, special protective measures, as described below, must be taken.

When the neutral point of the a.c. three-phase distribution system is earthed, the metal frame of the consumers' appliances

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can be connected to the public water supply system. This form of protection is known as *local earthing*. In rural areas where a public water supply system is not available, the metal frames of the consumers' appliances may be connected to the neutral conductor. This form of protection may be called *connecting to neutral*.

In the latter case it is necessary, however, to make arrangements so that, should a fault occur in the overhead system and cause an undesirable voltage to be transferred to the neutral conductor, the whole of the defective overhead line would be cut out. For example, if the neutral conductor of the overhead system should break, and the part of the line remote from the substation or transformer be left in service, the switching on of only one lamp in this part of the sytsem will transfer an undesirable voltage to the frames of all the appliances connected to the defective line.

The effectiveness of local earthing or of the neutral conductor as a protective device depends, moreover, on the following :—

(1) Adequate and reliable fuses or automatic circuit breakers must be inserted in the different distribution groups of the consumers' installations, so that in case of a fault, or of a defective appliance, the defective part of the consumer's installation would be cut out.

(2) A special protective conductor, independent of the current-carrying conductors (phase and neutral) should be arranged leading from the distribution board throughout all the premises of the installation where protective measures are, or are likely to be, necessary.

This protective conductor should be insulated in the same way as the current-carrying conductors and should be arranged throughout the installation in such a way as to secure an uninterrupted circuit. At the distribution board this conductor should be connected to the water pipe, when earthing is used, and to the neutral conductor of the incoming service line of the overhead system, when the neutral conductor is used as a protective device.

3. Where portable appliances with metal frames are used, the flexible cable connecting them to the wall sockets must be constructed in such a way that the *current-carrying conductors are concentrically surrounded by the protective conductor*. This is necessary, as otherwise if the flexible cable is worn out and its live conductor is touched, a dangerous voltage would occur between this conductor and the metal frame of the appliance. In this case, in fact, earthing has introduced a danger which would be non-existent if the metal cover of the appliance were *not* earthed or connected to the neutral conductor.

The diagram below shows the construction of such a flexible cable :—

Annealed thin copper wires are braided with cotton and surrounded by vulcanised rubber. Two such conductors together with jute filling the interstices between the cores, are first braided with and surrounded by compounded cotton and then concentrically surrounded by a thin layer of annealed copper wires which serve as the third protective conductor. This layer is braided with cotton and surrounded by an outer rubber sheath, and eventually by another braiding of artificial silk or glacé cotton.

The effectiveness of these precautions depends, mainly, on the protective conductor being connected to earth or to the neutral conductor in a reliable manner throughout the installation. Should an interruption occur in part of this circuit where one appliance has leakage voltage, the fuse or automatic switch will not operate, and not only the defective appliance, but the metal covers of all the non-defective appliances connected to the protective conductor, in the interrupted part of the installation, will obtain a dangerous voltage. A periodical test is therefore necessary.

There are, however, circumstances *where neither of these protective devices should be used*, i.e., for toasters or radiators, where it is possible to touch the live element at the same time as the metal framework. In such cases, earthing or the connecting of the metal frame of the appliance to neutral introduces a considerable risk which is greater than the one eliminated by earthing or connecting to neutral.

We may now summarise as follows :—

1. Use insulated installation wiring material, accessories and electric appliances *as far as possible*.

2. Where non-insulated electric appliances must be used try to place them out of reach of earthed constructions.

3. If this latter is impossible, then :—

Provide all such appliances with carefully constructed handles made of insulating material. A handle which has to be grasped firmly by the user is particularly dangerous when it is made of metal and the appliance develops a fault.

4. Where these precautions cannot be carried out satisfactorily, the frames of the metal-covered appliances should be earthed or connected to the neutral conductor.

5. The flexibles used with metal-covered portable appliances must have the current-carrying conductors surrounded by rubber-sheathed concentric protective earth wires, preventing the current-carrying conductors coming within reach on the occurrence of a fault in the flexible.

6. *Apparatus, where the outer metallic sheath does not form an effective earth shield, must not be earthed.* They must only be used in connection with wall-sockets placed in such a position that anyone using the apparatus cannot simultaneously touch the apparatus and an earthed metal construction or another non-insulated appliance which is in use.

7. Where earthing, or connection to neutral is used, the controlling supply undertaking must arrange efficient periodical tests to ascertain that the protective earth conductors in the different installations are in good working order.

This system is obviously not satisfactory—even in a case where a reliable local earthing or connecting to neutral can be carried out—for after the introduction of a number of earthed metal constructions it will be difficult to place the wall-sockets in the position described above. It may, however, be justified in that this difficulty can be overcome by using appliances covered with insulating material. If this should be a failure, or if an undertaking wishes to be ensured of no failure, it would be necessary to introduce another system which has been developed on the Continent during the last few years and which I hope to have an opportunity of describing in a subsequent article on housing.

BOOK REVIEWS.

Electrical Wiring and Contracting, Vol. IV. Edited by H. MARRYAT. (London : Sir Isaac Pitman and Sons, Pp. viii+237.) 6s. net.

Half of this series has now been published, and Vol. IV is well up to the standard of the previous volumes. This volume consists of Sections 14 to 17 inclusive, which deal with Motor Starters and Regulators by H. Cotton, M.Sc., M.B.E., A.M.I.E.E., Private Power Plant, by the same author, Electric Signs by G. A. Wedge, and Estimating by H. R. Taunton, who in a remarkably concise form, covers the all-important subject of estimating in a lucid and readable manner. This is a subject which may well mean the difference between life and death to an electrical contractor.

D. W. T.

Elektrobetrieb in der Textilindustrie. By DR.-ING. WILHELM STIEL. Pp. xiv+652. (Leipzig : S. Hirzel.) 33 marks.

Textiles are a sore subject at present in Britain, and a book on the industry from a Continental standpoint cannot fail to be of interest. It may be of significance that in 1924-25, according to the author, only 26% of the motive power in the English textile industry was electric, compared with 55% in Germany and 68% in the United States ; in the iron and steel industry the figure was 42%, compared with 74% and 72% respectively. The electrification of this country is undoubtedly backward, although the conclusion to be drawn from this fact is hardly the reviewer's business.

Dr. Stiel's book is a most exhaustive treatise, dealing with textile electrification from every standpoint, economical and technical. Electric drive compared with steam ; transmission ; group-drive ; individual drive ; machines and their speed control ; processes ; mechanical details, are among the subjects dealt with. The book has a mixed electro-textile-technological character, since for successful operation the union between machinery, electric drive and textile technology must be of the closest. The author has a substantial claim to combine a theoretical and practical knowedge of all three in his own personal experience. Besides the actual application of electricity to drives, the questions of lighting, heating, ventilation, etc., are discussed. The book is to be recommended on account of its authoritative nature and exhaustive treatment.

S. PARKER SMITH.

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UNEMPLOYMENT AND WORK—III.

Thinking Upside Down.

By SIR ERNEST J. P. BENN.

IT is not easy for a casual observer to grasp all that was in the mind of the artist if a picture is hung upside down, or to appreciate the beauties of a composition from the back of the canvas. Yet we continue day by day to potter about with the unemployment problem with an almost complete disregard of its essentials and a totally inverted view of its nature. If we start at the beginning, and consider an elementary example, this becomes apparent. Suppose we ask: What is a carpenter? Why does he exist? How did he arise? What are the conditions which brought him about? How long will he last? What are his obligations to others and the obligations of others to him? Unless we can answer such questions as these in a way to satisfy ourselves, we admit in advance our incapacity to discuss the employment of a carpenter. When, however, the subject is approached in this simple way, a number of long-forgotten but very obvious truths begin to dawn upon us.

Social Contracts.

The carpenter exists, we observe, as a carpenter because his neighbours are in need of woodwork. As civilisation evolved there gradually developed a sort of social contract between the carpenter and the rest, that if he would provide woodwork as and when the others were in need of it, they, on their part, would supply him with other things in return. An implied condition of the contract, quite essential to its proper working, left it understood on both sides that when the requirements of the neighbours in the matter of carpentering were satisfied, or of the carpenter in the matter of any particular article for which he exchanged his labour were filled, either party was under an obligation to find another market or to render some other sort of service. The whole scheme was built upon the need of the neighbours for woodwork and the need of the carpenter for other things. But now, and that is why I suggest that we are thinking upside down, the needs have disappeared from our discussion and we talk only of the carpenter and his wages. We have allowed our carpenter, and every other supplier of everything, to get into a false position. He says, in effect, "I am a carpenter. I will perform woodwork in such quantities and at such prices as shall be arranged by all my fellow carpenters in union together, and if you other people will not comply with our ideas and our requirements, if at any time you do not want our services on these terms, then we will be idle at your expense. You must continue to supply us with your products, but you can only have ours on our terms. If you do not want our products, then we will offer no others; we will wait until you see the wisdom of complying with our demands." All of which is summed up in the current phrase: "Work or maintenance."

Things are, of course, by no means as simple as this. Centuries of complications have obscured our economic foundations, but the foundations remain and are more essential than ever by reason of the wonderful fabric that has been built upon them. The simple truth that we work for others, however completely we may forget it and however far modern commercial methods may remove us from the others, remains and absolutely governs the whole situation. Until we get a different attitude of mind towards the consumer or the customer, our employment difficulties will continue to increase. At the moment, we have entered a period when it would seem, to judge by our conversation, as if the consumer did not exist, and there was therefore no need to take account of his convenience or opinions. The distance we have travelled along the wrong road is amazing; our minds cease to function, except on behalf of the worker or producer or supplier. This is noticeable not only in industrial discussion but in every question we touch. The other day we had an official inquiry into infant mortality, but the report of the experts, who were supposed to be concerned with the lives of our infants, consisted of a number of recommendations for pensions for midwives.

Whenever we talk of work, we think of the worker and ignore the work; we think of the wages and ignore the price; in fact, we get the picture upside down.

It is commonly agreed that it takes two to make a quarrel, but usually forgotten that in this respect a quarrel differs from few of the rest of human activities. Two at least are necessary for almost any economic process. One man writes, but unless another man reads he writes in vain. The singer who fails to attract a listener is not an economic proposition, and so in all well-ordered affairs you must have a willing buyer and a willing seller. From which it follows that there must be two opposing views of every economic proposition. One side desires to be rid of an article and another desires to acquire it. It is right and proper for me as a publisher to think only of selling books and to strive to sell them on my own terms. But society must think of buying books and endeavour to modify my demands. When two forces are allowed free play in an open market the maximum business follows, but when one or other of them secures a favoured position, an artificial and unreliable state of affairs prevails.

Man does not want work; he wants the product of the work of others, and it is the failure to realise this simple but incontrovertible proposition which is the cause of much of our difficulty. We have hedged the problem round with false issues and lost our way in a sophisticated political maze. Talking to a politician about unemployment is something like talking to a Jew about transubstantiation. There is no basis upon which to argue. The politician's mind is full of constituents who want wages or of manufacturers in search of artificial aids. On the other hand, it is as useless to talk about work to a trade union official or an officer of a Labour Exchange as it would be to discuss the totalisator with a bookmaker.

Like so many other problems that worry us, we want for a successful solution of this one less of the experts and more of common-sense experience. Life is much easier for us than for previous generations, because we have still further developed the processes of dividing labour and of specialisation. It follows, however, that we find ourselves more and more separated as producers and consumers, and it is increasingly difficult for the producer to visualise the consumer or for the consumer to get into touch with the producer of the article he enjoys. As I delight in a cigarette, it is not easy to recognise my obligation to the miner who produced the coal which made the steam to drive the machinery which manufactured the paper to roll the tobacco in. And yet the definite obligation is there. A greater stretch of imagination is called for on the part of the miner, because his coal, for all he knows, may be wanted for baking bread or boiling soap. Nevertheless, the mutual obligation is as definite and clear and irresistible as the obligation between the village carpenter and the blacksmith with whom he exchanges service. In these days of wonderful industrial organisation, we are quite naturally apt to lose sight of the other party and sometimes of the article itself, and give all our interest to the working of the great machine of which we form only an unimportant unit.

The unemployment problem is by no means entirely a working man's affair, and our errors are not by any means confined to the working classes. We are all after Safety First, and we cannot get it. It simply does not exist. It is the fashion to sentimentalise and legislate just as much for the inefficient employer as for the superfluous worker, and both processes accentuate our difficulties. A few more healthy bankruptcies would help our traders to see that safety cannot be secured by trade arrangements; it must be obtained by the harder means of satisfaction to customers.

Recent Experience.

I am quite conscious of the lack of any satisfaction in this line of argument to the father of a family in search of next week's wages, or to the directors of a factory whose machinery is for the moment standing idle. Also I recognise the plight of a Government which in face of such circumstances is almost forced to take some measures to avert disaster. But I protest that unless those measures are taken with a full knowledge and understanding of the real nature of the problem, they are quite certain to make it worse. I can at least point to our recent experience for a justification of this protest. The more we do for the unemployed, the more numerous they become; as things are now arranged, every competent observer expects to see the two millions mark reached before Christmas, and if we go on forgetting the nature of work the numbers will mount in a sort of arithmetical progression.

The sucking of an acid drop may do something to ease the pain of a sore throat, but unless the stomachic trouble, of which the sore throat is only the symptom, is corrected, grave harm may be done. No difficulty seems to stand in the way

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of a right understanding of the subjective method when the problem is concerned with science or medicine. Popular education has taught us to think rightly and to appreciate the difference between cause and effect, and we no longer mistake the symptom for the disease. Is it therefore entirely unreasonable to hope that our modern wisdom in these matters may now be capable of application to our economic troubles as well? Can we not give up this last remnant of the weakness for the quack remedy, and begin to think on scientific lines on unemployment and work? Science always starts at the beginning, with a correct analysis and a formula on which reliance can be placed. Politics, by way of contrast, concerns itself with the froth or fringe and discusses the visible, more often than not without regard to what is underneath.

The whole matter can be summed up in this very simple way: If we turn our attention from the unemployed to the employed, and asked them the question: "Are you giving value? Are you doing your best to satisfy the customer and develop the market in a sound and healthy way?" the whole problem might assume another and more pleasant aspect.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Unemployment and Work."

[To the Editor.]

Sir,—I have read with considerable interest Sir Ernest Benn's second article in last week's issue of The Electrician on "Unemployment and Work," and, although I think it is a little provocative, I agree with much that he says. Personally I regard the unemployment problem very seriously, for, in my small business here, I find very great difficulty indeed in getting sufficient good men. My experience is quite common in this trade, both in the London district and in Coventry and Birmingham. This means, I am afraid, that a very large proportion of the unemployed are below the line of economic employability, and that, as the trend of prices for our goods is slowly downwards, this economic employability line must tend to rise. The sooner this problem is tackled in the proper way the less likely is it to bring us to financial disaster. First, I would divide the unemployed generally into three categories. The first would contain those who are economically employable but, owing to their trade and situation, cannot get work. This type is likely to be found in a mining village, where local pits have closed down altogether. The second would contain the type of man, of whom I have seen a good deal, who is anxious to get employment but is not economically employable, and the third would consist of those who do not desire employment and may be seen in deputations to Boards of Guardians or public assistance committees. Whenever I have mentioned the matter to practical thinkers they have agreed with me, which confirms your condemnation of our lazy way of lumping all the unemployed together.

Although I am a supporter of the Conservative Party, I do not know the definition of a Conservative, but I am quite certain that I am an Individualist and I maintain that there are only two classes of people in this world—Individualists and Collectivists or Socialists. I am not opposed to Collectivism. I simply do not think that it is a practical proposition, for it means the possession of all things by everybody, and I have never yet met a Socialist practising Socialism. If an individual has no right to hold property by himself, a collection of individuals can obviously have no more right either. Were Collectivism a practical proposition, I think I should have no hesitation in overlooking the moral side of the question and in whole-heartedly embracing the Collectivist's creed for, although my undivided share in my collar stud would only amount to a several hundred millionth part, I should, at any rate, enjoy an exactly similar share in everything else with every other inhabitant of this globe. I am a member of a Rotary Club, whose motto is "Service above self," and I do honestly believe that I could work whole-heartedly for the good of humanity without hope of any extra reward, provided everybody else did the same. What makes me an Individualist is my grave doubt about the practicability of Collectivism with human nature as it is and is likely to be for a long time to come. Therefore I feel I have a divine right to hold the property I possess for the time being and that when I am called upon to give an account of my doings it will be from the point of view of what I have done for others. So it must be with this idea in our minds that we, as Individualists, must try to deal with every question.

In my small business I engage and discharge all labour, and, dealing as I do very largely with boys who are just leaving school, I am appalled at the apparent lack of individual responsibility shown by so many parents. I maintain that unemployment is very largely caused in the home, and is quite beyond the handling of teacher, employer or State. Probably the Church can do more than anything else to inculcate the sense of individual responsibility, divinely laid upon us, and all that employer and teacher can do is to work up in its later stages the human material that is provided. If politicians would only grasp the nettle and state clearly and emphatically that they can do far less than the head of the home, I believe that we should, at any rate, start from the right end to prevent this terrible problem of unemployment from getting any worse.—Yours faithfully,

D. G. Ryder.

New Cross, S.E.14,
May 12.

Kaplan Turbines at Passau.

[To the Editor.]

Sir,—In your issue of May 2 I read the account of the interesting installation at the Back River in Canada of the Montreal Island Power Co., consisting of turbines with movable blade propeller runners. An installation of this type, the Kaplan turbine, was erected in 1926 at the Austro-German frontier town of Passau, on the Danube, in connection with the Bavarian electrification scheme. There are eight of these propeller turbines, each rated at 7 350 h.p. normal output and 9 200 h.p. maximum output, the head being 9 m.—i.e., 29 ft. The electrical rating of each generator is 8 500 kVA at 6 300 V a.c. of 50 cycles.

As a result of this installation the navigability of the Danube has greatly benefited, because the water level has been raised by about 6·5 m., over a length of about 25 km., and the strong current of the river reduced.—Yours faithfully,

J. J. C. Berkeley,
Dipl.-Ing.

INQUIRIES AT THE B.I.F.

South Midland Area Committee of the E.D.A. Issues Report.

According to the E.D.A. officer of the South Midland Area, whose report on the British Industries Fair has just been issued, inquiries emanated from Canada, Australia, India and many foreign countries. It is estimated that 2 000 odd inquiries were made at the E.D.A. Kiosk, typical examples being:—(1) From Vancouver B.C.—wanted the name of a British firm making bulb lamps for sun-ray apparatus; (2) a Belgian engineer wanted a certain type of motor; (3) a representative of Hall Engineering works, Sydney, inquired *re* electric welding; (4) an inquiry for an electric dish washer; (5) an inquiry for an electric bird-scarer; (6) flood lighting; (7) procedure when supply authority changed over from d.c. to a.c.; (8) information *re* assisted wiring schemes; (9) electric water-heating; (10) advice *re* an all-electric house. It was difficult to estimate the number of visitors (apart from inquirers) during the Fair, but it is believed that over 5 000 people visited the Kiosk. Three German visitors who signed the visitors' book expressed surprise at the Fair, and especially the electrical section, one remarking that "we have had the surprise of our life; had no idea you had such a Fair in England." The most popular leaflets among the public were "Electricity in the Home"; "Chats on Electricity"; "Electric Helps"; "Is your Larder Safe"; and "The House You Want."

BOOKS RECEIVED.

"Die Elektromagnete." By Erich Jassez. (Berlin: Julius Springer.) Pp. vi+198. 21 marks.

"Machine Drawing and Design." By W. Abbott. (London: Blackie and Son.) Pp. 208. 7s. 6d. net.

"Der Einphasen-Bahnmotor." By Dr.-Ing. Karl Tofflinger. (Munchen and Berlin: R. Oldenbourg.) Pp. 51. 4.20 marks.

"Eiserne Gittermaste für Starkstrom-Freileitungen." By Wilhelm Taenzer. (Berlin: Julius Springer.) Pp. 64. 13.50 marks.

"Abraham's Theorie der Elektrizitat." Vol. I. New edition by R. Becker. (Leipzig and Berlin: B. G. Teubner.) Pp. vii+242. 15 marks.

"The Future of Empire Trade." By J. E. Ray. With a Foreword by the Rt. Hon. L. S. Amery. (London: Sir Isaac Pitman and Sons.) Pp. vii+128. 2s. net.

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NEWS IN BRIEF.

Rockefeller Donation for Royal Institution—Memorial to Sir Joseph Swan—The Electrical Women of Bradford—An Historical Pageant—America's Radio Merger.

It is stated that the Duke of York will visit the Lochaber hydro-electric works at Fort William on July 30.

The telephone service between England and the city of Luxemburg was extended last week to all parts of the Grand Duchy.

The Engineers Club, London, is to be wound up under an Order made by Mr. Justice Eve in the Chancery Division, on the petition of a creditor.

London County Council requires an instructor in the electrical engineering and physics department of the Poplar School of Engineering and Navigation.

The National Guild of Telephonists has passed a resolution protesting against the proposal of the Postmaster-General to employ women telephonists on late night duties.

Barking U.D.C. requires an electricity showroom assistant.

Applications are invited for the position of sales assistant in the Scarborough electricity department.

A chief lecturer is required in the electrical engineering section of the engineering department at Halifax Municipal Technical College.

Ilford Corporation has accepted an invitation from the Metropolitan Cable and Construction Co., Ltd., of Chadwell Heath, to visit the company's works.

The Royal Institution has accepted a conditional offer from the Rockefeller Foundation of £20 000 for the endowment of research in the Davy Faraday Laboratory.

Southwark (London) Libraries Committee has received from the Athenæum Club, a framed bas-relief in copper electro-type of the head of Faraday, for the Michael Faraday Memorial Library.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *of May 15, 1880, the gas interests were already showing signs of alarm at the development of electricity as an illuminant, and anti-electric propaganda was beginning. A statement by "Gas and Water Engineering" was quoted to the effect that doctors were prophesying that the electric light would eventually destroy the eyesight, one medical man claiming to have been blind for three days in consequence of having attended a concert in San Francisco in a hall supplied with the electric light. (As this was before the days of Prohibition, it was probably a smoking concert).*

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of May 19, 1905, recorded the issue of a revised code of the Board of Trade Regulations applicable to electric light and power undertakings. The new regulations sanctioned the delivery of extra high pressure to factories, mines or electric traction installations and clarified the rule as to permissible leakage on high pressure cables. It was provided that overhead lines could only be erected in accordance with plans approved by the Board of Trade.*

The L.M. and S. Railway Co. has arranged for the installation at the Prince of Wales Dock, Swansea, of an electric belt conveyor, capable of shipping about 700 tons of coal an hour.

A forthcoming examination of candidates for appointment as probationary assistant engineers in the engineering department of the Post Office is announced. Application forms from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1.

The first edition of "Westelco," the Westminster Electric Supply Corporation's new staff magazine, has now been issued. It contains a number of instructive and amusing articles and information relating to the staff's sports club, pension fund, co-partnership scheme, etc.

It is stated in the monthly report of the Lancashire Federation of Utility Poultry Societies that much success has attended the introduction of electric brooders in the district. It is stated that on one farm an electric bell rings in the house when a fuse on the poultry rearing circuit blows.

The charges for telephone communication from Great Britain or Northern Ireland to any place in North America have been reduced by £1 per minute. The charges now vary from £6 to £9 for 3 minutes, with *pro rata* charge per additional minute. The report charge is 12s. instead of £1.

In reply to an inquiry by Dr. G. de Gelder, of Amsterdam, Mr. R. Borlase Matthews has written a letter in which he describes his experiments to determine the effect of electric light and heat on bees. To get the blossom in the apple orchards better fertilised and to obtain an increased yield of honey, he says, the hives were placed in a house which was lighted and warmed, the bees were attracted out, flew around, fed on the syrup and water provided, and picked up some of the artificial pollen set out for them. Then the queen bee laid her eggs early, with the result that a strong breed of young bees was ready to attack the apple blossom harvest. This meant an increase of eight kilos of honey per hive per annum.

Weymouth Beach Committee has decided that the shelters on the esplanade be electrically illuminated, at a cost of £190.

Salford Watch Committee has found the police boxes in the Broughton and Pendleton districts so satisfactory that the system is to be extended to the Salford or "A" division.

A technical officer, with university degree in engineering or its equivalent, and with experience in design of telephones bells, etc., used in low power signalling systems, is required for an Admiralty establishment in London.

At the new Oxo factory at Blackfriars, London, there is an electric "OXO" sign, the letters of which are over 10 ft. in height. The nine floors of the building are electrically lighted and heated, and the equipment of the works includes 16 cranes and six overhead runways, all electrically controlled.

An electric organ blower has been installed at St. Mary's Church, Brecknock.

Two engineering and distribution assistants are wanted in the Hampstead electricity supply department.

Members of the Bradford Branch of the Electrical Association for Women had their first outing on May 3, when they visited the all-electric dairy farm of P. Hudson and Son, Carleton, near Skipton.

The National Committee of the Amalgamated Engineering Union, at its meeting last week, rejected a resolution to instruct the Executive Council to withdraw from the engineering joint trades wages movement.

Telephone communication is now available between all parts of Great Britain and the principal towns in the provinces of Buenos Ayres, Cordoba and Santa Fé, Montevideo and Santiago, Valparaiso and Vinadelmar.

It is expected that when the Prince of Wales visits Sunderland on July 3 he will unveil a bronze tablet which is to be erected in the hall of the Central Public Library to the memory of Sir Joseph Wilson Swan, the inventor of the electric incandescent lamp. The committee which has the memorial in hand hopes to raise sufficient funds to establish a local scholarship and a national lectureship as well as to erect the tablet.

It is reported that the United States Department of Justice has filed a suit to test the legality of the merger of the Radio Corporation with the radio interests of the Westinghouse Electric and Manufacturing Co. and the General Electric Co. of New York, and the legality of the arrangements existing between these companies and the American Telephone and Telegraph Co., Western Electric Co. and other companies.

An historical pageant will take place in connection with the Josiah Wedgwood Bi-centenary celebrations at Stoke-on-Trent next week. On the opening day, Mrs. C. H. Yeaman, wife of the City Electrical Engineer and herself an ex-member of the Borough Electrical Engineer's office staff, will enact the part of Queen Erminilda on Monday (when Princess Mary will be present), and on Tuesday and Thursday. An electrical exhibition will be held in the Fenton town hall during the week, and the town halls of Burslem, Hanley and Tunstall, and the offices of the electricity department and the North West Midlands J.E.A. will be illuminated electrically.

A National Safety Congress to be held at Liverpool from May 21 and 22, will be opened by the Duke of York (president of the Association). Sir Henry P. Maybury will speak on "The Development of Roads and Road Transport with Special Reference to the Prevention of Accidents," and Mr. Robert Beveridge, inspector of lighting and cleansing, Edinburgh, and member of the council of the Association of Public Lighting Engineers, will read a paper on "Street Lighting and Illuminated Traffic Signals."

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PERSONAL.

MR. Roy, electrical engineer at Wick, has been granted an increase of £52 per annum by the Town Council.

The late Mr. Arthur Greenhow Lupton, chairman of the Yorkshire Electric Power Co., left £83 010; net personalty £81 906.

Mr. A. W. Makovski, of Tamplin and Makovski, Ltd., has been re-elected president of the Reigate and Redhill Chamber of Commerce.

Mr. John Barnard, general manager of Bolton Tramways, has been appointed secretary of Lancashire and Cheshire Transport Authorities' Council.

Mr. Thomas Mensforth, works manager with the Darlington Rolling Mills Co., Ltd., has been appointed electrical engineer with Dorman Long and Co., Ltd.

The General Electric Co., Ltd., announces that owing to ill health Mr. P. Howard has resigned his position as general manager of their Singapore branch, and that Mr. R. C. Giggins, of their Kuala Lumpur branch, has been appointed to fill the vacancy.

Owing to pressure of work in connection with extensions at the generating station, Mr. A. J. Fuller, borough electrical engineer, will be unable to attend the conference of the Association of Public Lighting Engineers in September, and Mr. J. F. White, mains superintendent, will attend in his stead.

The Lord President of the Council has appointed Sir Ernest Rutherford, F.R.S., to be Chairman of the Advisory Council of the Department of Scientific and Industrial Research, in succession to the late Sir William McCormick, F.R.S., as from October 1, 1930. Prof. V. H. Blackman, F.R.S., will serve as Chairman until October.

The Begbie Challenge Cup, competed for annually by the Committee of the Engineering and Allied Employers' London and District Association, was won at Richmond Golf Club on May 6 by Mr. A. Vines, President of the Committee and managing director of Evershed and Vignoles, Ltd., with a score of 150 for two rounds.

Leyton Town Council has adopted a recommendation by the Electric Lighting and Tramways Committee that having regard to the increase in the responsibilities placed on the electrical engineer and manager, Mr. J. W. Speight, and to the increased volume of business since his appointment, his salary be increased to its maximum of £1 050 per annum on July 1 next, instead of on July 1, 1931.

Burnley Electricity Committee has interviewed three of 73 applicants for the post of demonstrator at the electricity showrooms. The post as originally advertised failed to attract suitable applicants, and it was again advertised at an increased salary. Miss I. M. Ward (Harrogate), for 12 months head demonstrator and showroom assistant to Harrogate Corporation, who has had previous experience with the Credenda Conduits Co., was selected for the post.

Bedford T.C. has received from the Electricity Committee a report that the salaries of the technical staff should be increased as from July 1 next owing to the station having been transferred from class E to class F, as follows: Mr. N. Flemming, station supt., from £505 to £526; Mr. A. A. Nimmo, mains engineer, from £448 to £467; Mr. A. Wilson, assistant station supt., from £373 to £403; Messrs. F. H. Boud, A. H. Jones, H. Bush, J. Thompson, N. Boydell, J. McD. Tait, J. Blaikie, B. Crowsley, and J. Harvey, engineers, from £314 to £340; and Mr. R. V. Hepworth, mains assistant, from £244 to £264.

Speaking at the general meeting of the South Wales Power Co., Ltd., on May 9, Mr. W. North Lewis stated that Mr. J. W. Beauchamp, the company's engineer and manager, had been offered and had accepted an important position under the Central Board in connection with the South West England and South Wales Electricity Scheme. Readers will remember that Mr. Beauchamp was the originator of the B.E.D.A., and left that association in January, 1928 in order to join the South Wales Power Co. Before joining the E.D.A. he was engineer and manager at West Ham and was succeeded in that position by Mr. F. W. Purse. See page 629.

Obituary.

MR. WILLIAM M'KAY, aged 70 years. He was, until his retiral, electrical engineer at Dunbeath Castle.

MR. JAMES BLACKWOOD WILSON, on May 1, aged 76 years. An ex-Provost of Kilmarnock, he was convener of the committee which inaugurated electric lighting and tramcars in the burgh and was a member of the Ayrshire Electricity Board.

BUSINESS ITEMS.

FALK STADELMANN AND CO., LTD., have opened a new branch at 15–19, New Station Street, Leeds.

The makers or the London agents of the "BIRUM" vacuum cleaner are requested to communicate their address to the Editor.

THORPE AND BOSCO, LTD., announce that the name of this company has been changed to THORPE AND THORPE, LTD., the address being 38, Broad Street, Golden Square, London, W.1.

MR. J. H. CHARLESWORTH, late partner in the firm of CHARLESWORTH AND WHISTON, electrical engineers, of 12, West Street, Crewe, has commenced business on his own account at 18, Hightown, Crewe.

The Adelaide branch of the BRITISH GENERAL ELECTRIC CO., LTD., Australia, has been moved from "Magnet" House, 21, Pulteney Street, to Industrial Building, King William Street, Adelaide.

The "New Imperial" machine ridden by E. A. Mellors in the Leinster "100" road race, which won at a speed of 66 m.p.h. and, irrespective of class, made the fastest time of the day as well as being the fastest in the 250 c.c. class, was fitted with a B.T.H. magneto.

The PREMIER RADIATOR AND ENGINEERING CO., LTD., Skerne Works, Albert Hall, Darlington, has received orders for the water-cooled transformer oil coolers for the new Battersea power station, and also has in hand coolers fo the air blast type for the South East, Central and N.W. England sections of the grid.

Readers will be interested to hear that "Met-Vick" ultra-violet ray, high frequency and radiant heat appliances, as well as their "Savage" health motor, were conspicuous factors in the training of the successful Arsenal football team. Each member of the team had regular sunbaths of two-minute periods with the 12 A quadrupel arc ultra-violet ray set, "Met-Vick" high frequency apparatus and radiant heat lamps being exclusively used in the way of massage and local treatment for sprains, bruises and minor injuries.

In connection with the twin-screw motor-ship "Tuscan Star," which has recently started on her maiden voyage to South America, it is stated that the vessel has the largest refrigerated capacity of any craft afloat. Most of the electrical equipment was supplied by the GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, W.C.2. The G.E.C. plant includes main generators, nearly 60 motors, and switchboards; electric cooking equipment; the whole of the switches, wall plugs and sockets, and also cabin heaters.

SUSSEX CONTRACTORS.

Annual Dinner of the Sussex Branch of the E.C.A.

PROPOSING the toast of "The Electrical Contractors Association and Allied Associations" at the annual dinner on May 10 at the Royal Pavilion, Brighton, of the Sussex Branch of the Electrical Contractors' Association, Mr. A. J. Ryan, of Hastings, referred to the success of co-operation in the various sections of the industry in promoting that all-electric age which was ultimately bound to arrive.

Mr. H. Willoughby Ellis, president of the E.C.A., in reply, applied the term of "fantastic dream" to the fears of those who seemed to think that on account of the extension of the "grid" under the national electrification scheme, chief engineers would be able to devote their time to wiring and sales, to the detriment of the electrical contractor. In his opinion the electrical contractor stood in no danger, and not 17% of the houses were properly wired.

Mr. H. L. Holford, of Hove, submitted the toast of "The Engineers of the Sussex Supply Stations," and in response Mr. J. K. Brydges, of Eastbourne, said there were six or seven municipal generating stations in Sussex and other smaller stations. He had at Eastbourne endeavoured to place as much work as possible in the hands of the local contractors and there were 1 000 electric cookers in Eastbourne alone.

A collection was subsequently taken up on behalf of the Electrical Trades Benevolent Institution.

E.C.A. CONFERENCE.

The papers to be read at the E.C.A. conference, which opens on June 25 at Llandudno, are, on June 26, "Future of Electrical Contracting," by Mr. C. H. Flower, and on June 27, "Specifications and Their Problems," by Mr. W. Cross. The remaining details of the conference were published in our issue for April 18.

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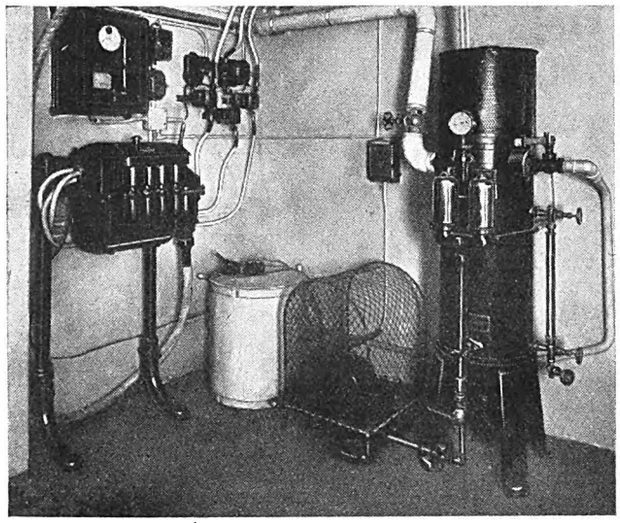
THE WHITE HOUSE.

An Interesting Installation on the Site of Original Grosvenor Galleries.

THE White House (Maison L. Giraud), 51, New Bond Street, London, W.1, which at one time formed part of the Grosvenor Galleries, and where once Michael Faraday had a work-



The Mascarini boiler and its controls as installed at the White House.

shop, is a business specialising in high-class lingerie and household linen, which has been established in Bond Street for twenty-four years. Expansion of business has necessitated increased accommodation, with the result that adjoining premises have recently been occupied and structural alterations carried out, making the shop one of the finest and most modern of its type in New Bond Street.

An entirely new shop front has been installed with modern window lighting by means of concealed silver glass reflectors, with cornice lighting in the entrance between the windows. The whole of the shop interior has been entirely re-constructed and re-decorated and new lighting up to modern standards installed. The heating of the entire premises is carried out by means of an electric panel system controlled by thermostats.

In order that the products of this house shall reach the public in the best condition possible, a laundry has been installed in the basement wherein all articles for sale are laundered and finished. The steam supply to this laundry presented some little difficulty, but was finally overcome by the installation of a 120 kW Mascarini electrode boiler. This is the first installation of this type in the country and has now been functioning for three months with entire satisfaction. The boiler is automatic in operation, the load taken from the mains being self-regulating according to the demand made for steam upon the boiler. Steam can be raised from cold within five minutes. The boiler is operated by the forewoman of the laundry who has no difficulty in carrying out the simple operations required for starting and shutting down. Steam is supplied at a pressure of sixty pounds per square inch to such machines as a rotary washing machine, a drying cupboard, a large 110 in. calender and a small 36 in. calender. Over the sinks where hand washing is done, is fixed a large Bastian thermal storage water heater. Should the demand be greater than this tank can handle water can be heated by blowing steam directly through the water in the sink.

The whole of the hand ironing is done by cordless type electric irons made by the Dowsing Radiant Heat Co., Ltd. These are of various shapes and sizes and are used in conjunction with control panels into which the irons are placed for heating up. These panels consist of a switch and pilot light and special contacts, which when the irons are placed on the stands make contact with lugs on the irons and so supply current to the elements. The canteen in which meals are supplied for the staff is equipped with "Jackson" electric cookers and small griller boilers for additional grilling.

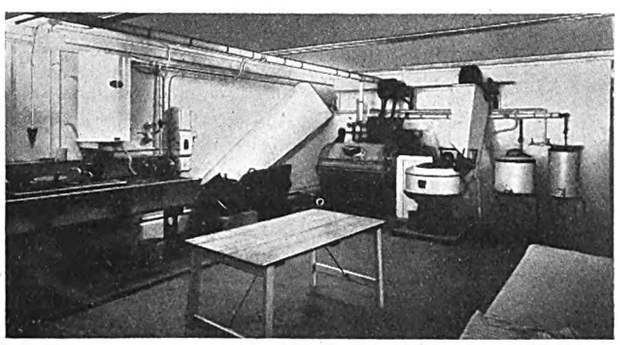
The premises are now completely electrified, there being no other form of either heating, lighting or power supply. The architect to the building is Mr. Billery, the consulting engineers, Messrs. Lucas and Pyke. The Mascarini electrode boiler was supplied by the Bastian Meter Co., Ltd., who also supplied the thermostatically controlled water heater. The installation was carried out by Griersons, Ltd., whilst Braithwaite and Co., Ltd., installed the laundry apparatus.

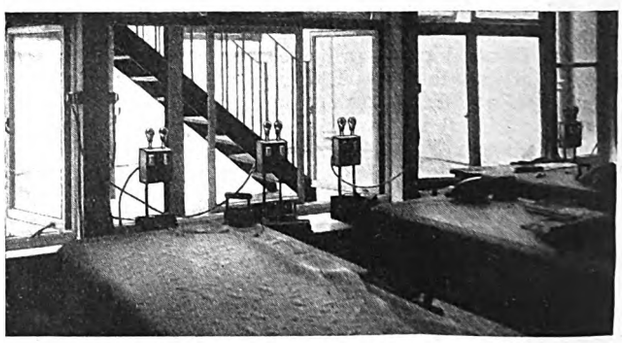
The connected loads of the installations are:—Lighting, 34 kW; heating, 81 kW; power, 8 H.P.; cooking, water, heating and iron heaters, 52 kW; and electrode boiler, 120 kW. It is interesting to note that 8½ miles of conduit and 10¼ miles of cables have been used in the lighting and heating installation, while the low temperature "Dulrae" tubular warming panels have a total length of 1½ miles of heating tube installed. This represents 183 warming panels having a total radiating surface of 2 700 square feet on the ceilings. The total cube of the rooms warmed is 211 600 cu. ft. Therefore, the heating load works out at approximately 0·38 W per cubic foot overall. Sufficient warming surface has been installed to maintain a temperature rise of 30 ° F. above the outside air, in showrooms, offices and workrooms, which are all controlled by means of thermostats, and a rise of 10° F. in storerooms, which are switch controlled. The heating tubes have a loading of 10 W per ft. run, and are spaced four inches apart. They consist of an element wire threaded through glass lined steel tubes, and the ends of each panel terminate in an octagonal header box to which the circuit conduits may be connected. Sheets of cork are attached to the joists and the panels are fixed on top of these. Expanded metal lathing covers the panels and the whole is embedded in the ceiling plasterwork, a suitable plaster being used for this.

THE EAST END HOSTELS ASSOCIATION.

A very distinguished company will assemble at the Mansion House on May 27 to hear the Lord Chief Justice and Mr. J. H. Thomas on the subject of the John Benn Hostel. Among those who have intimated their intention of being present we notice Lady Astor, M.P., Lord Clive, Lord Pentland, Sir John Barran, Mr. Max Bonn, Sir Harold Bowden, Mr. Geoffrey Duveen, Don Agustin Edwards, Mr. Gerald France, Sir Harry Hepburn, Sir Robert Kindersley, Dr. Herbert Levinstein, Sir Percy Mackinnon, Sir William Noble, Mr. Handley Page, Sir Denison Ross, Sir Henry and Lady Rothband, Air Commodore C. R. Samson, Sir Edward Stockton, and Commander H. S. H. Ellis.

Viscount Astor is presiding at the dinner and will receive the guests, and among the other speakers are the Rt. Hon. Wedgwood Benn, Lord Feversham, Mr. R. C. Sherriff, and Miss Haldane.





TWO further views of White House. On the left are seen the thermal storage water heaters over the sinks, and on the right are clearly shown the ironing facilities.

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DOMESTIC ELECTRICAL APPLIANCES.

Many New Items to Interest the Contractor—Further Batteries and Valves for Radio Trade—A Bagless-type Cleaner.

A NUMBER of new lines for public consumption have been placed on the market recently and among these may be mentioned a high tension battery made up of a series of nickel-iron cells. The battery is intended for use with radio receivers and is kept charged by means of the low tension supply. The makers are HENRY MILNES AND CO., Ingleby Works, Brownroyd, Bradford, whose London agents are J. T. HAYTER AND CO., 30, Victoria Street, S.W.1. The "Milnes" unit, as it is called, employs "Alklum" nickel and steel plates, which are immersed in a steel preserving alkaline solution, and it is worked in conjunction with a series parallel switch. When the receiver is required for use the switch on the h.t. unit is moved to the correct position indicated, when the cells become series connected. In the "charge" position the cells assume parallel connections in groups of five.

H. E. ASHDOWN (BIRMINGHAM), LTD., have recently placed on the market an ingenious new type of adjustable 2-pin plug which is practically universal in its instant adaptability to all sizes of sockets. This plug—made of bakelite—is of substantial construction, shockproof throughout, and is simple in operation. Pins are automatically adjusted to hole-spacing of socket merely by turning the knurled outside ring, thus obviating the dangerous practice of finger adjustment with its risk of touch contact. The pins, which are removable and interchangeable, are of 3, 5 and 15 A. capacity and any intermediate sizes. The advantage of this type of plug will be instantly appreciated by all sections of the trade, since its universal adaptability obviates the necessity of carrying stocks of different capacity plugs. Facility of wiring is another strong feature. It is only necessary to unscrew the cap when wires can be immediately attached to the easily accessible pin terminals, while efficient cord grip is ensured by the cap-moulding screwing down on to the flex which passes through a slot in the thread.

Contractors whose business includes the installing of wireless in privately owned yachts, boats, etc., will be interested in the new portable equipment for communication by means of telephony or telegraphy on short wave lengths which has been produced by MARCONI'S WIRELESS TELEGRAPH CO., LTD. (Marconi House, Strand, London, W.C.2). It is known as the Type S.P.2 set, and works on wave lengths between 30 and 80 metres. The 10 W power for the transmitter is provided by a small hand-driven generator, the containing case for which is provided with a padded top and folding feet, so that it will form a convenient seat. The metal mast when complete is 28 ft. high; it is stayed rigidly at the centre. An ingenious arrangement allows a part of the mast to be used as the aerial itself for wave lengths between 45 and 80 metres. The upper part of the mast is insulated from the lower part and connected to the instrument box by a downlead 15 ft. long. When it is desired to communicate on any wave length between 30 and 45 metres, the top part of the mast can easily be removed, and the lead from the centre forms the aerial. The equipment is divided into three loads.

To meet the need for an extra large power valve the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C., has produced the L.S.6A, valve, stated to possess the same advantages as the L.S.5A., but with an output equal in that given by two paralleled L.S.5A. types. When operating the new valve the makers point out that provision must be made for sufficient air circulation to prevent overheating, in that the anode dissipation can be as much as 25 W. The maximum permissible anode current is 63 mA and alteration to grid bias voltage, insertion or removal of the valve from its socket should not be attempted unless the power supply is first disconnected. Some conception of the characteristics of the valve can be gathered from the following table:—

Volts on Anode.	Approx. Anode Current mA.	Average Negative Grid Bias. Volts.
400	63	93
350	60	78
300	55	63
250	47	50
200	40	36

The mutual conductance of the valve is good, the normal slope being 2·3 mA/V; the impedance at 100 V with zero grid volts is 1 300 ohms. The amplification factor is 3·0.

Another valve introduced by the General Electric Co. is the P.2, recommended particularly for use in portable sets. This valve is specially designed to give the output of a super-power valve, with, at the same time, the least possible increase in h.t. current. With an h.t. voltage of about 100, and negative grid bias of about 6 to 7½ V, the anode current is said to be little more than that of an ordinary small power valve, while the quality of reproduction due to the low impedance and high mutual conductance of the P.2, will, it is claimed, be equal to that provided by a super-power valve working under the same h.t. conditions. If used in a table type of set working from 2 V batteries, in which super-capacity dry batteries or an h.t. eliminator can be employed, the new valve can operate a moving coil loud speaker if required.

An interesting demonstration of a new cleaning apparatus was recently given to our representative by AIR-WAY, LTD., of 15-19, Cavendish Place, London, W.1. The "Air-Way Sanitary System" is a combination of vacuum cleaner, blower and floor polisher, and the main features claimed for it are light weight, the absence of attachments and the elimination of the ordinary bag. The cleaner has a self-adjusting floor nozzle mounted on sprung wheels; agitators of Egyptian fibre are used, having diagonally crossed channels in the horizontal plane, disposed at angles of 45° with the direction of motion of the cleaner.

A special point possessed by the Air-Way is a glass window which serves the dual purpose of an indicator to show when all dust has been collected (since the stream of incoming dirt is claimed to be visible) and of acting as an interchange lever. The circular glass bears an arrow and by turning the cap the direction of suction is reversed. The machine can then be used as a blower by connecting a flexible tube in one position, or as a suction cleaner for dusting furniture, etc., by connecting the tube to another outlet the handle of the Air-Way is hollow and one method is to attach the tube to its top end. Suction or blowing force may be regulated by turning the dial to a greater or less degree. An attachment is provided for introducing disinfectants if desired, when the machine is used as a blower. The bag is eliminated by the provision of a replaceable container of cellulose fibre, which is destroyed when it becomes full of dirt. It normally becomes full after about a month of use, and 12 containers are supplied with the cleaner.

THE NATIONAL REGISTER.

Fifteen Names Added to List at Last Executive Meeting.

A MEETING of the Executive Committee of the National Register of Electrical Installation Contractors was held on May 2 when application for registration by electrical installation contractors numbered nineteen. Of this number one application was withdrawn and the Executive Committee declined three.

The names of the successful applicants, together with their addresses, are as follows:—

Fowler, John E., Corn Exchange Buildings, Market Street, Wakefield.

Cooper, Ernest, 1002, Stratford Road, Hall Green, Birmingham.

Kempster, Fred, 11, Edward Street, Bury, Lancs.

Outhwaite, Elijah A., 34, Wade Yard, Wade Lane, Leeds.

Prior, T., and Sons, 5, Blenheim Terrace, Leeds.

Baker, George Edward, 79A, York Road, Leeds.

Burdette and Co., Ltd., 5, Pocock Street, Blackfriars Road, London, S.E.1.

Carlisle, John, and Son, 28, Headingley Lane, Hyde Park Corner, Leeds.

Tipping, George O., 168, Cape Hill, Smethwick, Staffs.

Bartley, C. J., and Co., Ltd., 11, Queen Victoria Street, London, E.C.4.

Goddard, Walter G., Birmingham Road, Bromsgrove, Worcs.

Robson, Richard, 37, High Street, Willington, Co. Durham.

Western Engineering Co., 162, Stanley Road, Liverpool.

Hopkins, G., and Sons (Clerkenwell), Ltd., 40-52, Holloway Road, London, N.7.

Chapman, Lowry and Puttick, Ltd., electrical engineers, Haslemere.

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THE E.D.A. AND AMERICA.

Representatives to Visit U.S.A.—Supply Undertakings Policy to be Studied.

THE British Electrical Development Association has decided to send Lt.-Col. W. A. Vignoles and Mr. H. T. Young to America. Col. Vignoles will study policy and public relations in the electricity supply industry in the United States and Mr. Young will investigate electrification of industry and applications in the daily lives of American citizens. Their reputations justify the belief that this visit, which will include attendance at the annual conference of the N.E.L.A., being held this year in San Francisco, will have the effect of accelerating electrical development in England.

Col. Vignoles' record includes the past presidency of the Incorporated Municipal Electrical Association and among his present duties are those of Director and Secretary to the British Electrical Development Association. He served his apprenticeship with Messrs. W. T. Goolden and Co., electrical engineers, and in 1893 he was in full charge of an electrical coal cutting installation at Durham colliery. For over twenty-five years he was electrical engineer to Grimsby Corporation. After the war he carried out a scheme for the extension of the Grimsby electricity works which he had submitted in 1914. Until then the whole of the supply had been d.c. His scheme provided for generation at 6 000 V alternating current resulting in a large reduction in the cost of generation.

Mr. H. T. Young is a member of the council of the E.D.A., the Illimunating Engineering Society and the Institution of Electrical Engineers. He is also an active member of the Electrical Contractors' Association. His firm, Troughton and Young, Ltd., has been established in the West End of London over twenty years. Mr. Young was trained in the contracting side of the industry and has a wide experience in all forms of electrical applications. He was one of the first to assist in placing radio equipment in the hands of the public. More recently he has done a great deal of successful pioneering in architectural lighting design and established the first showroom in Europe for the display of modern lighting fittings in a modern setting. (See page 629.)

THE SOCIAL SIDE.

THE St. Helen's Cable Co., Slough, football team has won the Slough Town Cup for the second year in succession. It has also won the championship of the Windsor, Slough and District League.

Ald. W. H. Perkins, president of the Oxford Electric Co.'s football club, at the annual dinner, presented the Married v. Single Cup to Mr. F. Jones, captain of the single men's team He also handed a fountain pen to the secretary of the club, Mr. S. Wright, and an attache case to Mr. W. Sumersford. The first eleven has tied for the second position in its division of the County league, and the second eleven has won seven and drawn one out of eleven matches.

Members of the Field Station Department of the Marconi Company, held the first annual reunion dinner at Romano's Restaurant, London, on April 25. This department was started in 1907 and in 1921 formed the basis of the present field and air division, and it is worthy of note that of the original members of the F.S.D., Col. J. E. Cochrane, Mr. C. E. Prince and Mr. R. D. Bangay were present. Out of about 50 members of the department, 24 were present at the dinner, which was followed by a concert arranged by Mr. A. B. Stapleton and contributed to by Mr. E. E. Hughes, Mr. F. Munnion, Mr. E. Praill and Mr. G. E. Daggett. It was unanimously resolved to form a Dinner Club of all ex-members of the department and to hold the dinner annually. In order to communicate with as many ex-members as possible, Mr. A. Shore, of Marconi House, Strand, would be glad to hear from any members not notified this time, owing to their present address being unknown.

ELECTRICAL BALLADS.

Some of our readers will remember the "Electrical Engineer's Ballad Book," which was published by Biggs and Co. in 1907 and is now out of print, and will be interested to hear that the CROYDON CABLE WORKS, LTD., of Mitcham Road, Croydon, Surrey, have published in handy pocket form a stiff-backed book containing a number of reprints of the original verses

TRADE PUBLICATIONS.

MESSRS. SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham, have published a new conduit price list, No.1 201.

Specification No. A. 504 relative to a.c. switchboards, flat back type, has been issued by CROMPTON PARKINSON, LTD., Guiseley.

A special leaflet dealing with the new "Philips Merchandiser" has been issued by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2.

Specification No. A 608 dealing with instrument current transformers, ring type, has been sent to us by CROMPTON PARKINSON, LTD., Guiseley.

H. O. SWOBODA, INC., of 3 400, Forbes Street, Pittsburgh, Pa., have issued bulletin No. 190 dealing with "Falcon" furnaces and superseding No. 140.

The current monthly blotter of the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1, illustrates the "Junior" table cooker.

White enamelled electric bath-room fittings are dealt with in list No. P.1390 just issued by FALK STADELMANN AND CO., LTD., 83/93, Farringdon Road, London, E.C.1.

The "Igranic" transverse current microphone and control unit is the subject of publication No. 6651 by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.

MR. ALAN WRIGHT, of 117, Victoria Street, London, S.W.1, has sent us a new leaflet dealing with "Inventum" immersion heaters with thermostatic control and loadings of 1 000, 2 000 and 3 000 W.

"Are you Ready for the Big Load?" is the title given to a new issue by the W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1, relative to "Isco" ironclad service cut-outs.

A new price list dealing with this season's fans has been published by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4. The list is numbered 433 and supersedes No. 201.

The FULLER ACCUMULATOR CO., LTD., Chadwell Heath, Essex, has issued list No. 104 dealing with "Sparta" batteries, and list No. 105 showing suitable "Sparta" batteries for various makes of cars of different years.

The LIVERPOOL ELECTRIC CABLE CO., LTD., Linacre Lane, Bootle, Liverpool, has published catalogue No. L.E.C. 2, dealing with the company's new all-bakelite accessories for use in connection with the "Lecite" wiring system.

The March issue of "VES MITTEILUNGEN," issued by the Vereinigung Elektrotechnischer Spezialfabriken, of Berlin, a union of German electrical manufacturers, contains articles on the Leipzig Fair and on "Service to the Customer," Voigt and Haeffner's protective apparatus, Prometheus household heating and cooking apparatus; Ziehl-Abegg silent motors; Aron tariff meters; Garbe, Lahmeyer induction motors for tramways and railways; the manufacture of enamelled wires by the Deutsche Kabelwerke A.G.; Bayeruchi Elektricitäts Werke d.c. high tension generators; an enclosed distribution system, by the firm of F. Klockner; measuring instruments by Dr. Siegfried Guggenheimer Aktiengesellschaft; automatically controlled motor generators, by Lloyd-Dynamowerke A.G.; automatic cut-outs, by Nostitz and Koch; electromagnetic switchboard instruments, by Excelsiorwerk Rudolf Kiesewetter; Kolner accumulators; Hackethal cables; mirror galvanometers by Geb. Ruhstrat A.G.; Siefert Rontgen-ray metal-heating equipment, etc.

OVERSEAS TRADE.

Four Month Electrical Exports Exceed Imports by Over £3 250 000.

UNITED Kingdom exports of electrical apparatus, machinery and materials during April last amounted to £1 410 763, as against £1 674 149 during April, 1929, a decline of £263 386. Electrical exports for the four months of the year amounted to £6 414 171, as compared with £6 123 591 for the same months of 1929, an increase of £290 580.

Imports of electrical goods and machinery during April last were valued at £652 765, as compared with £543 237 during April, 1929, an increase of £109 528. Similar imports for the four months of this year amounted to £3 136 300, as against £2 222 172 during the corresponding period of last year, the increase being £914 128.

These figures show that during April electrical exports exceeded similar imports by £757 998, while during the four months exports were in excess of imports by £3 277 871.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

AMALGAMATED ANTHRACITE COLLIERIES, LTD.—Six months' supply of electrical goods, etc. Particulars from the Controller of Stores, Eagle Chambers, Swansea; stamped, addressed envelope to be sent.

GLOUCESTER CORPORATION.—Manufacture and supply of electric cooking apparatus, for the purposes of the Corporation's hire-purchase scheme. Further particulars from the City Electrical Engineer, Commercial Road, Gloucester.

GAINSBOROUGH URBAN DISTRICT COUNCIL, May 16.—Twelve months' supply of paper insulated, lead covered, double steel tape armoured l.t. cables; and single-phase and three-phase meters. Further particulars from the Engineer and Manager, Electricity Department, Lord Street, Gainsborough.

GLASGOW CORPORATION, May 16.—Six months' supply of electrical fittings to the public assistance department. Specifications, etc., from the Contracts Department, 266, George Street, Glasgow.

TOTNES CORPORATION, May 16.—Electric motor and centrifugal pump. Particulars from the Borough Engineer.

WARWICKSHIRE AND COVENTRY JOINT COMMITTEE FOR TUBERCULOSIS, May 16.—Supply of a.c. motors, switchgear, wiring, etc., at the King Edward VII Memorial Sanatorium, Hertford Hill, near Warwick. Specifications, etc., can be seen at the offices of Mr. A. B. Mallinson, consulting engineer, 44, Brazennose Street, Manchester, and will be supplied to contractors furnishing references of similar work carried out; deposit £2 2s.

CHERTSEY RURAL AND CHERTSEY, WALTON, WEYBRIDGE AND WINDLESHAM URBAN COUNCILS' HOSPITAL COMMITTEE, May 17.—Electric light installation at Ottershaw Isolation Hospital. Specifications from Mr. F. J. Wareham, clerk, Council Offices, West Byfleet, Surrey.

ECCLES CORPORATION, May 17.—Twelve months' supply of single phase house service integrating watt-hour meters. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft; deposit £1 1s.

SALFORD CORPORATION, May 17.—Transfer of existing X-ray apparatus and installation of new apparatus. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

EAST GRINSTEAD URBAN DISTRICT COUNCIL, May 19.—Supply and erection of second-hand Diesel oil engine, suitable for coupling to 320 kVA, three-phase, 50 period alternator. Tenders to Mr. G. E. Coldwell, Council Offices, London Road, East Grinstead.

ATHERTON URBAN DISTRICT COUNCIL, May 20.—Supply of one 200 kVA, single-phase, oil-cooled transformer, 2 400/240 V, 50 cycles. Particulars and form of tender from Mr. B. Darby, electrical engineer, at the Council's sub-station, Atherton.

BAKEWELL RURAL DISTRICT COUNCIL, May 24–31.—Electric light wiring aud accessories in 30 houses at Beeley, Youlgreave and Tideswell. Specification, etc., can be seen at the office of the Clerk until May 24.

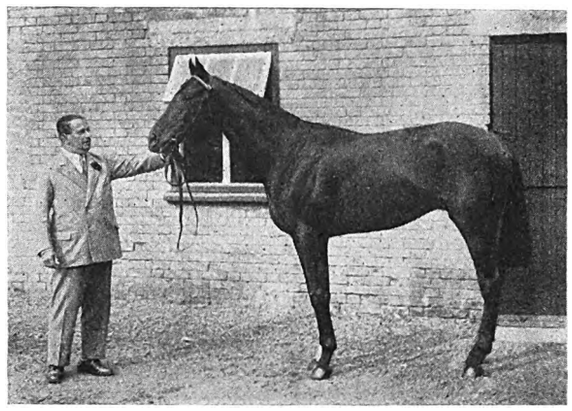
MANCHESTER CORPORATION, May 24.—Supply and erection of two rotary balancers, d.c. switchgear, cables, wiring, etc., at Haweswater, for the Waterworks department. Specification, etc., from the Engineer, Waterworks Offices, Town Hall, Manchester; deposit £2 2s.

MARGATE CORPORATION, May 24.—Electrically-driven booster pump set, with compression tanks, etc. Further particulars from the Borough Engineer, 40, Grosvenor Place, Margate.

LONDON COUNTY COUNCIL, May 26.—Supply, laying, etc., of cables at Blackwall Tunnel, in connection with new ventilating plant. Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £1 1s.

EAST GRINSTEAD URBAN DISTRICT COUNCIL, May 27.—Supply and erection of 320 kVA, three-phase, 50 period 11 000 V alternator and switchgear, and 200 kW reversible rotary, complete with transformers and switchgear. Specification from Mr. G. E. Coldwell, Council Offices, London Road, East Grinstead; deposit £1 1s.

HULL CORPORATION, May 27.—Three 50-line, common battery, private branch telephone exchange switchboards. Forms of tender from the Manager and Engineer, Corporation Telephones Dept., Mytongate, Hull.



AS announced in our last issue, Sir Hugo Hirst's "Diolite," ridden by Fox, proved an easy winner of the Two Thousand Guineas at Newmarket on May 7. There was a field of twenty-eight runners, and "Diolite," seen here with Sir Hugo, is now favourite for the Derby.

OGMORE AND GARW URBAN DISTRICT COUNCIL, May 30.—Supply, erection and connecting up of about 2 000 route yards of 11 000 V overhead service line, with short lengths of interconnecting cables. Specification, etc., from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £1 1s.

PORTADOWN URBAN DISTRICT COUNCIL, May 31.—Supply, erection, etc., of eight sets of electric motors and pumps and automatic switchgears at three pumping stations. Specifications can be seen and forms of tender obtained at the offices of Messrs. Taylor and Wallin, 1, Saville Place, Newcastle-on-Tyne; deposit 10s.

BELFAST WATER COMMISSIONERS, June 4.—Electrically-operated pumping plant. Specification, etc., from the Secretary, Water Office, Belfast, deposit £1.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15 kW motor-generator set, battery trickle charger, milking booster, and spare parts. Specification (No. 10) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of works supply sub-station 3 300 V and 400 V metal clad switchgear. Specification (No. 9) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

LIVERPOOL CORPORATION, June 6.—Installation of automatic telephone exchange at Central Police Station, Dale Street, Liverpool. Specifications from Mr. Walter Moon, town clerk, Municipal Buildings, Dale Street, Liverpool.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., LTD., May 16.—Supply of electrical fittings and materials. Specifications, etc., from the Company's Offices, 91, Petty France, Westminster, S.W.1, upon payment of 5s. (not returnable).

CAIRO MAIN DRAINAGE DEPARTMENT, May 17.—Supply of electric lamps, etc., for one year. Particulars from the Department, 2, Sharia Maleka, Nazli.

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VICTORIAN ELECTRICITY COMMISSION, May 19.—Twelve months' supply of triple braided, h.d. copper aerial cable. (Reference B.X. 6 325.)

DUBLIN BOROUGH COMMISSIONERS, May 20.—One year's supply of electric lanterns for street lamps. Specification, etc. (5s.) from the Superintendent of Public Lighting, Tara Street, Dublin.

A NEW sales aid introduced by Philips Lamps, Ltd., of 145, Charing Cross Road, London, W.C. The equipment is called the "Philips Merchandiser" and as will be seen from the illustration, draws attention to lamps in particular.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 20.—Supply and erection of one 25 kVA, three-phase, 400/230 V, 50 cycle generator. (Reference B.X. 6 307.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20.—Supply of terminal strips (schedule No. C. 578). (Reference B.X. 6 247.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, May 20.—Supply of telegraph instruments (Schedule C. 579). (Reference B.X. 6 248.)

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., May 21.—Electric overhead travelling cranes. Specifications (10s., not returnable) from the company's offices, 91, Petty France, Westminster, S.W.1.

ANTWERP MUNICIPALITY, May 22.—Supply of a group air compressor, electric motor and petrol engine (cahier des charges No. 864). (Reference A.X. 9 567).

ARGENTINE DEPARTMENT OF SANITARY WORKS, May 22.—Supply of three electric horizontal centrifugal pumping sets piping, control switchboard, etc. (Reference A.X. 9 212.)

SOUTH INDIAN RAILWAY CO., LTD., May 23.—Supply of electric cables and wires. Specifications, etc. (5s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

INDIAN STORES DEPARTMENT, May 26.—Two vertical and two horizontal centrifugal pumps, switchgear, etc. (Reference A.X. 9 416.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of 110 kV suspension insulators, for Mangahao power scheme, section 215B. (Reference B.X. 6 300.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of cable clamps for 110 kV suspension insulators for, Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of 110 kV suspension insulators for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

GREAT SOUTHERN RAILWAYS CO., May 28.—Six or 12 months supply of electric cables (form No. 129), electric lamps (form No. 137), etc. Forms of tender (6d. each) from the Stores Superintendent, Inchicore, Dublin.

CAPE TOWN MUNICIPALITY, June 4.—Supply of heavy current d.c. testing motor generator, and starting gear (specification No. 494/1930). (Reference B.X. 6 341.)

AUCKLAND HARBOUR BOARD, June 10.—Supply of submarine cable (contract No. 902). (Reference B.X. 6 354.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, June 12.—Supply of 2 000 V switch units and l.t. switchboards (tender No. 1 649). (Reference B.X. 6 365.)

BULAWAYO MUNICIPALITY, June 13.—One 5 000 kW turbo-alternator condensing plant, switchgear, transformers, etc. (Reference B.X. 6 321.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

MADRAS GOVERNMENT, June 15.—Complete electrical equipment of three 66/110 kV outdoor sub-stations, in connection with Pykara hydro-electric scheme. Specification (No. E.26) (price 30s.) and general conditions of contract (price 3s. 6d.) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4, on payment of the respective fees (not returnable).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of indicators (schedule No. C.588.) (Reference B.X. 6 333.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of multiple twin cable. (Reference B.X. 6 349.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of loading coil pots. (Reference B.X. 6 350.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, June 19.—Supply of metal-clad, 2 000 V switchboard, for Bloemfontein workshops sub-station (tender No. 1 657). (Reference B.X. 6 402).

INDIA STORE DEPARTMENT, June 23.—Supply and erection of 11 000 and 400 V a.c., and 220 V d.c. switchgear, power and control cables, etc., at Shanan power house. Forms of tender (£3 15s., not returnable) from the Director General, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24.—Supply of 110 kV outdoor steelwork and switchgear for, Waitaki power scheme—section 71. (Reference B.X. 6 238.)

CAPE TOWN MUNICIPALITY, June 25.—Supply of single phase transformers (specification No. 495/1930). (Reference B.X. 6 378.)

EGYPTIAN MINISTRY OF THE INTERIOR, June 25.—Pumping machinery, electric motors, etc., for waterworks at Abou-Tig-Nekheila. (Reference A.X. 9 509).

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of condensers (P. and T. 151/2 240.) (Reference B.X. 6 308.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 8.—Supply of telephonists' telephones. (Reference B.X. 6 352.)

MELBOURNE CITY COUNCIL, July 9.—Supply of totally enclosed, metal-clad switchgear (specification No. 1 024). (Reference B.X. 6 401.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable.)

NEW ZEALAND GOVERNMENT RAILWAYS, July 16.—Supply of two overhead electric, 30 cwt., underhung, travelling jib cranes, with 12 ft. jib, for goods sheds at Wellington and Auckland. (Reference A.X. 9 442.)

NEW ZEALAND GOVERNMENT RAILWAYS, July 17.—Supply of cable, switchgear and junction boxes. (Reference B.X. 6385.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 29.—Supply of auxiliary turbines and generating sets for Arapuni, power scheme.—section 305. (Reference B.X. 6 356.)

VICTORIAN RAILWAY COMMISSIONERS, July 30.—Supply and erection of turbo-alternators, condensing plant and control gear. (Reference B.X. 6 355.)

Tenders Accepted.

OLDHAM CORPORATION.—Union Cable Co., Ltd., supply of l.t. cable.

DUNDEE CORPORATION.—A. Westwood and Son, electrical work for one year.

CARLISLE CORPORATION.—Macintosh Cable Co., Ltd., supply of cables, £316.

MANCHESTER CORPORATION.—C. A. Parsons and Co., Ltd., two 750 kVA transformers.

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AYR COUNTY COUNCIL.—Campbell Banks, electrical work in new County Council Buildings.

DARVEL CORPORATION.—M. and R. Young, electrical work in connection with housing scheme.

BARNSTAPLE CORPORATION.—F. Bickford, electric light installation at Albert Hall, £53 10s.

MALLING RURAL DISTRICT COUNCIL.—Drake and Fletcher, electric light installation at new offices, £40.

WORTH PARISH COUNCIL.—East Sussex Electricity Co., public lighting at Three Bridges with 36 lamps.

GENERAL POST OFFICE.—Fire alarm system, London County Council, Standard Telephones and Cables, Ltd.

DARTFORD URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., cable for equipment of transformer sub-station at Shepherd's Lane.

BRADFORD CORPORATION.—Armitage and Longbottom, electric light installation at Simon Convalescent Home, £244. (Recommended.)

HASTINGS CORPORATION.—Pinching and Walton, electrical fittings, £49 5s., and lamps, £8 11s., at Verulam Buildings. (Recommended.)

DARTFORD URBAN DISTRICT COUNCIL.—E. E. Beaven, wiring 14 council houses in Howard Road, £77 17s. 6d. (Recommended.)

BERMONDSEY (LONDON) BOROUGH COUNCIL.—Reliance Telephone Co., installation of intercommunication telephones at municipal offices.

FORFARSHIRE EDUCATION AUTHORITY.—J. E. Fenton, electric light and power installations at Arbroath High and Technical Schools.

MIRFIELD SUNDAY SCHOOL.—H. Senior, electrician's work in connection with erection of a Sunday School at Old Bank Road, Mirfield, £67.

CROYDON CORPORATION.—Callender's Cable and Construction Co., Ltd., supply of cable-pressure testing set, estimated cost, £315. (Recommended).

PADDOCK CONSERVATIVE CLUB, HUDDERSFIELD.—A. E. Beaumont, electrician's work in connection with alterations and additions to club buildings.

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., supply of wireless apparatus to Northern Hospital, Winchmore Hill, £183.

EAST HAM CORPORATION.—Enfield Cable Works, Ltd., supply of high and low tension feeder cables, for Plashet sub-station, £4 548. (Recommended).

STOKE-ON-TRENT CORPORATION.—Craven District and Electrical Construction Co., Ltd., supply of overhead transmission lines for 12 months. (Recommended.)

WORCESTERSHIRE EDUCATION COMMITTEE.—Abell and Smith's Electrical Co., Ltd., electric light installation at Bredon School and teacher's house, £37 19s. 1d.

WATFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply of sub-station kiosk, £183; W. T. Henley's Telegraph Works Co., Ltd., supply of cables for 12 months.

ASHBY WOULDS URBAN DISTRICT COUNCIL—Kemp Bros. (Coalville), electric light installation at houses at Albert Village, £2 2s. per non-parlour house, and £2 5s. per parlour house.

COLCHESTER CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., supply of cable, £13 042; Alfa-Laval Co., Ltd., supply of portable oil purifier, £90. (Both recommended).

SALFORD CORPORATION.—Bertram Thomas, electric light installation at Hope Hospital, £3 655 8s. 1d.; Glasgow Engineers, Ltd., provision of lifts at Hope Hospital, £1 578. (Both recommended).

MIDDLESEX COUNTY COUNCIL.—A. E. Dean and Co., supply of X-ray outfit for Park Royal Hospital, £219. (Recommended). Also tendered: Newton and Wright, £243; Watson and Sons, £226.

HALIFAX CORPORATION.—Bury Lighting and Heating Co., electrical work at new High School for Girls, £907; Craven and District Electrical Construction Co., Ltd., laying e.h.t. cable from Luddenden to Hebden Bridge, £3 055 11s. 6d.

WORCESTERSHIRE STANDING JOINT COMMITTEE.—Electric light installations at police stations: J. Ward, Ltd., at Evesham, £98 6s. 7d.; and at Stourport, £43 10s.; H. Burlingham and Co., at Harvington, £10; B. French, at Rednal, £20 17s. 6d.; Mr. S. Beard, at Romsley, £7 15s.

MANCHESTER CORPORATION.—Tudor Accumulator Co., Ltd., lighting battery replacements at City station.—Supply of electric cookers during next six months: Credenda Conduits Co., Ltd.; Jackson Electric Stove Co., Ltd.; Revo Electric Co., Ltd.; and Siemens Electric Lamps and Supplies, Ltd.

LONDON COUNTY COUNCIL.—Thos. Bolton and Sons, Ltd., copper bonds, £547; Pease and Partners, Ltd., insulator clips; Quasi-Arc Co., Ltd., and Premier Electric Welding Co., Ltd., electrodes; Marryat and Scott, Ltd., provision of electric goods lift at Stamford Hill Stores depot, £864 10s.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Pirelli-General Cable Works, Ltd., supply and laying of three 1 000 V cables, with Bowden-Thompson protective shields, between generating station and Scrubs Lane sub-station, £27 742 3s.6d. (Recommended). Also tendered: Macintosh Cable Co., Ltd., £27 872 2s. 1d.; Enfield Cable Works, Ltd., £28 181 8s. 6d.; Standard Telephones and Cables, Ltd., £28 374 10s. 6d.; Siemens Bros. and Co., Ltd., £28 464 6s. 3d.; W. T. Henley's Telegraph Works Co., Ltd., £28 663 10s.

BIRMINGHAM CORPORATION.—United Electrical Co. (Birmingham), Ltd., installation of charging equipment, cables and wiring at electrical vehicle garage, Lifford; Rapid Magnetting Machine Co., Ltd., provision of electro-magnetic separator equipment, at salvage depot; Metropolitan-Vickers Electrical Co., Ltd., frequency changer and switchgear; Davison and Co., Ltd., works in connection with grit installation at Prince's power station; Ferguson, Pailin, Ltd., switchgear, at Handsworth and Saltley sub-stations; Sir William Arrol and Co., Ltd., electric crane, for Nechells gasworks.

LIVERPOOL CORPORATION.—English Electric Co., Ltd., supply of 12 1 000 kVA step-down transformers, £402 each; Ferguson, Pailin, Ltd., 33 000 V switchgear, for Pumpfields sub-station, £16 980; Switchgear and Cowans, Ltd., 6 000 V switchgear for Pumpfields sub-station, £18 974; 6 000 V switchgear for Lime Street district sub-station, £7 868; 6 000 V switchgear for Harrington Street sub-station, £8 486; Ferranti, Ltd., four 12 500 kVA transformers, for Pumpfields sub-station, £15 800; Ferguson, Pailin, Ltd., 33 000 V switchgear, £3 316; and two 33 000 V meter panels, £28 12s.; Mather and Platt, Ltd., two electrically-driven boiler feed pumps, with motors and control gear, for Clarence Dock power station, £3 522 17s.; C. A. Parsons and Co., Ltd., two 5 000 V transformers, £3 570; Cargo Fleet Iron Co., Ltd., 1 600 tons of Sandberg Silicon steel tramway rails, £11 5s. per ton; and 60 tons steel fishplates, £14 5s. per ton. Societé Anon. Des Usines and Acieries Allard, eight tons tramway fishbolts, £11 12s. per ton, and 80 tons steel tiebars, £11 3s. per ton; Hadfields, Ltd., tramway junctions, £723; Titan Trackwork Co., Ltd., tramway junctions, £692, and Edgar Allen and Co., Ltd., tramway junctions, £710 and £690; Mersey Welding Co. and Premier Electric Welding Co. (Mersey), Ltd., electric welding of 375 tramway rail joints, 11s. per joint, and re-treading rail surfaces, 1s. per in.

METAL AND CHEMICAL PRICES.

TUESDAY, May 13.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£58 15 0	5s.	—
Electro Wirebars	,,	£60 10 0	—	£2 10 0
H.C. Wire, basis	per lb.	8⅝d.	—	1/16d.
Sheet	,,	9⅛d.	—	¼d.
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	11⅛d.	—	1/16d.
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	8¼d.	—	⅛d.
Wire ,,	,,	9⅛d.	—	¼d.
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£20 0 0	£1 10s. 0d.	—
Foreign or Colonial	,,	£18 7 6	£1 7s. 6d.	—
Tin—				
Ingot	per ton	£145 12 6	—	£3 5s. 0d.
Wire, basis	per lb.	2s. 4½d.	3½d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£17 12 6	£1 7s. 6d.	—
Mercury	per bottle	£22 12 6	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2¾d.
Sodium Bichromate—Per lb., 3⅛d.

Rubber—Para fine, 8d.; plantation, 1st latex, 7d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

THE LEAD MARKET.

According to James Forster and Co., the market opened last week with a weak tone, May lead falling to £17 and forward to £17 2s. 6d. On Tuesday the opening was again flat at £16 15s. for forward, but at this point official support was given so that by Thursday May lead had risen to £17 10s. and August to £17 11s. 3d. Closing prices on May 9 were £18 for May and June, and £18 1s. 3d. for July and August, a rise of 15s. per ton on the week.

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ELECTRICITY SUPPLY.

New Plant at Shrewsbury—Transfer of Godalming Undertaking—Buckie Supply Project—Growth of Demand in Winnipeg—Proposed Sale of Monmouth Undertaking—Sheffield to Supply Dronfield and Beighton—Eastbourne Extensions.

LONG Newton P.C. is to adopt electric street lighting at a cost of £300.

Bath City Council has received sanction to a loan of £20 000 for mains and services.

Coalville U.D.C. has withdrawn its objection to overhead cables in Charnwood Forest.

Plymouth Electricity Committee has obtained sanction for a loan of £7 687 for laying cables.

Maidstone T.C. has decided that the houses being erected on the Mote Park estate shall be all-electric.

Shrewsbury Corporation has approved proposals for extending the plant at the electricity works, at a cost of £9 400.

Southwark (London) Electricity Committee has approved estimates of £9 660 for new mains and £3 025 for renewals.

The output of the Canadian Hydro-Electric Corporation during the year ended March 31 last was 2 176 405 000 kWh, an increase of 40%.

Three new 10 000 kVA transformers are being installed at Blackpool electricity works to work in conjunction with the bulk supply from Preston.

The supply of electricity from Grimsby to Louth was commenced on May 5. During the week an electrical trades exhibition was held in the Town Hall.

The Aldershot Gas, Water and District Lighting Co. has applied to the Commissioners for authority to take over the Godalming undertakings of the Urban Electric Supply Co.

The Electricity Commissioners will hold an inquiry on May 27 into the application of Buckie T.C. for an Order to light the town and harbour electrically. The local gas company is offering opposition.

Hammersmith (London) Electricity Committee recommends the B.C. to authorise the carrying out of mains extensions, amounting to £63 884, for the relief of unemployment. The Unemployment Grants Committee has approved the payment by the Exchequer of 50% of the interest for 15 years.

Oldham Electricity Committee has decided that the rateable value system of charging for electricity be extended so as to include the dwelling-house portion of combined houses and shops, two-thirds of the rateable value of the combined premises (with a minimum of £10) being taken as representing such portion.

The annual report of the City of Winnipeg Hydro-Electric System records an increase of 11% in energy generated and purchased during the past year. Gross earnings exceeded $4 000 000 and surplus for the year reached the record figure of $310 478. The increase in domestic electricity per customer for the last four years is 53%.

A condition of the proposed wiring of the market stalls by Shipley electricity department was that all stallholders must use electricity. At the request of the Shipley Market Traders' Association, the scheme has been deferred.—The Engineer is to prepare a report upon the hire-purchase system in force in regard to electrical domestic appliances, especially as to the period for payment by instalments.

Monmouth Corporation gives notice of intention to apply to the Minister of Transport for approval of a proposal to transfer its electricity undertaking to the Monmouth Electricity Co., Ltd. The proposed purchase price is £15 900. The General Electric Co., Ltd., agrees to subscribe or obtain subscriptions for any capital required by the Monmouth Electricity Co. in connection with the undertaking.

The South Metropolitan Electric Light and Power Co. is to be asked to complete the lighting of the main Hastings Road in Lewisham on to the borough boundary. The Works Committee of the Lewisham Council recommends, as a result of its inspection of the recent gas and electric lighting experiments, that the Council should adopt high pressure gas lighting for all main roads in the borough over 50 ft. in width, with the exception of the roads at present lit or to be lit by electricity.

In accordance with a request from the Electricity Commissioners that constructional work should be expedited, in order to assist the Government in dealing with unemployment, Manchester Electricity Committee has approved a scheme to extend electric mains into streets where the demands are not at present likely to be remunerative. The cost, with substations, is estimated at £100 000. The annual debt charges will amount to £7 750, and the special grants receivable from the Government will amount to about £2 250 per annum for 15 years.

Chester Electricity Committee has received a letter from Manchester electricity department communicating resolutions passed at a conference of engineers, representing South-East Lancashire undertakings who still supply direct current, held for the purpose of constituting a common policy in regard to alterations to radio apparatus involved in changing over from d.c. to a.c. Chester has decided that consideration of the letter be deferred until the Commissioners have communicated the terms upon which they would be prepared to give consent to the change over.

At a recent meeting of the New Forest Association a resolution in opposition to the proposal to erect an overhead line in the New Forest area was discussed. After some discussion, the meeting passed a modified resolution to the effect that it was desirable where the line was to be carried overhead that it should be as near as possible to the railway; that if the expense was not prohibitive the line from the railway to Picket Post should be laid underground; that the grid ought to be kept close to the railway; that the matter was urgent and delay would be unfair to Ringwood and Burley.

The Electricity Commissioners are prepared to entertain an application by the Eastbourne Corporation to amend the present application for a Special Order to extend the area of supply to the parishes of Hailsham, Westham and Pevensey, by the inclusion of five further parishes, in lieu of requiring the Corporation to lodge a separate application in respect of such parishes. The Electricity Committee has approved of the adoption of the suggested procedure. The Committee has received sanction to borrow £11 332 for extensions of the distributing system and £11 430 for the supply of electricity to premises in Eastdean and Friston.

The purchase of the Buckfastleigh non-statutory undertaking by Torquay Corporation has now been completed. Steps are to be taken to maintain the supply from the existing works pending the completion of arrangements for a supply from the Newton Abbot station. The system of slot meters in Buckfastleigh is to be continued, and the Corporation will exercise its power to sell apparatus and fittings in that district. —The Urban Electric Supply Co. has offered to sell its Dartmouth and Kingswear undertakings to Torquay Corporation for the amount outstanding on capital account. The offer has not been entertained by Torquay Electricity Committee, and the company is to be informed that the Corporation is still willing to supply the Dartmouth undertaking in bulk.

At Sheffield Corporation's meeting on May 7, Ald. A. J. Blanchard moved the reference back of the proposal of the Electric Supply Committee to supply electricity to Dronfield and Beighton. He said they had no guarantee as to the demand. All they knew was that they were to spend £15 000 on the supply, and they had heard that they would receive something like £500 for the first year. Ald. T. H. Watkins said it would not be wise to ask for guarantees. Their experience was that where they could get hold of services in the environments of Sheffield it was an economic proposition for the city. Ald. Blanchard's motion was defeated, and the committee's proposal was adopted.—The existing sub-stations in Filey Street and Greystones Road are to be equipped with additional plant to enable an adequate supply of electricity to be given to the tramways, the cost being estimated at £15 820 for plant, mains and apparatus, and £2 350 for buildings.

Liverpool Tramways Electric Power and Lighting Committee is applying to the Commissioners for sanction to borrow £135 000 for the provision of equipment for the distribution of electricity energy from the new Clarence Dock station into the central area of the city. The estimated cost includes: switchgear, £81 000; plant, £40 000; buildings, £10 500; coupling up and contingencies, £3 500. The Clarence Dock Power Station Special Committee has obtained the consent of the Electricity Commissioners to the extension of the plant at the Clarence Dock station, by the installation of one three-phase 50-cycle turbo-alternator of 50 000 kW, m.c.r., with switchgear and auxiliary plant and extensions to buildings.

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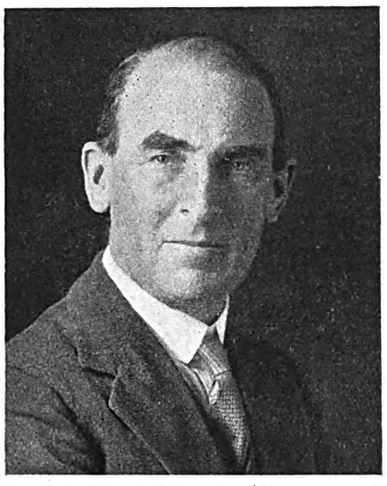
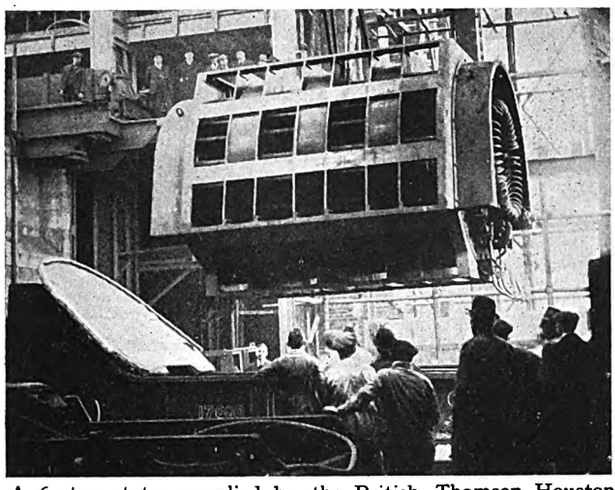
ELECTRICAL PICTURES.



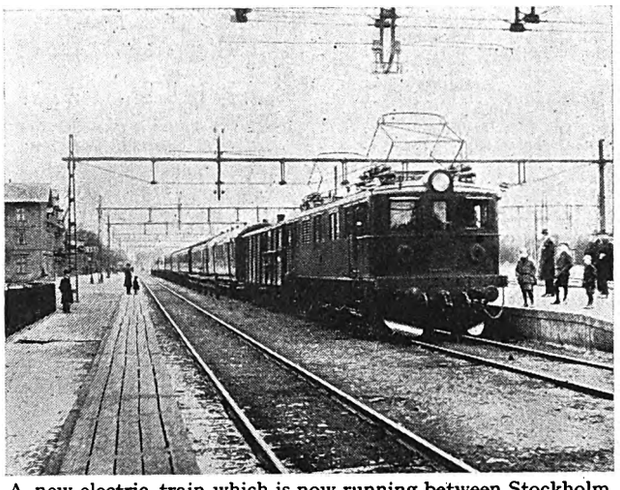
Lt.-Col. W. A. Vignoles, director and secretary of the E.D.A., who is shortly sailing for America to study policy and public relations in the supply industry in the United States. A note on the subject appears on page 624.

Mr. J. W. Beauchamp, whose name has been mentioned in connection with the South West England and South Wales Electricity Scheme. See page 621.

Mr. H. T. Young, of Troughton and Young, Ltd., who, as a member of the E.D.A. Council, will accompany Col. Vignoles to America to investigate the application of electricity to domestic science. See page 624.



A 64-ton stator supplied by the British Thomson Houston Co., Ltd., being craned into position at the new Leeds generating station at Armley, last week.



A new electric train which is now running between Stockholm and Gothenburg, a distance of 286 miles. Recently the journey was completed in 5 hours 44 minutes.

The Shell Oil Building, San Francisco, in floodlight. This installation, which employs 360 flood units, is said to be the finest example of floodlighting on the Pacific coast.

Some well-known electrical personalities on board the Orient liner "Otranto." The names from left to right are Mr. and Mrs. H. W. Clothier, Mr. and Mrs. R. A. Chattock, Mr. C. R. Belling and Mr. and Mrs. F. Tandy. This snapshot was taken off the Isle of Crete and sent to us by Mr. Belling from Cairo.

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FINANCIAL INTELLIGENCE.

Analysis of Electric Railway, Tramway, Telegraph and Telephone Companies' Accounts—Dividends, Recent Quotations and Yields.

By "AUDITOR."

BANK RATE (1929–1930).

1929.			1930.	
Feb. 7 ..	5½%	Nov. 21 ..	5½%	Feb. 6 .. 4½%
Sept. 26 ..	6½%	Dec. 12 ..	5 %	Mar. 6 .. 4 %
Oct. 31 ..	6 %			Mar. 20 .. 3½%
				May 1 .. 3 %

THE profits realised by certain electric traction, telegraph, and telephone undertakings during the past financial year are shown in the following tables, together with some recent debenture, stock, and share prices, and the yields :—

ANALYSIS OF RESULTS OF CERTAIN BRITISH AND FORBIGN ELECTRIC RAILWAY AND TRAMWAY UNDERTAKINGS WHOSE 1929 ACCOUNTS HAVE BEEN SUBMITTED.

	Brought Forward £	Profit, 1929 £	Total £	Carried Forward £	Annual Dividend %	Recent Price	Par Value £	Yield	Remarks
Bristol Tramways	3 786	163 566	167 352	4 277	10	26/6	1	7 11/16	At the close of the year, 34 miles of electric tramway routes were in operation. The ordinary and preference shares were sub-divided from £10 to £1 in November 1929.
,, ,, 4% Mort. Deb.	—	—	—	—	4	71	100	5 5/8	
,, ,, 4½% Mort. Deb.	—	—	—	—	4½	75	100	6	
,, ,, 4% Cum. Pref.	—	—	—	—	4	13/10	1	5 13/16	
City of Buenos Aires Trams	1 346	72 501	73 847	501	5	86/10	5	5 13/16	An annuity from the Anglo-Argentine Co. is sufficient to provide the debenture interest and 5% dividend on shares.
,, ,, 4% Deb. Stk.	—	—	—	—	4	74	100	5 7/16	
Cork Elec. Supply	14 170	42 737	56 907	17 220	10	—	1	—	The company's electric lighting undertaking has been acquired by the Electricity Supply Board, but the tramways continue to be operated by co.
,, ,, 5% Cum. Pref.	—	—	—	—	5	—	1	—	
,, ,, 4% Mort. Deb.	—	—	—	—	4	—	100	—	
Dublin United Trams	13 786	48 852	62 638	12 078	Pref. only	29	Stk.	—	A policy effected with a leading insurance company ensures the payment to the company in 1939 of the discount of 5% at which the debenture stock was issued.
,, ,, 3½% Mort. Debs.	—	—	—	—	3½	50	100	7	
,, ,, 3½% "B" Deb. Stk.	—	—	—	—	3½	55	100	6 4/11	
,, ,, 6% Pref.	—	—	—	—	6	59	Stk.	10¼	
Fife Trams	5 849	99 772	105 621	25 286	4	12/6	1	6 2/5	The 5½% 5-year registered notes are being repaid as at March 31 last.
,, ,, 6% Cum. Pref.	—	—	—	—	6	17/6	1	6 6/7	
Gateshead & District Trams	18 895	25 516	44 411	20 309	8	—	10	—	The revenue amounted to £123 999 as compared with £121 405 for the previous year.
,, ,, 6% Pref.	—	—	—	—	6	—	10	—	
,, ,, 5% Pref.	—	—	—	—	5	—	10	—	
Hong Kong Trams	$245 789	$731 764	$977 553	$259 553	$1 per share	—	$5	—	$68 000 was written off goodwill.
Jarrow & Dis. Elec. Traction	Credit 427	Loss 1 081	Deficit 654	—	—	—	1	—	The deficit was written off reserve.
Liverpool Overhead Rly.	3 730	16 979	20 709	5 623	—	—	10	—	No rent is payable to the Dock Board until after the profits amount to 6% p.a. on the cost of the undertaking.
,, ,, 4% Deb. Stk.	—	—	—	—	4	—	100	—	
,, ,, 5% Per. Pref.	—	—	—	—	5	—	10	—	
London and Sub. Traction	36 137	10 480	46 617	46 617	—	2/-	1	—	£24 595 5% "A" Debenture Stock was purchased during the year and cancelled.
,, ,, 4½% 1st M. Deb.	—	—	—	—	4½	70	100	6 3/7	
,, ,, 5% "A" Deb.	—	—	—	—	5	94	100	5 1/16	
,, ,, •5% Cum. Pref.	—	—	—	—	—	9/9	1	—	
London United Trams	—	17 384	—	—	—	—	5/-	—	A Bill seeking authority to equip trolley vehicles has been deposited.
,, ,, 4% 1st M. Deb.	—	—	—	—	4	52½	100	7 13/17	
,, ,, 5% Cum. Pref.	—	—	—	—	—	4/-	1	—	
Madras Elec. Trams (1904)	1 703	8 741	10 444	4 444	Pref. only	—	1	—	£7 500 was transferred to depreciation and renewals account.
,, ,, 5½% Deb.	—	—	—	—	5½	78	100	7 1/16	
,, ,, 6% Cum. Pref.	—	—	—	—	6	10/-	1	12	
Metro. Electric Trams	—	6 934	—	—	—	—	1	—	During 1929, £13 124 4½% Deb. Stock, and £11 441 5% Deb. Stock were purchased and cancelled.
,, ,, 4½% Deb.	—	—	—	—	4½	73	100	6¼	
,, ,, 5% Deb.	—	—	—	—	5	73	100	6 17/34	
,, ,, 5% Cum. Pref.	—	—	—	—	—	—	1	—	
Metropolitan Rly.	23 888	844 515	868 403	32 014	—	—	—	—	Building activity in districts served by the country lines is increasing, and there is every prospect of continued growth of traffic.
,, ,, 3½% Deb. Stk.	—	—	—	—	3½	71	100	4 11/13	
,, ,, 3½% "A" Deb. Stk.	—	—	—	—	3½	70¼	100	4 29/43	
,, ,, 4% Deb. Stk.	—	—	—	—	4	—	100	—	
,, ,, 3½% Pref. Stk.	—	—	—	—	3½	64	100	5½	
,, ,, 3½% "A" Stk.	—	—	—	—	3½	63½	100	5½	
,, ,, 3½% Conv. Stk.	—	—	—	—	3½	69	100	5 1/14	
,, ,, 5% Pref. Stk.	—	—	—	—	5	92	100	5½	
,, ,, Cons. Stk.	—	—	—	—	4	67	100	5 31/67	
,, ,, Surplus Lands Stk.	—	—	—	—	3½	75	100	5¼	
Montreal Trams	$1 969 503	$965 382	$2 934 885	$2 235 235	10	—	$100	—	Passengers increased by 5·55%.
Para Elec. Rlys.	5 002	28 103	33 105	3 605	—	2/6	1	—	During the year, £5 935 was debited to depreciation and renewals.
,, ,, 6% Cum. Pref.	—	—	—	—	6	—	1	—	
Potteries Elec. Traction	4 982	431	5 413	5 413	—	—	1	—	The preference dividend arrears total £71 969. No dividend has been paid on the ordinary shares since 1922.
,, ,, 4½% Deb.	—	—	—	—	4½	72½	100	6¼	
,, ,, 5% Cum. Pref.	—	—	—	—	—	—	1	—	
Provincial Trams	3 679	15 479	19 158	3 649	—	—	1	—	£4 000 was transferred to reserve and £801 to debenture sinking fund.
,, ,, 5½% 1st Deb. Stk.	—	—	—	—	5½	70	5	7 6/7	
,, ,, 6% Cum. Pref.	—	—	—	—	—	—	10	—	
Rangoon Elec. Tramway & Supply	20 624	123 829	144 453	21 786	11⅞	—	1	—	During the year 548 new consumers were connected. The low tension distribution voltage has been raised, and tramcars have been modernised.
,, ,, 4½% 1st M. Deb.	—	—	—	—	4½	89	100	5 1/16	
,, ,, 5% M. Deb.	—	—	—	—	5	87	100	5 3/43	
,, ,, 6% Cum. Pref.	—	—	—	—	6	19/6	1	6¼	
Singapore Traction	2 539	51 098	53 637	3 367	—	—	1	—	Controlled by Shanghai Electric Construction Co. The preference dividend arrears amount to 11%.
,, ,, 6% 1st M. Deb.	—	—	—	—	6	96	100	6¼	
,, ,, 7% Cum. Pref.	—	—	—	—	—	—	1	—	
S. Metro. Elec. Trams	11 139	57 651	68 790	11 790	5	—	1	—	Controlled by London and Suburban Traction Co.
,, ,, 4% 1st M. Deb.	—	—	—	—	4	72½	100	5½	
,, ,, 6% Cum. Pref.	—	—	—	—	6	—	1	—	
S. Staffs. Trams	895	2 131	3 026	747	—	—	Stk.	—	A perpetual lease of tramways has been granted to S. Staffs. Trams. (Lessee) Co.
,, ,, 6% Pref.	—	—	—	—	3	—	10	—	
Torquay Trams	1 786	73 780*	75 566	2 026	9	27/6	1	6 6/11	The trolley system is to be substituted.
,, ,, 5% Prior Lien Debs.	—	—	—	—	Plus bonus 5	85	100	5 17/20	* Including £50 500 profit on sale of share-holding in Devon and Gen. Omnibus & Touring Co.
,, ,, 5% Deb.	—	—	—	—	5	—	100	—	
Tynemouth & Dis. Elec. Traction	330	1 545	1 875	795	—	—	5	—	The transport services are to be co-ordinated.
,, ,, 4% Deb.	—	—	—	—	4	—	100	—	
Wrexham & Dis. Transport	7 912	3 005	10 917	7 792	2½	—	1	—	£13 000 was provided for renewals.
Yorkshire (West Riding) Elec. Trams	1 010	26 854	27 864	760	Pref. only	5/-	1	—	Local authorities have power to purchase the greater part of the system every seventh year.
,, ,, 6% Cum. Pref.	—	—	—	—	—	9/6	1	—	
,, ,, 4½% 1st Deb.	—	—	—	—	4½	55	100	8 2/11	

ANALYSIS OF RESULTS OF CERTAIN TELEGRAPH AND TELEPHONE UNDERTAKINGS.

1929 Accounts	Brought Forward £	Profit, 1929 £	Total £	Carried Forward £	Annual Dividend %	Recent Price	Par Value £	Yield	Remarks
Anglo-Portuguese Tele.	39 751	50 941	90 692	44 949	8	22/6	1	7 1/9	Revenue showed an improvement as the result of new tariffs and previous capital expenditure.
,, ,, 7% Convertible Deb. Stk.	—	—	—	—	7	101½	100	6 8/9	
Bogota Tele.	6 603	16 727	23 330	5 235	7	—	1	—	During the latter part of 1929, 1 000 additional stations were connected.
Constantinople Tele.	T. 4 932	T. 10 186	T. 15 118	T. 4 353	3½	2⅞	5	6 1/4	£T. 11 is equivalent to £10.
,, ,, 6% oblig. Bonds	—	—	—	—	6	87	100	6 57/58	
Para Tele.	1 963	8 936	10 899	1 726	6½	—	1	—	Last year's dividend was 5%.
Western Union Teleg.	$86 357 183	$15 474 893	$101 832 076	$95 635 228	8	—	100	—	8% div. has been maintained for four years.

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COMPANY NEWS.

British Electric Traction Dividend and Bonus—Ever Ready Co's Increased Profit—Expansion of Bournemouth and Poole Co's Output—Reports and Dividends.

GENERAL ELECTRIC shares during the past week have more than regained their recent fall, and a rise of over 4s. has brought the price up again to 51s. 3d. The other Transatlantic favourites have been comparatively firm, International Holdings remaining in the neighbourhood of 6⅜. Hydro Electrics easing only slightly to just under 47, Radio Corporation of America shares to a little over 50, and International Telephone and Telegraph stock to $64½. International Automatic Telephone shares have fallen from 35s. to 33s. 9d. Cables and Wireless issues are a point lower than a week ago.

The Electric Construction Company's ordinary shares have changed hands as high as 16s. 3d., and the price in the official list has been advanced from 11s. 3d. to that figure. The company's 7% cumulative preference shares have risen nearly 2s. to 21s. 3d. Crompton Parkinson 8% preference are 1s. 3d. up, at 23s. 9d. The leading cable manufacturers shares have shown weakness, Callender's, Enfield and W. T. Henley's each falling half-a-crown to £3 12s. 6d., £4 5s., and £6 10s. respectively. Telegraph Construction £12 shares have shed a point, to 21½. Associated Electrical Industries shares are quoted with the dividends deducted.

American Telephone and Telegraph capital stock has regained last week's fall, as also have Marconi International Marine shares, at 41s. 3d. Anglo-Portuguese shares are quoted just under 22s., ex rights.

Transportation shares have been quiet. Rio de Janeiro Tramway 50-year mortgage bonds, and Winnipeg Electric Company refunding mortgage have both risen a point, to 89½ and 87.

In the electricity supply section, Newcastle shares have regained the 6d. lost last week, and County of London 6% preference, Edmunson's 7% preference, and Westminster ordinary shares are likewise all 6d. to the good. Calcutta Supply ordinary shares have shed another 1s. 3d., as also have Bournemouth and Poole.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98½
6½	" " "C" 6½% Cm. Pf. Stk.	106	106	117½	98½
15	B'mouth & Poole El. S. Ord. ..	60/-	61/3	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	46/10½	48/1½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stock	82½	82½	81	77½
4	Central Elec. Sup. 4% Deb. ..	95½	95½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	27/6	27/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord...	36/10½	36/10½	44/6	26/6
8	" " " 8% Pref.	28/-	28/-	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	48/9	48/9	68/6	25/9
6	" " " 6% C.P.	23/-	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/6	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord.	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord... ..	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " " 4½% 1st Mt. Deb. Stk.	90	90	92	80½
—	Hydro Electric Securities.. ..	46½	47½	87	20
—	International Holdings	6⅜	6⅜	35½	6
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	28/-	28/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	29/6	29/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	28/6	28/6	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	26/9½	26/3	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord..	23/9	23/9	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(c)	St. James' & P.M. Ord. (£1) ..	27/6*	27/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6*	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds	95	95	98½	86½
7	Urban E.S. Ord.	33/9	33/9	46/6	18/-
5	Victoria Falls Power Ord. ..	63/9	63/9	69/-	46/3

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1929. Highest.	Lowest.
1/9⅜	W'minster Elec. Sup. Ord. (£1) ..	27/-	26/6	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/9	24/9	25/4½	18/9
6	" " 1st Mt. Deb. ..	103	103	106	97½
8	Yorks Elec. Power Ord.	33/9	33/9	38/9	24/6
6	" " " 6% C.P. ..	23/-	23/-	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb.	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	93½	93½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	" " " " 6% Pf. Stk.	130½	130½	133	103½
6	Calcutta Trams Ord.	11/10½	11/10½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(h)	Cent. Lon. Ry. Ord. Stk. (asstd.)..	77	77	74½	54
4½	" " " 4½ Pf.	80½	80½	85½	78
4	" " " 4% Deb.	80	80	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	78	78	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	" " " " 4% Pf. Stk.	71½	71½	77	68
4	" " " " 4% Deb. ..	79	79	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95	95	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	75½	75½	75½	62
5	" " " 5% Deb. ..	79½	79½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	66½	67	81	54½
3½	" " " 3½% Pf. Stk. ..	64½	64½	76	60½
3½	" " " 3½% Deb. ..	71½	71½	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77½	77½	81½	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	89½	88½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
9(i)	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/-	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	87	86	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	27/-*	27/-	58/6	26/3
8	" " " 8% C.P.	50/7½*	53/1½	56/9	49/6
4	" " " 4% Mt. Deb. ..	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	76/3	76/3	99/4½	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/6	23/6	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	127½	127½	153½	120
15	Callender's Cable Ord.	72/6	75/-	91/3	63/9
6½	" " " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " " 7½% B. Pref. ..	26/10½	26/10½	28/3	25/-
12	Consolidated Signal Ord.	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	23/9	22/6	27/-	14/-
6	" " 6% Cum. 2nd Pf.	19/-	19/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	16/3	11/3	32/6	23/6
7	" " 7% C.P. ..	21/3	19/4½	22/9	20/-
4	" " 1st Mt. Deb.	69½	69½	75	68
20	Enfield Cable Works Ord.	85/-	87/6	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	89	89	103½	86
6	" " Conv. Deb... ..	66½	66½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	18/9	92/3	17/10½
10	" " 7% Partic. Pref. ..	30/-	30/-	34/2	23/9
6	Ferranti 6% Pref...	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord...	51/3	46/10½	81/3	26/6
6½	" " "A" C.P.	23/6	23/6	26/-	22/-
7½	" " "B" C.P.	26/-	26/-	27/9	22/9
7	" " 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	130/-	132/6	136/10½	69/3
12½	International Auto. Telephone Ord	33/9	35/-	50/6	35/-
10	Johnson & Phillips Ord.	37/6*	40/-	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	23/9	23/9	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	25/-	25/-	36/6	23/6
10	" " " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " " Deb. Stk. ..	92½	92½	95	88½
10	Telegraph Const. Ord. (£12) ..	21½	22½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	$255	$249	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	10e
3½	Anglo-Am. Teleg. Ord. Stk. ..	59½	59½	63½	56½
6	" " 6% Prefd. Stk.	102½	102½	105½	91
1½	" " Deferred Stk.	25	25	27	22
8	Anglo Portuguese Tele. Ord. ..	21/10½†	23/1½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk... ..	51½	52½	90½	73½
—	"B" Ord. Stk.	25½	26½	104	33
—	5½% Cum. Pref. Stk. ..	93½	94½	99	90
3½	Eastern 3½% Pref. Stk.	64½	64½	70½	58½
4	" 4% Deb.	78*	78	82½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	32	32	43½	26
—	International Teleph. & Teleg. ..	$64½	$65½	161½	48½
15	Marconi Int. Mar.	41/3	40/-	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	99½	102½	50
12	Oriental Telephone Ord.	55/7½	55/7½	65/-	42/-
—	Radio Corporation of America ..	50½	51½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	82/3
4	Western Tel. 4% Deb. Stk. ..	78	78	82	73

(a) 29⅝d. per share. (b) 1s. 9·2d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·477d. per share. (e) 1s. 7·281d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅝d. per share. (h) 88s. 2·136d. (i) 9%, plus special bonus of 30% from sale of omnibus company's shares. * Ex dividends. † Ex rights.

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Directors' Reports, etc.

SIEMENS BROS. AND CO., LTD.—Fin. div. of 5%, makg. 7½% for year (same rate as last year) is announced.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Directors have decided to offer 143 515 £1 ord shs. at par to ord. and "A" ord. shhldrs. in proportn. of one new sh. for every 5 held.

TRANSFER OF GERMAN COMPANY'S SHARES.—It is reported that the International Standard Electric Corporation has purchased from Philips' Glowlampworks, Ltd., its hldg. of 70% of the sh. cap. of the Lorenz Co., Berlin.

CAWNPORE ELECTRIC SUPPLY CORPORATION, LTD.—Net rev. for 1929, after mtg. deb. int., £79 944, agst. £75 063. To depreciatn. and renewals acct., £27 500; to gen. res., £2 500, to income tax acct. £4 000 and to deb. sinkg. fund, £7 827. Fin. div. on ord. shs. 7%, makg. 10% for year.

BRITISH ELECTRIC TRACTION CO. LTD.—Pft. subject to audit, for year ended March 31, 1930, £253 081 agst. £196 995. Cash div. of 5%, less tax, on dfd. ord. stk., and bonus of 10% in fully-paid £1 dfd. ord. shs., recommended (same rate as last year). Hldrs. of 6% cum. participatg. pref. stk. will receive further 1·89% by way of participatg. div. makg. 7·89% for year. Blce. of £65 547 added to undivided pfts. acct.

PETERBOROUGH ELECTRIC TRACTION CO., LTD.—Rev. for 1929, £79 074, increase £16 481. After provisn. for exes. and placing £10 500 to renewals acct., net pft. was £4 839, agst. £4 309. Div. on ord. shs. 5%, agst. 10%. Fwd. £5 557, agst. £4 232. L. and N.E. and L.M. and S. Railway Companies have acquired a joint int. in company equal to that of Tilling and British Automobile Traction.

EVER READY CO. (GREAT BRITAIN), LTD.—Rpt. states that pft. for year ended March 31, 1930, was £244 555, increase £34 388. Fin. divs., as announced in our issue of May 2, make 10% and 35% for year on pref. and ord. shs. respectively. To res., £30 000; to donatns. and staff benevt. fund, £1 272. Fwd. £34 000. Directors propose to increase cap. to £1 000 000 by creatn. of 1 000 000 5s. ord. shs.

NORTH SOMERSET ELECTRIC SUPPLY CO., LTD.—Rpt. for 1929, adopted at the recent gen. mtg., states that rev. was £68 519, agst. £51 856, and net pft. £23 522, agst. £17 585. Electy. supplied was 7 097 250 kWh, agst. 6 329 109. Div. on ord. shs., 7%, less tax; fwd., £1 458. Company has acquired practically whole of issued shs. of Burnham and District Electric Supply Co. and Mid-Somerset Electric Supply Co. These companies will be continued as separate undertakgs., but as a portn. of company's scheme. Arrangements are being made for extendg. supplies to Somerton and Langport district.

LOTS ROAD POWER HOUSE JOINT COMMITTEE.—The committee has informed hldrs. of Metropolitan District and London Electric Railways joint power house rent charge stk. that expansn. of the train service on the Underground Railways has increased demand upon power house, which necessitates certain additns. to plant. Extensns. and improvemts. are estimated to cost £1 350 936, of which £682 234 is chargeable to reserves and £668 702 to cap. The cost chargeable to cap. has been met to extent of £173 428 out of proceeds of last issue of rent charge stock. To provide for remainder of cost chargeable to cap. and also for exes. of issue, it is proposed to issue further amount of power house 4% rent charge stk. (not exceedg. £675 000 nom. value).

BRUSH ELECTRICAL ENGINEERING CO., LTD.—After providg. for gen. charges, maintenance of plant and bldgs., int. on deb. stks., income tax, and £16 289, for depreciatn. of bldgs. and plant, the net pft. for 1929 was £58 988. To gen. res., £5 413; to div. (10%), £48 743; further int. on prior lien second deb. stk., £2 044; to surplus acct. for apportionmt. between stkhldrs. and co-partners, £2 787. During year £5 360 has been distributed out of undivided pfts. acct. The members elected to receive £2 971 in form of fully-paid ord. stk. at par, and £2 389 was paid in cash. After deductn. of £5 360, and additn. of members' proportn. of surplus for 1929 (£490), undivided pfts. acct. stands at £77 947. Out of £9 839 allocated to co-partners in respect of surplus of year 1928, £8 058 was taken in form of fully-paid ord. stk. at par. Fwd. £77 947. Issued sh. cap. now stands at £487 430 and gen. res. at £260 218.

CANADIAN HYDRO-ELECTRIC CORPORATION, LTD.—Second ann. rpt. states that gross rev. for 1929 was $6 855 778, agst. $4 367 393 for 1928; net earngs. available for divs. amtd. to $991 882, agst. $776 063. Four qrtrly. divs. of 1¾% had been paid on 6% 1st pfd. stk. Peak load on corporation system for 1929 was 518 900 H.P., compared with 383 300 H.P., and output increased by 800 985 000 kWh to 2 097 793 000 kWh. Pendg. delivery of full amt. of 505 000 H.P. as primary power, surplus is being sold at secondary power rates for mfre. of steam by electricity. Earngs. reflect sale of only 250 000 H.P. primary power in first part of year, with increase to 324 000 H.P. effective for last three months. Increase in producth. was, in great part, due to largely increased deliveries of power to Hydro-Electric Power Commission of Ontario under its two contracts. Under the larger contract the Commission agreed to purchase 130 000 H.P. by October, 1931. Actually 150 000 H.P. was taken from October, 1929. Under second contract, which calls for delivery of an ultimate total of between 60 000 and 100 000 H.P., Commission is now taking 12 000 H.P. Initial stage of company's construction programme on Gatineau river was completed during 1928, and in 1929 Gatineau river generatg. statns. were physically interconnected with company's plants on other of lower Ottawa river tributaries, by a h.t. line from Gatineau, Quebec, to Calumet, Quebec, and Hawkesbury, Ontario. The large additional block of power to be taken in October, 1930, by the Hydro-Electric Power Commission of Ontario has necessitated provisn. of second 220 000 V line from Pangan generatg. statn. to a point on Ottawa river near Chats Falls. The line will be completed during coming season.

Company Meetings.

OSWESTRY ELECTRIC LIGHTING AND POWER CO., LTD.—At the final meeting of this company, whose undertaking has been bought by Oswestry Corporation, the chairman, Mr. Philip Minshall, announced the receipt of a cheque for approximately £20 000 from the Corporation, and said shareholders would probably receive 30s. for each £1 share. A liquidator was appointed.

PYE RADIO, LTD.—Sir Thomas A. Polson, presiding at the meeting on May 1, said trading profit and interest for year ended March 31, 1930, was £71 510. Net profit was £62 686. They were the largest independent British manufacturers in the radio industry. It seemed safe to predict a very prosperous future for the company. They had several interesting designs coming forward, including a talking picture amplifier. Mr. R. M. Ellis said the sales for April 1930 considerably exceeded the figure for April 1929.

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO., LTD.—At the recent meeting Mr. R. B. Renwick read the speech prepared by Sir Harry Renwick (who was absent), in which he stated that receipts increased by over £6 000 in the past year, but that increase was extinguished by the increase of over £7 500 on the other side of the account, nearly the whole of which was represented by increased rates and taxes, which accounted for no less than £7 000. It was proposed to pay a dividend of 11%, the same as for last year. The company's new assessment had been increased, under the Rating and Valuation Act of 1925, from £1 976 to £15 165, and this militated against the possibility of reduction of their supply charges. New connections and units sold showed a very satisfactory increase, and the figures for the first three months of this year were also satisfactory and justified them in anticipating a good year. A large amount of the area had already been changed over from direct to alternating current. The report and accounts were adopted.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Lord Meston, presiding at the meeting on Monday, said in spite of the general political unsettlement and a good deal of labour trouble in other industries, the Corporation work of providing material comfort and industrial power had continued almost unchecked. They had sold 170 000 000 kWh during the year, against 148 000 000 in 1928, they had erected 17 miles of new overhead cables, and laid down 58 miles of new underground mains; 2 848 additional houses had been connected, and the demand for minor domestic services, cooking, refrigerating, etc., had been encouraging. The increased revenue had been discounted to some extent by an important concession to the consumer—namely, that from July 1 that section of their tariff for h.t. power which was based on the kilowatts of maximum demand, had been reduced by roughly 10% all round. They had within the last few weeks issued privately through Messrs. Robert Fleming and Co., on favourable terms, a block of 220 000 preference shares. It was hoped to issue, certainly before this time next year, and probably a good deal earlier, a substantial amount of ordinary shares, which it was their intention to offer to existing ordinary shareholders. The report was adopted, and the preference dividend and the final dividend on the ordinary shares, making 12% for the year, plus a cash bonus of 5d. per share, was approved.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—Lord Erskine, presiding at the meeting on May 9, in the

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unavoidable absence of Sir Harry Renwick, read the speech prepared by the latter, in which it was stated that units sold during 1929 were 15 526 668, increase 2 159 922, and new business secured amounted to 4 562 kW, making 36 912 kW connected. Total receipts were £277 066. It was proposed to distribute a final dividend of 9% on the ordinary shares, making 15% for the year, and leaving £7 798 to be carried forward. The total reserves, including the carry forward, amounted to £416 303. The company's new assessment for rates had been increased from £19 174 to the enormous figure of £46 797. There appeared to be no settled practice or formula for arriving at the new assessments, and the subject called for a thorough overhauling. It seemed to him that some system of adjustment should be adopted as between local rating and supply charges. Negotiations were still going on with the local authorities regarding an extension of the company's tenure, and he had faith in the local authorities to do the right thing for all concerned, notwithstanding the complications involved and the delays that had taken place. He referred, of course, to areas over which the local authorities had the option to purchase in 1932 and 1941, but they had other areas outside the borough, and further extensions were pending for areas adjoining, thus consolidating their present area, so that their eggs were not all in one basket. The new undertakings which they acquired last year had made substantial progress. There was an increase during the first three months of this year of over 50% in the kilowatts applied for. The report and accounts were adopted.

British Power and Light Corporation (1929), Ltd.—Mr. H. A. Vernet, presiding at the first ordinary general meeting on May 6, said the balance of profit and loss account was £20 535, which it was proposed to carry forward. The results had fallen short of the expectations formed at the time the corporation was launched. The time required to expand the sales of current had proved greater than was anticipated, while an unusual lack of rainfall from January to July last year caught the North Wales Co. short of water reserves, and caused an increase in that company's expenses. Current sold by the North Wales Power Co. to general consumers, as distinguished from the Aluminium Corporation, totalled slightly over 46 000 000 kWh., against rather over 41 000 000 in 1928, while the English distribution companies sold just on 1 000 000 kWh. As to the English companies; the trouble was to be attributed not to a lack of demand but to difficulties and delays in connection with various matters, such as wayleaves. Given time, the original estimates of sales should be found conservative. A depreciation account had been instituted as from May 1, the date on which they took over the North Wales Power Co., and there had been placed to this account from profits the sum of £14 992, while £5 000 had been transferred from profits to a special renewals fund. It was computed that the loss due to the drought was approximately £17 000. Their reserves of water at the beginning of this year were the equivalent of 5 000 000 kWh more than at the beginning of 1929, and on March 31 last the water storage was equivalent to 8 000 000 kWh more than at the corresponding date last year. Electricity Distribution of North Wales and District sold 85% more electricity than in the previous year. The report and accounts were adopted.

South Wales Power Co., Ltd.—Mr. W. North Lewis, presiding at the meeting on May 9, said the gross profit of the Parliamentary company (the South Wales Electrical Power Distribution Co.) for the past year was £93 666, against £89 060, which enabled it to meet its debenture interest and preference dividend, to transfer £15 000 to depreciation reserve, and to hand over to the South Wales Power Co. £8 331, against £3 724 in the previous year. The income of the South Wales Power Co., which the balances received from the Parliamentary company enabled it to meet in full its debenture interest and sinking fund, preference dividend, directors', trustees' and auditors' fees, with a balance over of £3 171, against £477 for the previous year, which the directors recommended should be carried forward, thus increasing the balance forward to £24 354. Sales of electrical energy had risen from 65½ million to over 76 million kWh, this being a record to date. Within the past year the company had put into commission the new 25 000 kW generating plant at the Treforest power station, and this new plant had been in use for less than half of the year, but the weight of coal consumed per kWh of electricity had been reduced by 10%. Cost of generation compared with the previous year was reduced by nearly 17%. With the addition of this new unit, the total up-to-date plant capacity of the station now amounted to 62 000 kW. The increase in the company's business was represented by 940 new consumers. In the areas in which the company held Electric Lighting Orders the number of consumers had increased by 11½% and electricity sold to them by 22%. During the year they had put into use a travelling showroom, which had proved an attractive method of advertisement. The proposals of the Central Electricity Board for South West England and South Wales were now available. It was anticipated that this seventh national scheme would be adopted by the Board in a few weeks, and they had reason to understand that the Treforest station would become a selected station under the scheme. The report and accounts were adopted.

New Companies.

Thompson and Dean, Ltd.—Cap., £1 000. Theatre furnishers, electrical contractors, etc. Reg. Office: 38, Hurst Street, Birmingham.

City Sign Co., Ltd.—Cap., £200. Manufacturers of glass, electric and other signs, reflectors, etc. Reg. Office: 49, Red Lion Street, Clerkenwell, London, E.C.1.

Electricity Distribution Co., Ltd.—Cap., £10 000. Electric light company, etc. Solicitors: Last, Riches and Fitton, 18, Bolton Street, London, W.1.

Electric Hammers, Ltd.—Cap., £1 000. Electric hammer manufacturers, electricians, electrical engineers, etc. Reg. Office: 160, Piccadilly, London, W.1.

Shardlow Electric Wires, Ltd.—Cap., £1 000. Manufacturers of electric wires and cables, etc. A director: C. A. Smith, 39, Melton Road, West Bridgford, Nottingham.

Weston Electric Lamp Co., Ltd.—Cap., £1 500. To acquire the business of merchants of lamp and other electrical appliances heretofore carried on by Weston Electric Lamp Co. at 35, Hatton Garden, London, E.C.

Rich and Bundy, Ltd.—Cap., £1 000. To acquire business of electrical engineers and transformer manufacturers now carried on at 13, New Road, Ponders End, Middlesex, by A. I. Rich and A. H. Bundy, as "Rich and Bundy."

British Sweeper Stores, Ltd.—Cap., £1 500. Dealers in, and manufacturers of, electrical and other sweepers, electric or other irons, kettles, heaters, radiators, lamps, etc. Reg. Office: 5, Gray Street, Oxford Street, London, W.1.

H. Evans Electrical Fittings Co., Ltd.—Cap., £1 000. To acquire business of dealer in electrical appliances, etc., heretofore carried on by H. Evans at 7, Charlotte Street, Fitzroy Square, London, W.1, as Evans Electrical Fittings Co.

British Electric Welding Machines, Ltd.—Cap., £20 000. Manufacturers of, and dealers in, electric resistance welding machines, manufacturers of, and dealers in, electric motors and generators, etc. Solicitors: Restall, Round and Gloster, 21, Waterloo Street, Birmingham.

Claude-General Neon Lights, Ltd.—Cap., £218 000. To adopt agreement with Georges Claude, A. G. für Elektrizitats Industrie and the General Electric Co., Ltd., to carry on the business of manufacturers of, and dealers in, illuminated signs, lamps, tubes and other apparatus for electric or other lighting, etc. Solicitors: Wild Collins and Crosse, Kennan's House, Crown Court, London, E.C.2.

COMING EVENTS.

Friday, May 16 (To-day).

Electrical Association for Women.—Fifth Annual Conference. Visit to Messrs J. Lyons and Co.'s Factory at Greenford, 10.30 *a.m.*; ball at the Park Lane Hotel, London, 9 *p.m.* to 2 *a.m.*

Institution of Electrical Engineers (Scottish Centre).—Technical College, Dundee. Twenty-first Kelvin Lecture by Mr. R. H. Fowler, F.R.S., on "Some Recent Advances in the Electron Theory of Metals." 7.30 *p.m.*

Saturday, May 17.

Institution of Electrical Engineers (London Students' Section).—Visit to the Brookmans Park Regional Station of the British Broadcasting Corporation. 2.30 *p.m.*

Association of Mining Electrical Engineers (South Wales Branch).—Esplanade Hotel, Porthcawl. Annual meeting. 5.30 *p.m.*

Wednesday, May 21.

Institution of Electrical Engineers (North Midland Students' Section).—Whole day visit to Hope Cement Works, by invitation of Messrs. G. and T. Earle, Ltd., of Hull.

Overhead Lines Association.—I.E.E. Building, Savoy Place, Victoria Embankment, London. Paper by Mr. G. W. Molle on "Corrosion." 5.30 *p.m.*

Polytechnic Electrical Engineering Department.—307-311, Regent Street, London. Lecture III (Course of six lectures), by Mr. W. H. Date, on "Thermioni Valves." 6.30 *p.m.*

Thursday, May 22.

Batti-Wallahs' Society.—Hotel Metropole, Northumberland Avenue, London. Luncheon. 12.30 for 1 *p.m.*

Friday, May 23.

Physical Society.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London. Discussion on "Magnetism," opened by Sir Alfred Ewing, with a contribution on "Ferro-Magnetism and Hysteresis." 3-4.30 *p.m.* and 4.30 to 5.15 *p.m.*

Royal Institution.—21, Albemarle Street, London. Paper by Mr. R. S. Whipple on "Some Scientific Instrument Makers of the 18th Century." 9 *p.m.*

Friday, May 23—Monday, May 26.

Institution of Electrical Engineers (Western Centre).—Sedbury Park Hotel, near Chepstow. Summer meeting.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BURNSTON, Mr. P., trading as HARPER ELECTRICAL CO., 30, Durward Street, E.1, electrician. £21 9s. 4d. February 13.

CURTIS MANUFACTURING CO., 30, Barden Road, Tonbridge, electrical engineers. £17 13s. 4d. March 20.

EADE, Jas., and SON, 48, New Road, Skewen, electric engineers. £10 1s. March 4.

EVERITT, Charles J., 248, High Street, Plumstead, wireless dealer. £12 7s. 8d. February 24.

HEATHERINGTON, Mr. R. W., 56, Fowter Street, South Shields, wireless dealer. £20 11s. 6d. March 20.

MULLIGAN, Laurence Alfred, GILLIVER, Frederick Herbert, 31a, Warwick Street, S.W.1, electricians. £13 2s. 6d. February 27.

SCHOLEFIELD, Mr. H., The Arcade, Waterfoot, master electrical engineer. £10 9s. 1d. March 14.

SIMKINS, Mr. F. W., trading as CORNER CABINET WORKS, Roxeth, Corner, Harrow, wireless dealer. £20 2s. 7d. March 17.

STIRLING RADIO CO., Station Stores, 183, High Road, Dagenham, dealers. £15 12s. 1d. March 26.

SULLIVAN (H. W.), LTD., 72, Leo Street, Peckham, electric engineers. £10 5s. 11d. March 19.

Deed of Arrangement.

HIRST, Richard Bows (dairy company's manager), trading as "FORWARD" ELECTRO-PLATING CO., St. Peter's Mills, Park Lane, Leeds. Dated May 1, filed May 7. Trustee, A. V. Lynas, Hylands Buildings, Wood Street, Wakefield. Liabilities unsecured, £985; assets, less secured claims, £138.

Receiverships.

RAVEN (PETER) AND CO., LTD. A. W. Watson, of 5, Waterloo Street, Birmingham, was appointed Receiver on April 10, 1930, under powers contained in debentures dated November 7, 1929.

ROSEWARNE (T. V.), LTD. S. W. King, of 32, Matheson Road, Kensington, W., was appointed receiver and manager on April 28, 1930, under powers contained in mortgage or charge dated March 28, 1925.

UBIQUE CONSTRUCTION CO., LTD. E. Hard, of 23, 24 and 25, Billiter Street, E.C., was appointed Receiver of the moneys due and payable to the company by the Manchester Corporation under a contract made on or about May 20, 1929, by Order of Court dated April 7, 1930.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

DALWIN, LTD., London, E., gramophone, motor and wireless dealers.—Registered May 3, £700 debenture, to L. J. C. Goodall, 55, Fore Street, E.C.; general charge.

HARMONIC RADIO CO., LTD., Nottingham.—Registered, May 3, £400 debenture, to Mrs. E. E. Kynaston, 172, Trent Boulevard, West Bridgford; general charge.

HUNT (JOHN A. H.), LTD., Birmingham, gas and electrical fitting manufacturers.—Registered April 25, £350 debentures, part of £5 000; general charge.

NORTHAMPTON RADIO, LTD.—Registered April 25, £200 debentures, to S. G. Crimes, 150, Southampton Row, W.C.; general charge.

ROLYAT ELECTRICAL CO., LTD., London, S.W.—Registered April 29, £1 000 debenture to Mrs. M. D. Taylor, 11, Furzedown Market, Tooting; general charge.

RUSKIN ACCUMULATOR SERVICE, LTD., London, N.—Registered April 29, £140 debenture, to G. G. Portch, 111, Queens Road, Buckhurst Hill, and another; general charge. *Nil. June 24, 1929.

WESTON ELECTRIC LAMP CO., LTD., London, E.C.—Registered May 1, £800 debentures; 2nd general charge.

WORTEX MANUFACTURING CO., LTD., London, E.C., electrical engineers.—Registered April 30, £4 000 1st debenture, to T. N. Bessunger, 26, Palace Court, Finchley Road, Hampstead; general charge. *£2 000. December 31, 1928.

WESTON ELECTRIC LAMP CO., LTD., London, E.C.—Registered April 22, £396 15s. debenture, to Universal Electric Lamp Co., 89, Great Eastern Street, E.C.; general charge.

Satisfaction.

ABINGDON ELECTRIC SUPPLY CO., LTD.—Satisfaction registered April 25, £2 500, registered July 5, 1925.

London Gazette, etc.

Winding-up Petitions.

K. N. ELECTRICAL PRODUCTS, LTD. A petition for winding-up has been presented by Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, London, W.C.2; and is to be heard at the Royal Courts of Justice, Strand, London, on May 26.

PETO-SCOTT CO., LTD.—A petition for winding-up has been presented by Philips Lamps, Ltd., 145, Charing Cross Road, London; and is to be heard at the Royal Courts of Justice, Strand, London, on May 19.

RECORDAPHONES, LTD.—A petition for winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, on May 19.

Companies Winding-up Voluntarily.

BATTERY SUPPLIES, LTD.—By reason of its liabilities, May 2. R. Davies, certified accountant, 4, King Street, London, W.6, appointed as liquidator.

BORDER ELECTRICAL FACTORING CO., LTD.—By reason of its liabilities, April 24. T. E. Williams, 14, Lowther Street, Carlisle, incorporated accountant, appointed as liquidator.

OSWESTRY ELECTRIC LIGHTING AND POWER CO., LTD. By special resolution, May 6. G. N. Sinclair (of the firm of Garner, Pugh and Sinclair), Prudential Chambers, Oswestry, incorporated accountant, appointed as liquidator.

PETO-SCOTT CO., LTD.—Meeting of creditors at Incorporated Accountants' Hall, Victoria Embankment, London, W.C.2, Thursday May 15.

Bankruptcy Information.

RICHARDS, Sydney Ernest, and NEILSON, Alan Kelson, trading as RICHARDS AND NEILSON, 182, Tulse Hill, London, S.W.2, wireless and electrical engineers. First meeting, May 16, 11.30 a.m. and public examination, June 17, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

WILEMAN, Norman Arthur, trading as A. WILEMAN AND CO., 141, Commercial Street, Maesteg, Glamorgan, electrical engineer and contractor. First meeting, May 16, 12 noon, 34, Park Place, Cardiff. Public examination, June 19, 11.30 a.m., Court House, Wyndham Street, Bridgend.

Notice of Dividend.

HOBSON, Joseph, electrical engineer, Cross Street, Pendleton, Salford. First and final dividend, 1s. 11½d. per £, payable, May 19, Official Receiver's Offices, Byrom Street, Manchester.

Notices of Intended Dividends.

JACKSON, John Harold, Dock House, Winsford, Chester, electrical engineer. Last day for receiving proofs, May 26. Trustee, C. J. Pyke, 12, Lonsdale Street, Stoke-upon-Trent, Official Receiver.

MADDOX, Victor Frederick, 6, Homend Street, Ledbury, Hereford, electrical and wireless engineer. Last day for receiving proofs, May 28. Trustee, O. B. Wallis, 133, Saint Owen Street, Hereford, Official Receiver.

Bankruptcy Proceedings.

DOBBING, Anthony Chapman, and ROTHERY, Arnold Lloyd, (trading as THE RIPON ELECTRICAL COMPANY), 39, Kirkgate, Ripon, Yorks., electrical engineers. The public examination of these debtors was held on May 9, at Harrogate, when a statement of affairs was produced showing liabilities expected to rank at £810, against assets of £89, a deficiency of £721. Debtor Dobbing said, in reply to questions, that he commenced trading in February, 1928 in partnership with another. That was a failure and was dissolved in June of the same year. The debtor continued trading, and in November was joined in partnership by debtor Rothery. Under the partnership deed, the latter was to put in £250. The former did not contribute any money, but the building and goodwill were assessed at £500. He was to receive two-thirds of the profits, and Rothery one-third. The debtor Dobbing said that he had put the £250 into the bank. The business, he said, had never paid its way owing to lack of capital, and the delay in laying the main cables. They had expected to get a lot of work, most of it relying upon the Ripon Corporation laying cables. Between the commencement of the partnership in November, 1928 and April 10, 1930, they had incurred liabilities to the extent of £809, and the whole of the £250 contributed by Rothery had gone. Debtor Dobbing said that his sister had advanced him £250, and friends £50 or so. At the time of filing the petition, the stock in trade and fixtures was put down at £80. Debtor Rothery was next examined, and he said that his father had given him the £250 to put into the business. He had not known anything about the concern. He had no personal debts. The hearing was concluded.

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THE ELECTRICIAN, May 23, 1930.
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PUBLISHERS' JUBILEE HISTORY.

THE ELECTRICIAN

ESTABLISHED 1861. *THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF*
Electrical Engineering, Industry, Science and Finance.

Vol. CIII.—No. 2712. Friday, May 23, 1930. [*Registered at the General Post Office.*] Sixpence

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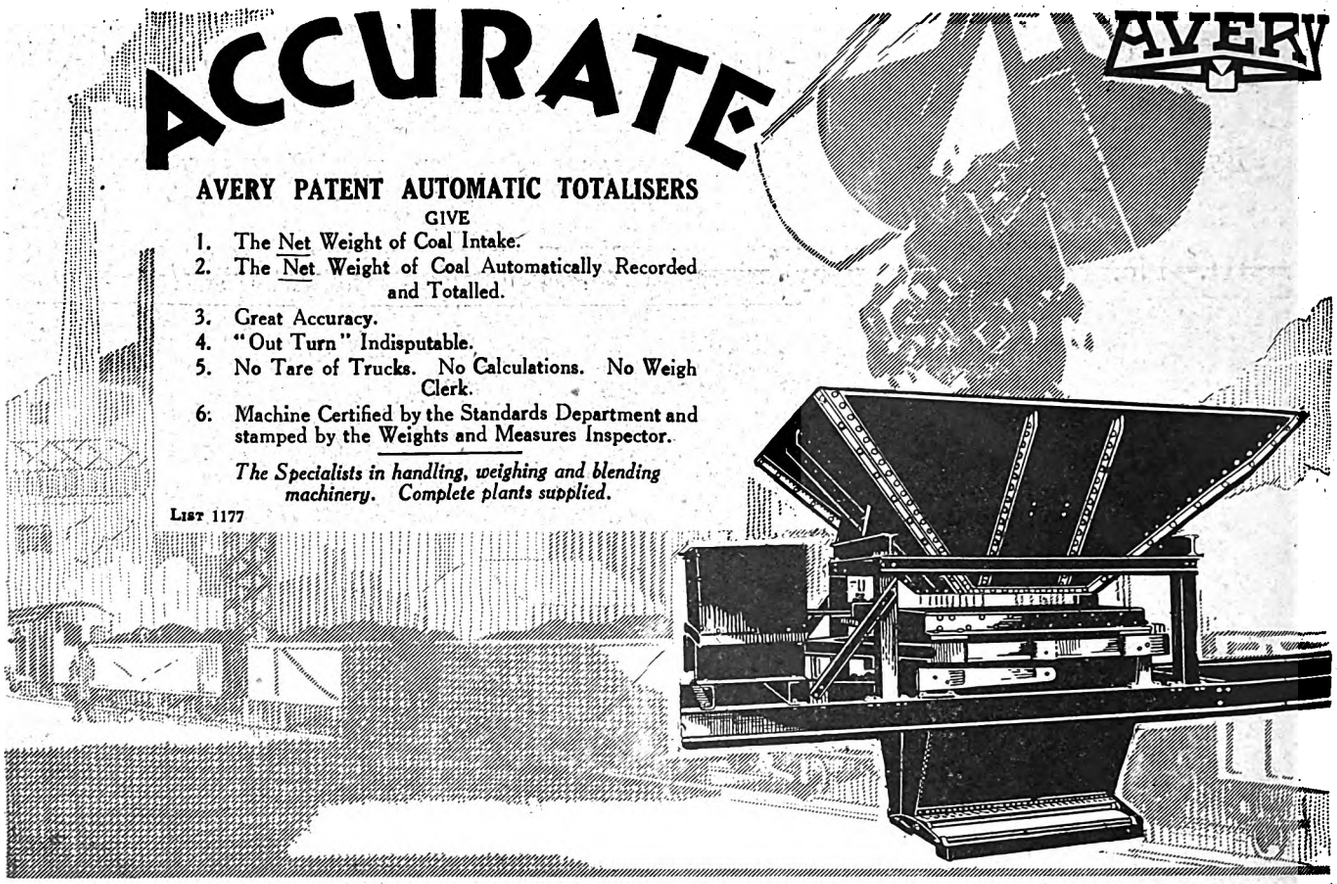

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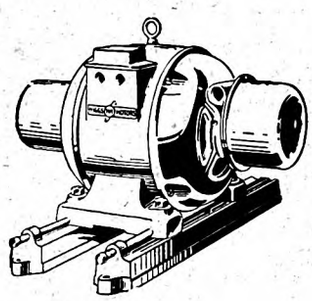
A.C.  D.C.

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

Bouverie House, 154, Fleet Street, London, E.C.4 *Telegrams: "Benbrotric, Fleet, London."*
Telephone: City 0244 (Ten lines).

[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

No. 2712. [No. 21. Vol. CIV.] Friday, May 23, 1930. Annual Subscription, 25s. Overseas, 30s.

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Retrospect.

IN view of the fact that the foundation of the firm of BENN BROTHERS, the present proprietors of this journal, virtually coincided with the beginning of the electrical era, it seems specially appropriate that the family of periodicals controlled by this firm should include a newspaper which has been so intimately associated with electrical progress in all its branches. Like the Institution of Electrical Engineers, which originated as the Society of Telegraph Engineers, THE ELECTRICIAN was at first mainly concerned with telegraphy, which, with electric bells and electro-plating, long remained almost the only commercial uses of electricity. But a year or two before JOHN BENN founded "The Cabinet Maker" in July, 1880, a great forward movement in the application of electricity was beginning to take shape. The dynamo and the arc lamp, closely followed by the invention of the carbon filament lamp by Swan and Edison, had initiated a revolution in the artificial production of light, and the first telephone exchange had just been installed in London.

Not the least interesting part of the story told in the Special Jubilee Supplement included in this week's issue of THE ELECTRICIAN will be found in the section dealing with the part played by this journal in some of the great electrical controversies of the closing quarter of the nineteenth century. Mention may be made of the support accorded by C. H. W. BIGGS, then editor, to that eccentric genius, OLIVER HEAVISIDE, which has been characterised by Mr. ROLLO APPLEYARD, in his recently published "Pioneers of Electrical Communication," as "the finest action to the credit of technical literature in our time." The publication in 1894 of Dr. (now Sir) OLIVER LODGE'S treatise on "Signalling Across Space Without Wires," and the subsequent championship of LODGE'S claims in the long controversy which ended with the acquisition by MARCONI of the Lodge patent in 1911, was another notable instance of courageous editorial policy. Time brings its revenges and within the past few months we have found it necessary to suggest that the larger organisation of which the Marconi Company now forms part has not been altogether fairly treated by the Government in connection with the development of long-distance radio telephony.

It seemed fitting on this occasion to ask Col. Sir THOMAS PURVES, as President of the Institution of Electrical Engineers and Chief Engineer of the Post Office, and Col. R. E. CROMPTON, the *doyen* of the electrical industry in this country, whose years sit so lightly upon him, to contribute special articles. Sir THOMAS PURVES surveys the growth of telephony in this country from the opening of the Coleman Street exchange (the first to be established in Great Britain), in 1879, to the automatic switching system that is gradually abolishing the human element except for special duties in connection with trunk and international calls. In the past fifty years we have passed from the stage when intercommunication between subscribers in one restricted area was the limit of achievement to the new era, as yet in its infancy, of trans-oceanic radio telephony linking the Antipodes and bridging thousands of miles between ships and shore In fact, to-day the obstacles to vocal communication between any two persons, however widely separated, are financial rather than technical. Col. CROMPTON, who played a pioneering part in the development of electricity supply, recalls the early difficulties, both technical and legislative, which had to be overcome before house to house supply of current became practicable. Now the case is altered and attention is largely concentrated on how to stimulate a larger demand for the current that is so plentifully available. Col. CROMPTON has had a great deal to do with both aspects of the supply problem and we are particularly indebted to him for his ready compliance with our request that he should favour us with an article covering his half-century of active effort in the development of electric supply and manufacturing.

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Current Topics.

E.A.W. Conference.

LAST week the Electrical Association for Women held its fifth annual conference, the business part of the occasion being supplemented by several very successful social gatherings, to which reference is made elsewhere in this issue. The E.A.W., in its five years of vigorous life, has grown into an organisation of more than 4,000 members, with branches all over the country, as Sir FELIX POLE remarked at the luncheon held immediately after the annual meeting. This is a record of which the Executive Committee and Miss HASLETT, whose onerous duties as director are so efficiently and amiably carried out, have every reason to feel proud. They are doing work which is of the highest importance in interesting the women of this country in the possibilities of electricity as a means of lightening their domestic tasks and in giving them some instruction concerning the handling of this new servant. Every supply undertaking, anxious to smooth out the Matterhorns from its load curve, and obtain a profile more resembling that of the Hog's Back, has an invaluable ally in the E.A.W.

S.W. England and S. Wales Scheme.

WE learn that the South West England and South Wales scheme will probably be formally adopted by the Central Electricity Board to-day and that the post which Mr. J. W. BEAUCHAMP has accepted under the Board is that of District Engineer in this area. Mr. BEAUCHAMP has done excellent work not only as an engineer and manager of supply undertakings but also in the sphere of electrical propaganda and we feel sure that he will prove a very valuable acquisition to the Central Board, whose satisfaction at having secured his services is in inverse ratio to the regret which the South Wales Power Company feels at parting with him.

Lamp Measurements.

THE May number of the "Journal of the I.E.E." contains a paper by Mr. G. T. WINCH, A.M.I.E.E. (a communication from the staff of the General Electric Company's Research Laboratories at Wembley), describing the construction of a simple photo-electric photometer suitable for measuring incandescent electric lamps of the vacuum and gasfilled 10 to 100 W types at commercial speeds under continuous service conditions. As an instance of the saving of time without loss of accuracy effected by the use of this apparatus it is mentioned that measurements which occupied five observers for four days, apart from the time taken to calculate the results, were made photo electrically without calculations by one observer in about four hours.

British h.t. Insulators.

EXAGGERATED suggestions of the uniqueness in Great Britain of the new Steatite and Porcelain Products factory and research laboratory at Stourport which have appeared in the daily Press have naturally caused resentment amongst other and old established British manufacturers of electric insulators. Sir FRANCIS JOSEPH, president of the North Staffordshire Chamber of Commerce, has circulated a letter in the course of which he points out that it is very regrettable that some respected names should have been linked with the claims in question (though they are not, perhaps, responsible for them) on the eve of the JOSIAH WEDGWOOD Bicentenary, when will be seen examples of the finest electrical porcelain in the world, manufactured by old-established British firms, who have been in the forefront of the industry ever since its inception. Sir FRANCIS JOSEPH adds that British electrical porcelain has been, since long before the War, in use on h.t. lines throughout the world. In many instances the British product has supplanted both the German and the American. The British specification for electrical porcelain is the severest known, and not only is super-high testing apparatus in general use by manufacturers, but the National Physical Laboratory is at the service of the industry. Electrical porcelain, made by old-established British factories has been used exclusively in the Grid scheme and on British Government wireless stations, and is incorporated on British transformers and switchgear, for both home and export.

Passamaquoddy Tidal Project.

IF the joint American and Canadian investigation (for which a resolution appropriating $45 000 was voted by the House of Representatives at Washington last month) results in overcoming Canadian opposition to the project, it is proposed to spend £15 000 000 to £20 000 000 on the harnessing of the tides of Passamaquoddy Bay to supply electricity to New England and the Maritime Provinces of Canada. The Dominion is to share the cost of the inquiry. Some £70 000 has already been spent on preliminary work in connection with the scheme which is opposed by fishing interests and by the Canadian Pacific Railway. It is stated that the work would occupy 5 000 men for four years and furnish about 3 000 000 000 kWh per annum.

H.T. Theft.

IN some parts of Africa it was, not so long ago, difficult to maintain telegraph communication owing to the propensity of the inhabitants for stealing the wire which was a much less troublesome way of acquiring useful metal than their own crude smelting, if there were workable ores in the locality, or buying it with their labour. One would hardly expect that in the United States such practices would be prevalent, yet it seems that the theft of transformers and copper wire from transmission lines alongside the roads in Arkansas is rife. The Arkansas Light and Power Company has even advertised in the Press asking for public co-operation in preventing this practice.

Small Rural Transformers.

At the April meeting of the Overhead Lines Association Mr. F. H. CLOUGH suggested the appointment of a committee composed of three members nominated by B.E.A.M.A. and three representatives of users, with Mr. DICKENSON, of the Electricity Commission, as chairman, to discuss the standardisation of small rural transformers with a view to the production of an improved type at lower cost. He mentioned that he had discussed the matter with Mr. DICKENSON, who had expressed his willingness to preside. We regret to learn that Mr. DICKENSON, on further consideration, has not found it possible to agree to do so, owing to pressure of other duties. For the moment the matter is in suspense, although the B.E.A.M.A. has agreed to appoint representatives on such a Committee. It is naturally of the greatest importance that the right man should be found to undertake this important work and we hope that the Overhead Lines Association will shortly succeed in finding him and inducing him to act so that the Committee can be set up and get to work.

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FIFTY YEARS OF TELEPHONE PROGRESS IN GREAT BRITAIN.

London's First Exchange—Abolition of Earth Return Circuits—Copper Replaces Iron—Underground Cables of 1 100 Pairs—Magneto Calling—Central Battery System—Automatic Switching—World-wide Telephony Achieved.

By COL. SIR THOMAS F. PURVES, Engineer-in-Chief of the G.P.O. and President of the Institution of Electrical Engineers.

THE jubilee now being commemorated by a special supplement of THE ELECTRICIAN covers the period in which the telephone has been developed. World-wide telephony is now technically an accomplished fact and all that is necessary for its actual achievement between any two points is the reasonable assurance that the sinking of capital in various parts of the world will be justified by the traffic obtained. All telephone administrations now recognise that good service induces traffic and consequently the prospects in this country for world-wide telephone communication are bright.

The first telephone exchange was established in Great Britain in 1879 at 36, Coleman Street, E.C. (See Fig. 1). In those early days the only service contemplated was communication between subscribers situated in comparative proximity to each other. The telegraph system had already been developed with single conductors, the earth providing a return circuit, and such arrangements were naturally, for reasons of economy, at the outset adopted for telephone purposes. It was soon evident, however, that the very tiny currents involved in the transmission of telephone speech were easily disturbed by electrical energy reaching the circuit from an external source, and one of the most important early developments was the introduction of twin conductors which eliminated the common earth connection as a source of leakage disturbance and also permitted the two conductors to be revolved in a disturbing field, so that the inductive effects were balanced in the twin conductors and neutralised. Incidentally, one of the most troublesome forms of disturbance had been that due to the mutual interference of two circuits, resulting in the overhearing of conversations.

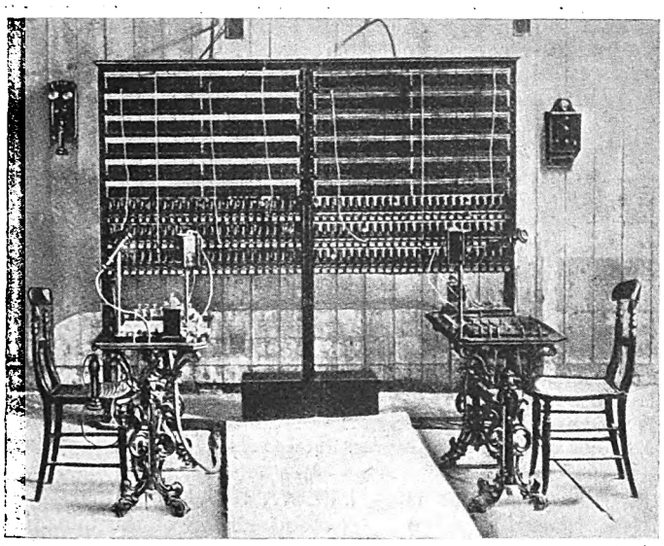

Fig. 1.—The first telephone exchange installed in Great Britain (at 36, Coleman Street, London, E.C., in 1879).

The conductors between the subscriber's office and the telephone exchange were at the outset galvanised iron wires. Although iron wire had many advantages mechanically and was cheap, it became evident very early that its conductivity for speech currents was too low, and between 1880 and 1890 experiments were carried out by Sir William Preece in collaboration with Messrs. Thomas Bolton and Sons, wire manufacturers, which resulted eventually in the production of hard drawn copper wire suitable for telephone purposes. Since that time iron wire has fallen out of use for telephone works. The use of copper wire changed the methods of construction, for much greater care was necessary in its manipulation than had been the case with iron wire. It is difficult to-day to realise the importance of the step taken when a suitable specification for hard drawn copper wire was produced; previously all the copper wire used for electrical purposes had been soft and, as such, was unsuitable for road line construction, thus copper appeared to be outside the realm of practical engineering until a system of hard drawing was designed.

In course of time, as the telephone system of the country grew, attention was devoted to the possibility of placing the conductors underground on grounds of security, cheapness, and economy of space. At first gutta-percha was used, but this was eventually superseded by air spaced, paper core, lead-covered cables, which were introduced experimentally in 1891. Speech over underground wires was restricted by the attenuation and distortion produced by the capacity of the circuit, and this, of course, was much greater in the case of gutta-percha than with air-spaced paper core cable.

For some years the use of cable was confined to local areas. It has proved so effective, however, for local distribution, that cables containing 1 000 pairs are now in general use and occasionally 1 100 pairs are placed in one cable.

Primary batteries were the only source of energy available in the early days and, furthermore, the operators were without any means of effectively supervising and controlling the connections they established; nevertheless, in a period of ten years more than 30 000 lines came into operation and it became abundantly clear that there was a demand for telephone communication over a much wider field, and as the telephone system of the country grew there developed a demand for a trunk service between the various cities and towns of the country. This was very much facilitated by the invention of hard drawn copper wire already mentioned, and until comparatively recent years increasing the gauge of conductors was the only known means of increasing the distance over which speech was practicable. Even just prior to the Great War circuits of a gauge of 600 lb. and 800 lb. per mile were the only means of establishing communication between London and the north of England and Scotland.

As the art developed it became necessary progressively to improve the switching equipment provided for the operators. At local exchanges an early development was the invention of the subscriber's multiple which enabled each operator to have direct access to every subscriber. The multiple was adopted first at magneto exchanges, i.e., exchanges in which the calling and clearing signals were given by the subscriber's turning of a small hand generator provided for the purpose. With the development of the multiple, of course, came the need for providing operators with a means of ascertaining (without interrupting him) whether a required subscriber was already engaged or not.

Glow Lamp Indicators.

The labour of maintaining the primary batteries in an extensive telephone system was not only expensive but difficult, and objectionable to the subscribers. In 1900 an exchange was installed at Bristol in which the power was supplied from centralised equipment at the exchange, and this rendered unnecessary the primary batteries at subscribers' premises. This improvement led to a number of incidental but also important developments. For instance, the clumsy indicator previously utilised on exchange switchboards was replaced by a small glow lamp that was lighted from the common power plant. The lifting of the subscriber's receiver from the hook was made the means of operating this lamp and also of controlling signals in front of the operator, enabling her to supervise a call and take down the connection promptly when the conversation had terminated. This was known as the central battery system and has been standard for large manual exchanges ever since. (See Fig. 2.)

The growth of the telephone business had meanwhile included the establishment of a trunk system which eventually in 1896 came into the hands of the Post Office, although the local systems continued for many years to be operated not only by the Post Office but by various companies and municipalities. It is not proposed to enter into an explanation of what might be termed the politics of telephony, but, briefly, the process was one of rationalisation, in which all the smaller telephone organisations were absorbed by the larger ones until, eventually,

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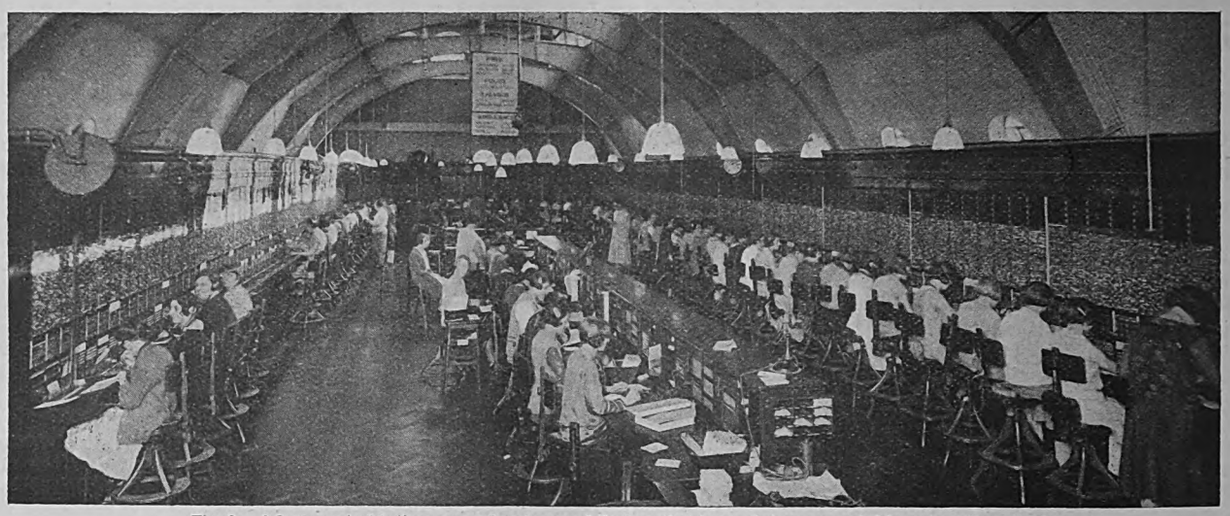

Fig. 2.—A large central battery manual exchange of the type that is now being superseded by automatic switching.

the whole of the telephone system of the country (trunks and local) came into the hands of the Post Office in 1912.

As in the case of the local exchanges, lamp signalling was adopted for all the larger trunk exchanges, giving the operators suitable facilities for controlling calls between towns.

Two important developments in telephony have influenced the growth of long-distance service. They were the introduction of the loading coil and the application of the thermionic valve repeater or amplifier. It has been stated previously that long-distance service has been carried on by means of heavy gauge expensive overhead copper conductors. Before the Great War the use of underground cables for long-distance calls had been small owing to the technical difficulties involved, but the introduction of the loading coil permitted the restrictive effect of capacity in telephone cables to be compensated, and so increased the distance over which underground conductors could be used for telephony. It was still impossible to use very light gauge conductors for underground work, and the cable circuits, therefore, had to be confined to comparatively short distances. During and after the War, however, rapid strides were made in the development of the thermionic valve amplifier, and the combination of loading and amplification have made universal underground service in this country possible. Practically the whole of the telephone system of this country is now underground, and long distance circuits of only 40 lb. per mile* are in operation between towns so far apart as London and Glasgow, with 20 lb. circuits on many routes. Thus a conversation which 15 years ago required the use of 280 tons of copper now demands only 14 tons and the speech transmission is superior in the latter case.

Meanwhile invention had produced the automatic exchange, so that in place of the switching operator, mechanism which could be controlled by the subscriber was provided for connecting a local call. At the date of writing there are in Great Britain 400 000 subscribers' lines operated on this system and the number is increasing progressively. A view of an automatic exchange is given in Fig. 3.

* The London-Glasgow circuit of 40 lb. per mile consists of two channels per conversation, each of 20 lb. per mile conductors, i.e., an effective (not actual) 40 lb.

Growth of International Calls.

International telephony has made rapid strides during the last five years and practically the whole of Europe is in regular communication with Great Britain. Service with America via a radio link was opened in 1927 and this was later extended to Canada, Mexico, South America and Cuba. On February 14 last, service to passengers on the White Star liner "Majestic" at sea was inaugurated, and last month a public telephone service to Australia was introduced. The following figures give a measure of the present trunk and international telephone business transacted in the interests of the 1 900 000 subscribers' stations connected to the 5 000 exchanges of the system.

Number of Inland Trunk Calls in 1929	116 488 568
Number of Outgoing International Calls in 1929	527 896
Number of Incoming International Calls ,, ,,	570 085

NEW CANADIAN ELECTRICAL CODE.

On June 1 Part I of the second edition of the Canadian Electrical Code, issued by the Canadian Engineering Standards Association, will become effective. This code has already been adopted by Nova Scotia, Quebec, Ontario, Saskatchewan, Alberta, British Columbia and by leading municipalities in New Brunswick; it is hoped that it will shortly become the standard for the whole of Canada. The code is to be revised periodically, probably every two years. Copies of this new edition, which is about half as large again as the first issue, can be obtained from the Secretary, Canadian Engineering Standards Association, 178, Queen Street, Ottawa, price 25 cents.

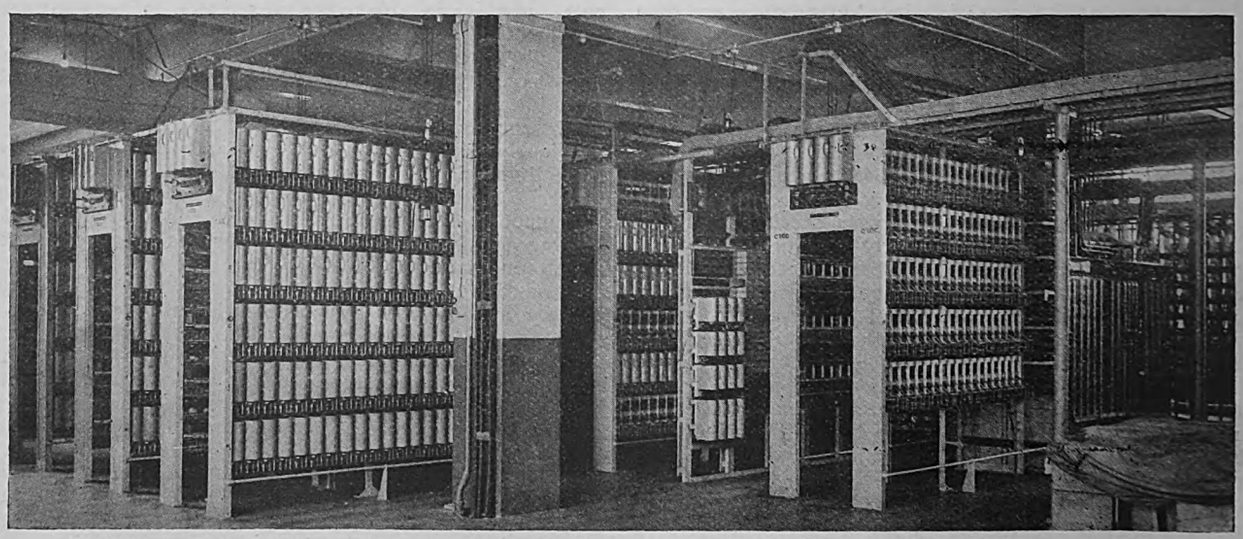

Fig. 3.—Part of an automatic telephone exchange. The contrast between this picture and that of the manually operated exchange is impressive.

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HALF A CENTURY OF ELECTRIC SUPPLY.

Some Recollections of Early Engineering Development—Production of Efficient Dynamos—First Steps in House to House Supply—Efforts to Increase the Load.

By COL. R. E. CROMPTON. C.B.

THERE has recently been a tendency to date the commencement of the Electrical Age from Swan's and Edison's developments of the glow lamp, but I feel that this is a mistake, as the firm with which my name is connected commenced working out the arc lamp and dynamo business in 1878, so that we were able to commemorate the Jubilee of the foundation of our company in 1928. Moreover, the problems with which we dealt during the years previous to Swan's invention were very fruitful, for we then had to find out for ourselves the relations between e.m.f., current, and power, without which knowledge it was quite impossible to develop the designs of dynamos, lamps, conductors or other accessories used by us in the early days of arc lighting.

During those early years, our knowledge increased at a rapid rate as we had to deal in turn with the relations between the magnetic field and its power of inducing e.m.f. in the coils of the armatures of our dynamos. Although we applied to the then fairly well developed industry of the telegraph engineer, they had done little to help us ; resistance was measured then in miles of telegraph wire, e.m.f. in terms of Daniel cells. Again, when we began to study the further improvement in efficiency of our dynamos, we found ourselves quite at variance with the telegraph people, whose ideas on the production of e.m.f. from various kinds of batteries made them tell us that it was no use our reducing the internal resistance of our dynamos for it was well-known to them that the internal resistance of a battery must always exceed the resistance of the external circuit served by it. I well remember the late Sir William Preece telling me this, and suggesting that any further research to get economy in excess of 50% was a hopeless task, so that we had better drop it.

In spite of this, by constant experimenting and largely due to the assistance of men like Lord Kelvin (then Sir William Thomson), his brother James Thomson, and one or two others, we did hit on the idea that the most important direction in which we could hope to make progress was by reducing the internal resistance, by diminishing the number of armature turns and by increasing as far as possible the strength of the magnetic field in which the armature revolved. At any rate, at the time when Swan first showed me his successful lamps in his laboratory in Newcastle we had made such progress with our arc lighting plant that we were able at once to supply him with dynamos which enabled us to carry out installations of Swan's lamps on a large scale within a few months after Swan had made his invention. When we completed the lighting of the Law Courts in the latter part of the year 1882—the first installation of electric lighting on any considerable scale in this country or elsewhere—our Crompton-Bürgin machines were already quite reasonably efficient and were sufficiently self-regulating to maintain the lighting in the Courts almost as steadily as is possible to-day. Again, at that time, we had already seen the enormous advantage in reliability and regularity, that must follow the adoption of the Planté accumulator worked in parallel circuit with our dynamos.

The 1882 Act.

During the period which immediately followed the opening of the Law Courts, we were engaged in carrying out a large number of detached installations, lighting of country houses, and in a few cases of town houses, but our attempts to carry out house to house supply was entirely prevented by the severe terms of Chamberlain's 1882 Act, which limited the period during which we could develop our undertaking to 21 years.

In spite of this handicap in those days we made several preliminary investigations to develop house to house supply. At that time satisfactory lamps could not be produced to stand an e.m.f. above 100 to 110 V. We had to struggle with the whole question of how to lay down in the streets sufficient copper at a reasonable cost, but we now know that the designs we prepared in 1882 and following years for a supply station from Victoria to feed the Pimlico area, could never have been sufficiently extended to be profitably worked, so that when an opportunity offered itself to deal with electric supply on a large scale in the City of Vienna, in the year 1884, among the first problems that presented themselves was how to design dynamos which could be run at a speed not exceeding 600 r.p.m., so that they could be coupled direct to Willans high speed engines and give 500 V at their terminals. This led to the development of those improvements which practically resulted in the production of the d.c. dynamo in its present form. We then developed the idea of distributing from a central station at 500 V and cutting it down to 100 V by working out a 5 wire system. The lamps in the theatre at Vienna were supplied at 100 V by using four batteries of accumulators in series and this work turned out so remarkably successful that I had the temerity to take a short term licence under the old Chamberlain Act to work a district in London, immediately surrounding Kensington Court, in which the estate designer had provided subways under the principal streets. Although the Act of 1888 (and the Provisional Orders which followed thereon in 1889) for the supply of London did not allow of any considerable work being carried on in developing these Orders until 1889, our Vienna experience, supplemented by the additional experience of working our licence at Kensington Court, enabled us during the years 1886 to 1889 to develop a good deal of the main laying and distribution systems which have generally been adopted with modifications throughout London and many other large towns. So that it may be said that it was during the years which followed the opening of the Law Courts up to 1890 that I, with various co-workers, developed the d.c. system which was largely followed by municipal authorities who, owning their gas undertakings, also began to deal with electric supply.

Load Factor Improvement.

At that time Ferranti, at Deptford, and J. E. H. Gordon with his newly formed Metropolitan Company, were alone in developing alternating supply. For us the problems of d.c. supply were far simpler and more easily mastered than the difficult questions of parallel working, transformers and a.c. meters, which were so successfully dealt with by Ferranti. By the year 1890, we had encountered and dealt with the whole question of load factor and its important effect on the cost of supply to the user. In London and most towns where the demand for industrial power does not exist to any great extent this improvement of the load factor has been mainly due to finding new uses other than lighting by which the householder could benefit by electric supply.

At a very early date, we, at Cromptons, turned out electrical hotplates, by using a resistance wire embedded in enamel, and this idea has been generally followed, so that we now have a long range of electrical heaters, cookers and kettles and so on.

For years we have been working on developing the electrical load by using power in small quantities for housemaids' work, cleaning our carpets, walls and furniture by the various types of electrical sweepers with which we are now fairly familiar. One of the more recent developments has been the production of artificial cold—refrigerators which enable us to preserve our food in good condition for long periods.

At an early date we encountered the problem of the costly nature of electrical distribution where the users are widely distributed. The money expended on distribution mains in a country district is vastly in excess of that necessary for the town. It is perhaps an unfortunate thing that our politicians, when they advocated the 1926 Act, promised everyone that they would have a very cheap supply and that our farmers and villagers would have the same amenities associated with cheap electric supply that are enjoyed by town dwellers. But obviously, generation is a very small proportion of the total cost to the consumer, and most unfair comparisons have been made between England and other countries, such as Switzerland, where a cheap supply has been carried into country districts. It has been the fashion to suppose that this was due to the generating cost in Switzerland from water power being exceedingly low. Those who talk so loosely on these matters forget that all over Switzerland, a small country in which rural industries have flourished for many years, the points at which supply is taken in the houses and villages are grouped far more closely than is the case in any part of England outside our purely industrial districts, and that in England, in industrial districts where there is a heavy power load, the cost of supply has for some years past been very low.

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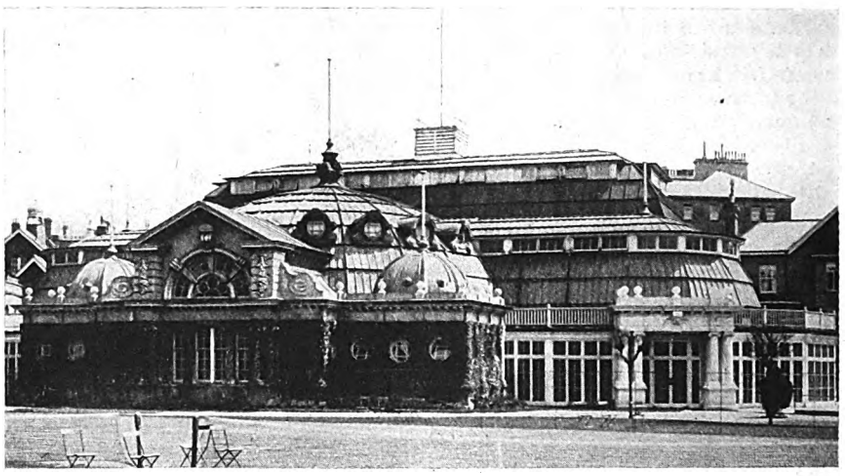
I.M.E.A. MEETING AT EASTBOURNE.

Next Week's Programme—Papers and Functions—The Corporation Electricity Works—A Progressive Undertaking—New Front Lighting.

NEXT Monday, the 35th annual Convention of the Incorporated Municipal Electrical Association assembles at Eastbourne. From 10 a.m. to 1 p.m. and from 2.30 to 9 p.m. the Convention office in the Winter Garden in Devonshire Park will be open for the issue of badges. The reception by the President, Mr. J. K. Brydges, M.I.E.E., who will be supported by the Mayor of Eastbourne, Coun. Lieut.-Col. Roland Gwynne, D.S.O., D.L., J.P., will be held in the Winter Garden from 8.15 to 8.45 p.m. Dancing and music will follow.

On Tuesday the serious business begins. At 9.30 a.m., members of the Council will meet, and ordinary members will assemble at 9,50 a.m. for the opening of the Convention. The morning's programme will include the civic welcome by the Mayor, the presidential address (at the conclusion of which ladies present are invited to meet Mrs. Brydges in the tea room of the Winter Garden), and the first paper and discussion. The paper will be read by Ald. R. S. Chatfield, chairman of the Eastbourne Electricity Committee, and will deal with "Obligations of Electricity Committees."



The Winter Garden, Devonshire Park, Eastbourne, in which this year's I.M.E.A. Convention will be held.

At 12.30 p.m. the official photographs will be taken, and at 2.30 p.m. there will be an official visit to the exhibition of electric cooking, water heating, refrigerating and other apparatus in Devonshire Park. The Mayoral reception will take place in Devonshire Park from 8.15 to 8.45p.m. The Mayor will be supported by the Deputy Mayor, Ald. Miss Hudson. Dancing and music will follow until 11.45 p.m.

At 10 a.m. on Wednesday, Mr. G. H. Lake, A.M.I.E.E., Borough Electrical Engineer, Derby, will read a paper on "Pulverised fuel firing as affecting Economic Boiler House Operation." The afternoon will be occupied with a visit to the Brighton Electricity Works or to the "grid" sub-station at Fishergate, and tea will be provided by the Brighton Electricity Committee and the Town Council at the Royal Pavilion.

Thursday will be Women's Day. The morning will be devoted to a paper by Mr. J. W. Burr, M.I.E.E., M.I.Mech.E., Borough Electrical Engineer, Swansea, on "Electric Heating of Buildings," followed by an informal discussion on "Domestic Water Heating," to be introduced by Mr. A. E. McKenzie, M.I.E.E., M.I.Mech.E., Borough Electrical Engineer, Wimbledon. There will be a luncheon in the tea room, Devonshire Park, at 1 p.m., and at 2 p.m. the exhibition will be visited. The Deputy Mayor and Mrs. Chatfield will receive the visitors. Tea will be provided by the Eastbourne Electricity Committee at 4 p.m.

At 2.30 the annual meeting of members of the Local Authority Committee will be held, and at the same hour there will be an engineers' meeting (members of A.M.E.E. only) in the Lecture Room.

The Annual Dinner will be held at the Grand Hotel (7 for 7.15 p.m.), and will be followed by dancing.

On Friday a meeting of the Council will be held at 9.30 a.m. The annual general meeting will follow at 10,30 a.m. In the afternoon there will be a coach trip to Bexhill, Hastings, Winchelsea and Rye.

On Saturday the Convention will conclude with a visit to the Eastbourne Electricity Works.

More than 1 100 intimations of intention to take part in the Convention have already been received, this number being about a hundred in excess of the attendance at Torquay last year.

Although the I.M.E.A. Convention has been held at Brighton on three occasions, it has never before met at Eastbourne. The town, sheltered by the high ground of Beachy Head from westerly winds, has an excellent sunshine record.

Eastbourne began its electrical history in 1881 when the Eastbourne Electric Light Company negotiated with the Local Board for the illumination of the Parade. In September, 1882, this was effected with 22 Brush arc lamps, Eastbourne being the first town on the South Coast to supply electricity from a central station for public lighting. In 1883 the generating station, on the site of the old Bedfordwell gasworks, contained two 25 H.P. semi-portable Robey boilers and Undertype engines, driving two 25-light Brush arc machines.

In 1900 the Corporation acquired the undertaking, which had been transferred to the Old Brewery, in Junction Road, in 1844. New works at the east end of the town were completed in 1902, two 400 kW Ferranti plants, two Stirling 11 800 lb. and one Babcock and Wilcox 9 440 lb. boilers being installed. Later additions were: (1907) one 750 kW Willans Bruce-Peebles turbo-alternator and a 23 000 lb. Babcock and Wilcox boiler; (1914) one 1 500 kW British Westinghouse set; (1915) one 1 250 kW Brush Ljungström set (old 150 kW and 200 kW sets being then scrapped); (1918) one 30 500 lb. Thompson water-tube boiler and underfeed travelling grate stoker (replacing two Hornsby boilers) and a 200 000 gallon water cooling tower; (1923) one Allen-G.E.C. 2 500 kVA turbo-alternator, a second cooling tower, and two 37 000 lb. tri-drum Stirling boilers; (1926) a duplicate Allen-G.E.C. turbo-alternator and a Vickers 50 000 lb. triple circuit three-drum boiler (two 5-drum Stirling boilers being scrapped); (1929) a third Allen-G.E.C. turbo alternator, boiler and two cooling towers were added.

During the winter of 1929 the maximum peak load reached was 8 065 kW, and the total number of units generated for the year ended March 30, 1930, was 18 150 000, compared with 12 323 210 in 1927–28.

Important extensions have recently been made to the distribution system, which includes two 11 000 V ring main cables about eight miles long encircling the town. Two 11 000 V feeder cables, each three miles long, to supply Meachants, Lower Willingdon and the villages of Eastdean and Friston have also been laid, and a substantial increase of transforming plant and switchgear has been necessitated.

In connection with the South-East England scheme, a transforming station is being installed adjacent to the existing electricity works. A partial supply from the grid has been promised for October, 1930, and by October, 1931, it is anticipated that the whole supply for Eastbourne and district will be taken from the grid. This will necessitate a good deal of modification of the distribution system.

Mr. Brydges has devoted much attention to street lighting. The specially designed decorative standards installed along the front with their three tiers of coloured lamps surmounted by Paisley lanterns, which were brought into use a few weeks ago, extend along the whole length of the front, and give it a very pleasing and distinctive appearance at night. In other directions, Eastbourne has played a prominent part in the development of street lighting practice. Electric House, the headquarters of the Corporation Electricity Department, is another example of progressive enterprise, and the tariffs in force are amongst the lowest in the country. Members of the Convention will, therefore, find much to interest them in the electricity undertaking managed by their President, and its methods.

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MODULUS OF ELASTICITY OF STRANDED CONDUCTORS.

Determination of Sag—Difference Between Single Wires and Cables—Value of Modulus for Copper, Aluminium and Steel Conductors.

(FROM A CORRESPONDENT.)

THE modulus of elasticity of a cable, defined as the ratio of the applied stress to the elastic strain produced, is a factor of considerable importance in the correct determination of sag in overhead lines. It has been the practice to assume that the modulus for a stranded conductor is the same as for a single straight wire of the same material, but this is only true if the length of lay of the stranded wires is infinitely long, and the following theory suggests that the true value may be materially different for cables of normal construction.

The application of tension to a cable does not cause the same tension in all the individual wires, and, referring to

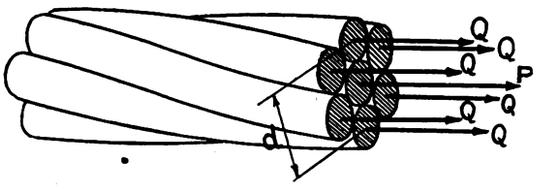

Fig. 1.

Fig. 1, while the tension in the inner straight wire is P-lb., that in the wires of the first stranded layer would be of some other value Q. Taking a length L'' of cable, which on the application of the load stretches to $(L+x)''$, the modulus of elasticity is defined as :—

$$E_c = \frac{nQ+P}{nA+A} \cdot \frac{L}{x} \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where n is the number of wires taking tension Q and A is the area of each wire.

The modulus of elasticity for the centre straight wire will be :—

$$E = \frac{P}{A} \cdot \frac{L}{x} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

and similarly the effective modulus for the annular ring of stranded wires would be :—

$$E_1 = \frac{nQ}{nA} \cdot \frac{L}{x} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

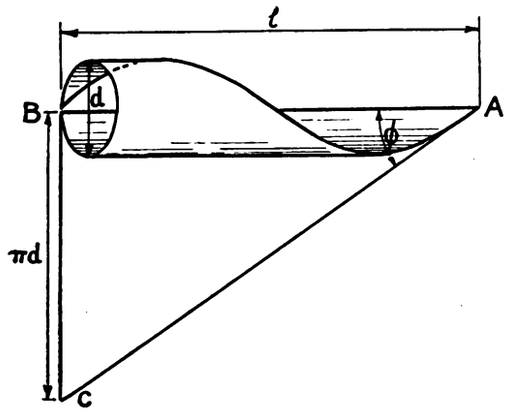

Fig. 2.

From these expressions it follows that :—

$$E_c = \frac{nE_1+E}{n+1} \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Similarly, should the cable have a further layer of m wires, of which the effective modulus is E_2 then :—

$$E_c = \frac{mE_2+nE_1+E}{m+n+1} \quad . \quad . \quad . \quad . \quad . \quad (5)$$

If the wires in the different layers are not of the same size, the expression becomes :—

$$E_c = \frac{mE_2A_2+nE_1A_1+EA}{mA_2+nA_1+A} \quad . \quad . \quad . \quad . \quad (6)$$

where A is the area of the inner wire ; A_1 the area of one wire of the layer of n wires ; A_2 of the layer of m wires.

The modulus of elasticity for the cable can therefore be calculated from a knowledge of the effective moduli for the wires in the different layers.

The centre line of any stranded wire is inclined to the axis of the cable at an angle φ such that

$$\tan \varphi = \frac{\pi d}{l} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7)$$

where d is the pitch diameter of the layer, i.e., the diameter of the circle through the centres of the wires, and l is the length of lay, i.e., the length in which one wires makes a complete rotation in the cable.

The derivation of this expression for tan φ will be obvious from Fig. 2, which indicates that if a right-angled triangle ABC of which AB is l and BC is πd is rolled up about side AB, the hypotenuse AC will form a helix corresponding to the centre line of one of the stranded wires in the cable.

In evaluating the effective modulus for a stranded wire, it is convenient to treat the wire as though it were unrolled from the cable into position AC as shown in Fig. 3.

When tension is applied to the cable so that it stretches by the amount x, then the load Q which is applied to the end C of one stranded wire will cause this wire to stretch and take up a

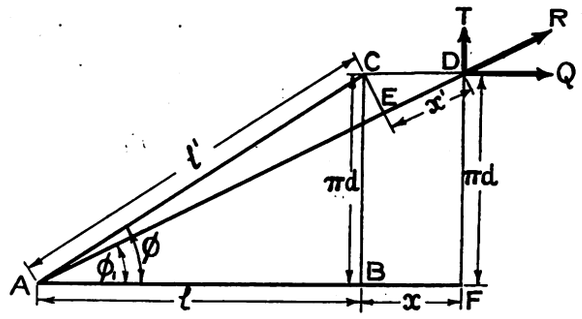

Fig. 3.

final position AD. The angle of lay will be slightly reduced to φ_1.

The application of tension Q to the wire will also bring into play a reaction force T, shown in the diagram, the value of T being such that the resultant R of T and Q acts along line AD. If AE is equal to AC, the original length of the unstretched wire, then ED or x^1 is the stretch in the direction of R, and the relation between x^1 and R must be :

$$E = \frac{R}{A} \cdot \frac{l^1}{x^1} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

where E is the true modulus of the material.

Now as φ and φ_1 are not very different, little error is introduced by assuming that CE is at right angles to AE, and we can write

$$ED = x^1 = CD \cos \varphi_1 = x \cos \varphi_1$$

also $R = \frac{Q}{\cos \varphi_1}$ and $l^1 = \frac{l}{\cos \varphi}$

Substituting for R, l^1, and x^1 in expression (8) we get

$$E = \frac{Q}{A} \cdot \frac{l}{x} \cdot \frac{1}{\cos^2 \varphi_1} \cdot \frac{1}{\cos \varphi}$$

But the effective modulus E_1 is equal to $\frac{Q}{A} \cdot \frac{l}{x}$ . . (9)

Hence $E_1 = E \cos^2 \varphi_1 \cos \varphi$, or, very approximately,

$$E_1 = E \cos^3 \varphi \quad . \quad . \quad . \quad . \quad . \quad . \quad (10)$$

This very simple relation is sufficiently accurate for the cable sizes most used, but for large sizes of cable it may be desirable to go to a greater refinement by taking into account the lateral attenuation of the wires which accompanies any longitudinal stretch. When the longitudinal dimensions of the cable are increased by $\frac{x}{l}$ inches per inch of length, then the diameters of the wires are at the same time reduced by $\frac{\sigma x}{l}$ ins. per inch of diameter, where σ is Poisson's Ratio. In consequence, the

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pitch diameter of the layer under consideration will be reduced by an amount $\frac{\sigma x}{l} d$, when the tension is applied. The final position of the stretched wire will not therefore be along line AD as in Fig. 3, but along AS, as in Fig. 4, in which $FS=\pi\left(d-\frac{\sigma dx}{l}\right)$

From this diagram, again assuming $\angle CEA$ is a right angle, we have

$$x^1 = CS\cos(\theta+\varphi_1)=\frac{CD}{\cos\theta}(\cos\theta\cos\varphi_1-\sin\theta\sin\varphi_1)$$
$$=x(\cos\varphi_1-\sin\varphi_1\tan\theta)$$

Also $\tan\theta=\frac{DS}{CD}=\frac{\sigma\pi dx}{lx}=\sigma\frac{\pi d}{l}=\sigma\tan\varphi$

Hence $x_1=x(\cos\varphi_1-\sigma\sin\varphi_1\tan\varphi)$ . . . . (11)

As before $R=\frac{Q}{\cos\varphi_1}$ and $l^1=\frac{l}{\cos\varphi}$, and substituting for these and for x^1 in (8)

$$E=\frac{Q}{A}\cdot\frac{l}{x}\cdot\frac{1}{\cos\varphi\cos\varphi_1(\cos\varphi_1-\sigma\sin\varphi_1\tan\varphi)}$$

and if we write φ for φ_1 we have

$$E=\frac{E_1}{\cos^3\varphi-\sigma\cos\varphi\sin^2\varphi}$$

Transposing, we get

$$E_1=E(\cos^3\varphi-\sigma\sin^2\varphi\cos\varphi) \quad . \quad . \quad . \quad . \quad (12)$$

The value for σ varies from 0·31 to 0·34 for copper and aluminium and assuming the average value is 0·33, expression (12) reduces to :—

$$E_1=E\cos\varphi(1\cdot33\cos^2\varphi-0\cdot33) \quad . \quad . \quad . \quad (13)$$

Using this latter expression, the following values are calculated for the ratio of the effective modulus for stranded wires to the true modulus for straight wires :—

Length of lay as multiple of pitch diameter. $\left(\frac{l}{d}\right)$	$\frac{E_1}{E}$
15	0·923
17½	0·942
20	0·955
25	0·971
30	0·980

These figures apply to copper and aluminium conductors and possibly with sufficient accuracy to steel or steel-cored aluminium as well, though Poisson's ratio for steel is somewhat smaller than for the non-ferrous metals (0·27 to 0·31).

The modulus of elasticity for straight wires is taken by the British Engineering Standards Association as :—

Copper	18×10^6 lb./sq. in.
Aluminium	$9\cdot9\times10^6$,,
Steel	28×10^6 ,,

and using these values the modulus for different types of stranded cables is calculated from formulæ 6 and 13, as follows :—

Material	No. of wires.	Length of lay.	Modulus of elasticity millions of lb./sq. in.
Copper ..	1	—	18
	7	20	17·31
	19	20 inner 17½ outer	17·09
	37	20 inner 17½ middle 15 outer	16·86
Aluminium ..	1	—	9·9
	7	20	9·52
	19	20 inner 17½ outer	9·39
	37	20 inner 17½ middle 15 outer	9·27
	37	30 inner 20 middle 17½ outer	9·44
Steel-cored aluminium	6 aluminium 1 steel	20	12·12
	30 aluminium 7 steel	20 inner 17½ middle 15 outer	12·56

This theory is based on the work of the Warrington Research Laboratories of the British Aluminium Company, who have done much research on the modulus of stranded cables of aluminium and steel-cored aluminium, and the theoretical values given in the foregoing tables correspond remarkably well with measured values. It will be recalled also that researches on this same subject were carried out in 1924 by the B.E.A.I.R.A., the results being published in the I.E.E. journal. The measured values there given also correspond reasonably well with the theoretical values corresponding to the actual lengths of lay.

It may be remarked that in all tests on stranded conductors, the apparent modulus of elasticity at light loads is very low.

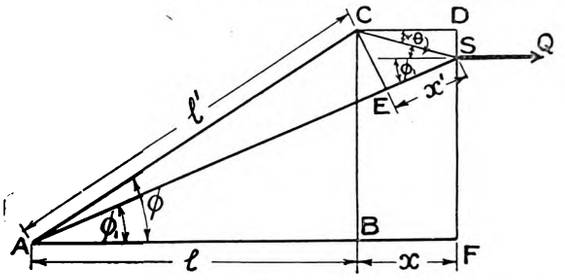

Fig. 4.

This is due to the fact that in an unloaded cable the stranded wires have a certain degree of looseness on account of their "springiness." At tensions higher than about 10% of the ultimate strength, however, this looseness is all taken out, and the modulus then corresponds very closely with the theoretical value. For overhead line purposes, as the cable is operated at loads well above 10% of the ultimate strength, the low initial value of the modulus can be ignored as of no account.

ANNUAL MEETING OF THE I.E.E.

Growth of Membership—£10 000 for Faraday Centenary Celebrations—Not Enough Full Members.

THE annual general meeting of the Institution of Electrical Engineers was held in London on Thursday, May 15.

In presenting the annual report of the Council, the President (Sir Thomas Purves) commented on the satisfactory increase in the membership during the post-war years, the total number of members now being 14 200, whereas the figure in 1921 was only 9 449. As regards the proposal to spend £10 000 on the Faraday Centenary Celebrations, the President said that though this might seem a large sum the Council was satisfied that it would be justified in the action proposed because it was the intention to endeavour to create a great public interest in electricity in connection with the celebrations.

Mr. F. W. PURSE commented on the fact that not only has the Institution only 1 959 full members but that the number has not been increased during the past year. It was a matter for surprise that the Institution, with such a large industry to draw upon, had so few full members and it seemed to him that some were not doing their duty either to the Institution or the industry in not transferring to full membership, because there must be many who were eligible.

The PRESIDENT promised that the point should be considered by the Council. He agreed that it was a matter of importance, but added that the position was entirely due to the fact that no proposal had been forthcoming.

Mr. W. C. P. TAPPER referring to the suggestion that the Faraday Centenary Exhibition would not be of an advertising character, asked how the public interest in electricity could be aroused if there was to be no advertising.

The PRESIDENT replied that the exhibits at the Exhibition would not be of the usual commercial and advertising character. As a matter of fact, a sum of probably £2 000 would be earmarked for propaganda in connection with the celebrations because it was the intention to make a really energetic push to stimulate public interest. The expenditure on 'propaganda would be carried out in conjunction with the British Electrical Development Association, which was rendering great assistance.

The COUNCIL'S Report was then adopted.

CAPTAIN J. M. DONALDSON (Chairman of the Finance Committee) presented the annual accounts in the absence of the Hon. Treasurer, who was unable to be present through ill-health. There was a slightly lower balance to the good for 1929, viz., £242, as compared with £6 040 in 1928. This was accounted for by special expenditure, some items of which would not recur while others could not occur for a long time. There had also been a small increase in management expenses. The Institution now had assets of £186 343 and liabilities of £10 200, a position which was £8 000 better than in 1928.

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UNEMPLOYMENT AND WORK—IV.

Work or Maintenance

By SIR ERNEST J. P. BENN.

THE continual repetition of the Socialist slogan, " Work or Maintenance," has achieved its object upon an intellectually lazy world, and it is to be feared that the fallacy which it embodies is very generally accepted as truth. The notion is that the Government should arrange matters in such a way as to provide work, and failing that, maintenance, from which theory arises quite logically the absurd idea that the individual citizen has a claim on the Government in these respects. He is willing to work, the Government (or so the argument runs) is responsible for the absence of work, and that being so, maintenance becomes a citizen's right.

Two big mistakes are apparent in this way of looking at things. First of all it attributes powers to Government which that institution can never possess, and secondly it assigns to the citizen economic rights which in the very nature of things do not exist. The confusion of thought, now quite common, has developed in a very natural way. We began by claiming political rights, things which very definitely do exist. Political rights developed political power. We then began to think, quite wrongly, that political power could be used to provide economic benefit, and from that point the step to economic " rights " became easy and fatal.

Meaningless Jargon.

The phrase " economic equality " has, when examined carefully, about as much meaning in it as there would be if we spoke of " musical equality," " literary equality " or " moral equality." If it has any basis at all, I am entitled to complain because I cannot secure as many readers for my writings as Mr. Bernard Shaw. A potato might just as well complain because it was planted in poor soil while its fellow could fructify in a better field, and demand that the Government should make all soil equally good for all potatoes. The right to live sounds so nice, appears to be so just, fits in so exactly with the social sentiment of our day, that the phrase slips into our conversation and evades critical thought or examination. But where does it come from—this right to live? What exactly does it mean? Who confers it upon us? What does it consist of? If we think it out we may find that, like other paradoxical attributes of a civilised life, it exists only on condition that very little use is made of it. The wealth of London built on the gold standard gives us a clue to the truth of the matter. For centuries London has enjoyed pre-eminence in the money markets of the world because London always pays in gold. On further examination, however, we find the truth to be that people prefer to send gold to London rather than fetch it away. The Post Office Savings Bank is a simple illustration. People who put their savings into that safe keeping do so because they are assured of immediate payment when the savings are required. But if even a moderate proportion of the depositors asked for their money on any given day, the bank would burst. It will be observed that the security of the bank depositor, nebulous as it is, depends upon an introductory deposit having been made at some prior date. If such a security based on initial sacrifice is only available with such drastic limitations, how can it be argued that " the right to live," a far more comprehensive and expensive security, is freely available for all at all times. The thing is quite absurd, and those who endeavour to ease the hardships of people in trouble with any such dangerous dope are rendering them no service and undermining the stability of society itself.

Life is a struggle for existence against the forces of nature, and it is on that firm basis of truth that we must start any discussion which hopes to be useful on how to manage life, so as to secure the maximum of comfort to all. The " right to live " is a soft, comforting, easy lie, the constant repetition of which will lead us further and further into difficulties. As a civilised people, we can use our political power to say that when we are prosperous we will devote some of that prosperity to the care of the down and out, but such an attitude is necessarily governed by serious practical limitations.

It will be noted that our ability to care for the down and out depends entirely upon our prosperity. That prosperity must not be thrown away in the supposed interests of our social failures, for in that way we merely defeat our own charitable purpose. The first condition of our power to aid is that we should be prosperous, and proper attention to our own prosperity may prove to be a better service to the objects of our anxiety than direct attention to their particular needs.

There is another and more practical way of analysing this supposed " right to live." We are concerned, of course, only with the economic side of things, the provision of those material amenities which go to make a decent life according to modern standards. From this point of view, and taking only very simple illustrations, the absurdity of the proposition is apparent. For instance, does " the right to live " include a cup of tea? If so, how do you get it from China? Does the Chinaman recognise your right to live? Is he also possessed of any similar right and who confers it upon him? Has he some prescriptive claim upon English textiles and are we prepared to honour that claim? Such questions have only to be asked for the inherent absurdity of this " rights " idea to be completely exposed. Is a pipe of tobacco included in this much-talked-of right to live? If so, does it go as far as to give to the smoker the right to a choice of brand or flavour? Can he, if he prefers, select a cigarette instead of a pipe? Has the possessor of the right to live the privilege of reading Edgar Wallace or Arnold Bennett, and have these people any rights, and if so, what are they? Would these self-same rights include the right to a wife? And how shall we arrange matters in such a way as to square the account between the man who gets a wife who knows how to keep a home, and the other man who is not so fortunate? These are practical questions which ordinarily form no part of political speeches; in the sophisticated complications of present-day discussions they seem to be trivial, but surely they serve to bring us back to realities and enable us to realise that you cannot provide the living of the people by Acts of Parliament.

We can only live by rendering service one to the other. Further, that service must be valued by the person to whom it is rendered. When we get back to fundamental truths like this we shall begin to march along the road to prosperity, but beforehand we have to retrace a good many false steps. Those steps have mostly been taken in obedience to the erroneous idea of economic rights, forgetting that none of us have anything but economic responsibilities. We can, of course, acquire rights by a full recognition of our responsibilities, but these things must be placed in their proper relation to one another in the same inevitable way that the horse must be in front of the cart if the journey is to be accomplished.

Reflections such as these will, I am fully and painfully aware, bring little or no comfort to the reader who is an unfortunate victim of all our political mistakes and finds himself to-day in difficulties about to-morrow's dinner. I do not, of course, pretend to be discussing what practical steps should or should not be taken to bring momentary aid to such a case. But even the unemployed will agree as to the importance of right thinking and sound principles, and when they consider the disastrous failure of our efforts in recent years to remove the causes of their troubles, they themselves may begin to see that those who have talked to them about the right to live may after all be false leaders.

Price of Freedom.

We all possess an inherent sense of the wonderful complications of life and living which makes us doubt the wisdom or the practicability of simple political remedies. In our better moments we experience a sense of revolt against the idea that other people can arrange things for us better than we can manage them ourselves. In particular we resent the notion inherent in the political method that our troubles are always somebody else's fault. Temporary intellectual comfort secured that way always proves to be of the nature of the physical comfort obtainable through the use of alcoholic liquor. Both in the end are equally degrading.

Rights and freedom are not capable of bestowal at the hands of either demagogues or soothsayers. They are to be acquired only by those who will pay the price of them and they are wonderful value even for the heavy price involved. They are not the simple, stupid things that they are represented to be, but possess that paradoxical truth and charm underlying the old phrase, contradictory in its very words: " Whose service is perfect freedom."

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DIESEL ELECTRIC LOCOMOTIVES FOR INDIA.

Trials of Two General Electric Units for the North-Western Railway—Details of Electrical Equipment.

THE General Electric Company, Ltd., has recently completed preliminary trials of two Diesel-electric locomotives on a branch line of the L.M.S. Railway in Scotland. These locomotives, the electrical equipments of which are constructed in accordance with the Oerlikon system, are required for duty on short runs on both main and branch lines of the North-Western Railway of India, and are intended to meet the steadily increasing competition from road transport experienced during the last two or three years.

For this purpose relatively high speed is of paramount importance, while, with Indian drivers, ease of control and maintenance are further essentials. It was specified that with a light load on a level track a speed of 50 to 55 miles per hour should be possible, while with a train consisting of three bogie vehicles having a gross weight of 100 tons the normal running speed should be 47 m.p.h., decreasing to 36 m.p.h. on a 1 in 300 gradient and to 13 m.p.h. on a 1 in 50 gradient. This means that the power of the locomotive would be intermediate between the 4–4–0 type steam passenger locomotive, which has a tractive effort of 19 000 lb. at starting, and the ordinary rail motor coach with trailer.

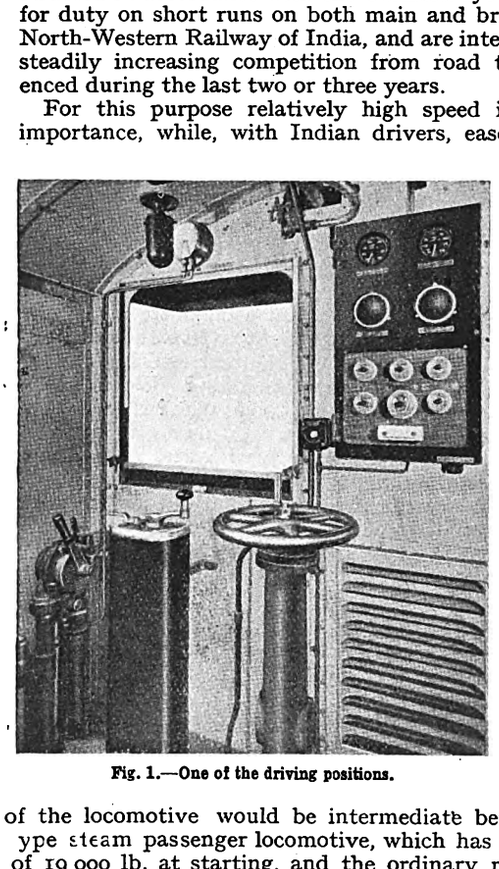

Fig. 1.—One of the driving positions.

The locomotives are of the double bogie type without articulation, the wheels being side equalised in order to give easy riding qualities over rough tracks. The superstructure follows the recognised design for electric locomotives, and consists of a long cab divided into three compartments. Driving compartments are arranged at both ends, each containing a master controller, driver's brake valve for the vacuum brake, engine indicators, lighting switches, brake pressure gauge and other controls arranged for the driver's convenience, while the central compartment houses the Diesel engine, generator, oil and water cooling radiators and other equipment. One of the driving positions is illustrated in Fig. 1, from which it will be seen that control of the locomotive has been reduced to its simplest form.

The principal dimensions and data relating to the locomotives are as follows :—

Length over buffers	35 ft. 10 in.
Height over cab	12 ,, 9 ,,
Width overall	9 ,, 0 ,,
Total wheel base	23 ,, 0 ,,
Wheelbase of each bogie	7 ,, 8 ,,
Centres of bogies	16 ,, 0 ,,
Distance from rail to platform	4 ,, 1 ,,
Diameter of wheels	3 ,, 0 ,,
Track gauge	5 ,, 6 ,,
Weight in running order	48 tons
Maximum tractive effort	10 000 lb.
Continuous H.P. of Diesel engine	350 H.P.
Number of driving motors	Four

In order to carry out trials in this country the design was so arranged that with few modifications the locomotives could run on British tracks having a gauge of 4 ft. 8½ in., and would conform with the British loading gauge. Wherever possible, components such as tyres, spring brake blocks, sand boxes, etc., are constructed to the standard types and sizes used on the Indian State Railways, thus making these components interchangeable with those on existing stock.

The Diesel engine is of the high speed type, built by Messrs. William Beardmore and Co., Ltd., and functions on the four cycle fluid pressure injection system. These engines have been operating for some years on the Canadian National Railways, the design being originally developed to provide a compact lightweight engine of steel construction having a low weight power ratio, which in this particular instance has the extremely low value of 21 lb. per B.H.P.

The six cylinders of the engine are arranged in line, and have each a bore of 8¼ in. and a stroke of 12 in., the engine developing 350 H.P. when running at 900 r.p.m. For short periods this can be increased to 420 H.P. The engine forms a self-contained unit complete with its own water and lubricating oil pumps, both of which are automatically controlled. Fig. 2 shows the engine and generator erected on the test bed.

Control of the locomotive speed of the engine is effected primarily by variation of the speed of the governor, the latter being arranged with four definite settings giving speeds of 400, 600, 750 and 900 r.p.m., while an automatic overspeed device is fitted which prevents the engine exceeding a speed of 1 050 r.p.m. by venting the fuel pump.

The governor setting for these four speeds is controlled by a series of electrically operated valves operated from the master controller in the driver's compartment. This method of controlling speed by altering the governor setting affords several distinct advantages, among which may be mentioned the considerable economy gained in fuel consumption when travelling down long gradients, and the simple manner in which a variable H.P. output from the locomotive is obtained.

The engine is started by supplying current from a storage battery. The control is so arranged that it is impossible for the driver to start the engine on full compression. This is an important point, as it considerably reduces the strain of starting on the battery. Furthermore, a safety device is introduced in the form of a special relay which prevents the generator passing a heavy charging current to the battery should the driver keep the starting connections in operation after the engine has started. The control consists of a push button suitably interlocked with the de-compression lever, both of which are mounted on the engine. Three push buttons for stopping the engine are also provided, and these are situated one in each driving position and one in the engine compartment. Thus the driver has always close at hand the means for stopping the engine either under normal conditions or in an emergency.

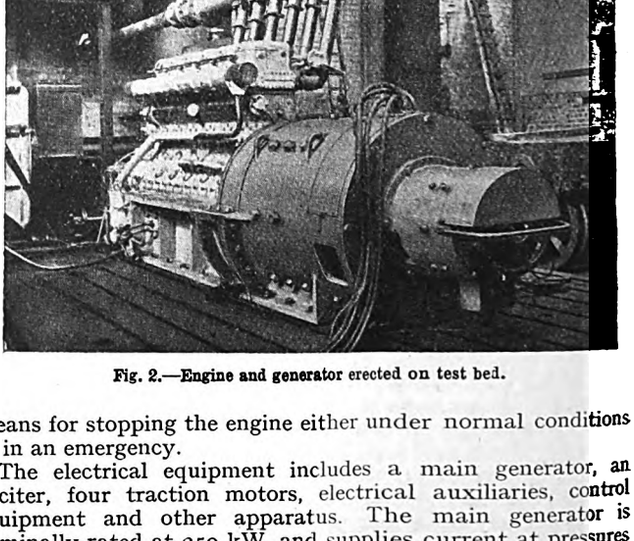

Fig. 2.—Engine and generator erected on test bed.

The electrical equipment includes a main generator, an exciter, four traction motors, electrical auxiliaries, control equipment and other apparatus. The main generator is nominally rated at 250 kW, and supplies current at pressures varying between 100 and 800 V, depending on the speed and load. Only one bearing is included in the construction of the machine, this being situated at the exciter end of the armature

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shaft, the other end of which is coupled to the engine flywheel by means of a solid spigot and bolt coupling. This construction reduces the stresses which normally would be set up by the use of two bearings in the generator in addition to those of the engine. The single bearing employed is of the Hoffman roller type carried in a spherical seating which further ensures self-aligning of the shaft.

The frame of the generator is of cast steel, and is flanged at the coupling end for bolting to a similar flange provided on the engine bedplate. As the unit is carried as a whole on the main frame of the locomotive any tendency to distort is eliminated.

In order to obtain a heavy drooping characteristic the generator is provided with an inverse compound winding, which has the effect of limiting the output of the machine, the windings being so proportioned that the engine can never be seriously overloaded. A simple form of adjustment is provided in the form of resistances which will allow any subsequent alteration to be made to suit any special service conditions.

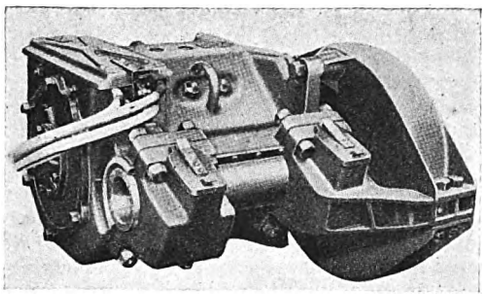

Fig. 3.—Traction Motor.

The overhung exciter follows normal practice and is rated at 10 kW with a normal voltage of 120. Actually the exciter would be more correctly termed an auxiliary low tension generator, as it is supplies current when running at speeds of 750 and 900 r.p.m., not only to the main generator field but also to the vacuum brake exhauster motor, while it also assists in maintaining the battery in a charged condition. An automatically operated series resistance inserted in the shunt field enables the exciter to maintain the same voltage at both the speeds indicated.

Below these speeds—that is, at 400 and 600 r.p.m.—the battery supplies the total low tension current required by the generator field, exhauster motor, lighting, and the control system.

As in the case of the main generator, the exciter is designed with a slightly drooping characteristic so that it automatically protects itself from heavy overloads. The nominal voltage of the low tension circuit is 110.

The traction motors (Fig. 3), of which there are four, follow standard practice, and are designed to meet the maximum service condition without undue heating. Their normal one-hour rating is 120 amperes at 600 V, but they will carry considerably greater loads than this, while in order to give the normal running speed of 47 miles per hour the motors are arranged for field shunting, approximately 35% field shunt being provided. The motors are axle hung, their drive being transmitted to the axles by single reduction spur gearing enclosed in oil-tight gear cases. The armatures are carried in grease-lubricated roller bearings.

Apart from the exciter, which has already been described, a small petrol engine driven generator is provided for the purpose of maintaining the battery in a properly charged condition. This auxiliary is rated at 5 kW, and supplies direct current at 110/135 V at a speed of 1 200 r.p.m. It should be particularly noted that the battery obtains sufficient charging current from the exciter during the normal running of the locomotive, but as the latter may, on occasions, be used in abnormal circumstances in out-of-the-way localities, it is considered necessary to have an auxiliary for giving the battery periodical gassing charges and thus keep it in good condition.

The battery installed in each locomotive cosnists of 50 cells, type K.L.17, supplied by the D.P. Battery Co., Ltd., having a total capacity of 224 ampere hours at the 5-hour rate of discharge. The elements are fitted in strong ebonite containers designed to allow the free circulation of air round each cell. The master controller is provided with an "off" position and eight steps as follows, in addition to a "forward" and "reverse" handle:—

(1) Engine, 600 r.p.m., weak field generator, full field motor.
(2) Engine, 600 r.p.m., full field generator, full field motor.
(3) Engine, 750 r.p.m., weak field generator, full field motor.
(4) Engine, 750 r.p.m., full field generator, full field motor.
(5) Engine, 900 r.p.m., weak field generator, full field motor.
(6) Engine, 900 r.p.m., full field generator, full field motor.
(7) Engine, 900 r.p.m., weak field generator, weak field motor.
(8) Engine, 900 r.p.m., full field generator, weak field motor.

Reversing is accomplished by means of the usual type of solenoid operated railway reverser, while other functions are carried out by means of contactors, the whole of which are operated from the master controller and are mounted on the various panels in the engine compartment.

Interlocks are introduced in certain cases for the safety of the equipment, so that faulty connections cannot be made in the event of any contactor failing or remaining closed. In the "off" position the motor circuits are entirely broken by the appropriate contactors.

The master controllers are provided with the usual mechanical interlocking between reverse and main drums, and the engine is also safeguarded from being started under load by "off position" interlocks on the controller.

For the control of the field of the main generator, two sections of resistance are employed, one section being used only for the first step, thus facilitating suitable control of the locomotive when running light.

In conclusion, it should be mentioned that the locomotives were built to the specification of the Consulting Engineers, Messrs. Rendel, Palmer and Tritton, the electrical equipment being manufactured throughout by the main contractors, the General Electric Co., Ltd., while the engines and mechanical portions respectively were constructed by their sub-contractors, Messrs. William Beardmore and Co., at their Parkhead and Dalmuir Works, Glasgow.

ROYAL SOCIETY CONVERSAZIONE.

Electrical Exhibits—New Heat Resisting Alloy for Furnaces.

THERE was a large gathering at the Royal Society's Conversazione at Burlington House on May 14. Sir Ernest Rutherford, the President, received the guests.

Exhibits of electrical interest included demonstrations of the frequency analysis of a modulated continuous oscillation and of the reception and recording of signals from the Orfordness rotating wireless beacon and an exhibit of radio transmitting and receiving apparatus for wavelengths of 4–10 m., by the National Physical Laboratory. The last named apparatus included a 1 kW 2-valve transmitter suitable for generating oscillations on wavelengths between 4 and 10 m., and a simple portable 2-valve receiver for reception on the same range.

X-ray photographs and crystal models illustrating the structure of vitreous and amorphous solids were shown by the Research Laboratories of the General Electric Company (Mr. J. T. Randall and Mr. H. P. Rooksby).

A micro-volt meter for investigating the flow of heat at a window, inwards or outwards, was shown by the Building Research Station (Mr. A. F. Dufton). An interesting exhibit was the electric furnace in operation, with heating elements of the new R.H.* heat resisting alloy, which has the high electrical resistance of 134 microhms per c.c at 20° C. with a low uniform temperature co-efficient of 0·000075 per °C. combined with remarkable resistance to heat scaling, shown by Sir Robert Hadfield, Bt., F.R.S. By means of this alloy, resistance type furnaces can be maintained continuously at temperatures as high as 1 200° C.

Next Sunday the cable laying vessel "Ampere," built by the Société Provencale de Constructions Navales to the order of the French Ministry of Posts, Telegraphs and Telephones, will be launched by M. Mallarmé, Minister of Posts and Telegraphs, at La Ciotat. The new vessel is 91·5 m. long with a beam of 12·5 m., and has a loaded displacement of 3 920 tons.

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ELECTRICAL ASSOCIATION FOR WOMEN.

Fifth Annual Conference and General Meeting—Electrical Training for School Girls—Ministers' Tributes to the Association.

THE fifth annual meeting of the Electrical Association for Women was held at the Park Lane Hotel, Piccadilly, on May 15. Mrs. Wilfrid Ashley, president of the Association, was in the chair, and over 200 members were present.

A presentation of a pendant was made to Mrs. Hammer, on retirement from the chairmanship of the Council after five years' service, as a token of esteem and appreciation.

Officers elected for the ensuing year are :—President, Mrs. Wilfrid Ashley ; Chairman of Council, Mrs. G. Z. de Ferranti ; Vice-Chairman, Councillor Mrs. E. Gregory ; Hon. Treasurer, Mrs. Ll. B. Atkinson.

The following new members of the Council were elected : Lady Brooks, C.B.E., J.P., Mrs. H. Bentham, Mrs. M. B. Jackson, Miss M. Reading.

Councillor Mrs. Gregory (Chairman of the Higher Education and Public Health Committees of West Ham) proposed, and Mrs. H. K. Beale (president of the Birmingham branch) seconded, the following resolution, which was adopted :—

> In order that the school girl may receive some training in electrical matters during her school life, we, of the Electrical Association for Women, urge the value and importance of co-operation between educational and electrical authorities so that domestic science centres and schools shall be equipped with the most modern domestic electrical appliances.

Mrs. Beale detailed the work done by the Birmingham branch in connection with the Birmingham Education Committee, and Councillor Mrs. Price White spoke of activities in this direction in North Wales.

All branches were represented at the meeting, and remarkable accounts of progress were presented.

The fifth annual report, presented by the Director, Miss C. Haslett, recorded that all the local organisations with one exception, are in a very flourishing condition. " The Electrical Age," the magazine of the Association, is increasing its circulation and finding its way to many parts of the world. It is not only self-supporting, but brings in a small revenue.

Inquiries are being received from many countries as to the possibility of forming electrical associations for women, and a number of overseas members of the E.A.W. are being enrolled. An artistic brooch embodying the badge of the Association has been produced.

Mrs. Wilfrid Ashley, occupied the chair at a largely attended luncheon at the Park Lane Hotel on May 15, following the annual general meeting.

Miss Margaret Bondfield, Minister of Labour, proposed the toast of " Electricity in the Service of Women," and said that the average price of electricity was now 3·05d. per unit, a decrease of 2·7d. or 47%, since 1921–22. The retailing of electricity was still in a most unsatisfactory and unscientific state. She was glad to know that free wiring and hire purchase were increasing. She congratulated the Association on the part it had played in the publicity campaign, and referred to Miss Partridge's work in trying to make a real future for women in connection with the development of electrical plant. The Ministry of Labour was anxious to extend the work of training centres for girls on the electrical side so that in time there would be a larger supply of electric cooks, for whom the demand was in excess of the supply.

Changes in Domestic Economy.

Mr. Herbert Morrison, Minister of Transport, replying, said that women's organisations as well as statesmen ought to give consideration to the avenues through which modern science could lighten the labours of the housewife and particularly the lower middle class and working class housewife. Since the middle ages there had been a steady process of change in domestic economy. But it was still true that millions of British housewives got up each morning in the winter, made their individual fires, sprinkled their tea leaves, swept their individual carpets, and had to boil hot water specially as and when it was required. It was still true, therefore, that there was a mass of needlessly laborious work being undertaken which modern electrical science could largely eliminate.

The object of the Minister of Transport, the Electricity Commissioners and the Central Electricity Board, together with all branches of the electrical supply industry, should be to assure, in the words of electricity legislation, a cheap and abundant supply of electricity. In a large number of areas this cheap and abundant supply was not yet available, and in all areas the price of electricity was still not as low as it could be. If that end was to be achieved, not only must the administrative and other activities of national public authorities be stimulated in that direction, but the supply undertakings must pursue a policy of rapid development with sound and attractive tariffs. They must also expand and intensify their sales organisations.

There was an obligation upon women also to understand the possibilities of electricity, to have faith in the practical use of this great, wonderful force, and to be willing to use electrical energy for varied purposes in the household. All supply undertakings would be wise to pursue the policy of earning a modest profit on an increased turnover instead of being content with high profits and restricted development.

Splendid Educational Work.

The Electrical Association for Women was doing splendid educational work. Both the industry and women themselves owed much to the educational and pioneering activities of this important body, and he desired to congratulate their energetic president, Mrs. Wilfrid Ashley, who by voice and pen had done so much for the furtherance of the cause, and Miss Haslett, the director, who performed valuable and responsible duties in the organisation of the Association.

Sir Felix Pole, proposing the toast of " The Electrical Association for Women," said that in the five years since the Association was formed it had grown to a body with more than 4 000 members and branches all over the country. The propaganda of the Association had been thoroughly good ; it was up to date and practical. We needed people of vision—both men and women. It was foresight and vision which instituted the grid, and we must see that the use of electricity kept pace with the supply. He would like to see the same price charged for current throughout the country just as one could send a letter for the same charge to a neighbouring suburb or to Scotland. He would say to the Central Electricity Board : " You are going to be wholesalers of current ; why not be retailers as well ? " One result of electrification would, he hoped, be the repopulation of the countryside.

Mrs. Ashley, responding, said that there had been too much fuss about overhead construction. When windmills were first erected she had no doubt that a lot of people condemned them as ugly blots on the landscape, but to-day there was, she believed, a society for the preservation of windmills. We should hardly live long enough to see a society formed for the preservation of overhead lines, but there was no doubt that before long they would be accepted just as other innovations had been after the first reaction to change had disappeared. It was particularly necessary to bring down tariffs so that electricity could creep along the wires into every small home in this country.

Members visited the Home Office Industrial Museum in Horseferry Road, S.W., in the afternoon, and in the evening the London Executive Committee held a reception at the Institution of Electrical Engineers. A feature that was greatly appreciated was Mr. Ll. B. Atkinson's talk on " Some Electrical Reminiscences," illustrated with a very interesting series of slides of early dynamos and pioneers of the electrical era. Mrs. Hammer was in the chair, and Mrs. Lamb, of the Manchester branch of the E.A.W., proposed a vote of thanks to Mr. Atkinson. Mrs. Lamb, while also expressing the appreciation of the members to the Council of the I.E.E. for their invitation to meet within " these sacred walls," asked Sir Thomas Purves to admit that he had never before seen such a nice-looking audience in the lecture room of the Institution. The President, who was then called upon to speak, in his characteristically happy manner said that he was only too ready to make that admission without any prompting.

On the second day of the Conference (Friday), members visited Messrs. J. Lyons and Co.'s factory at Greenford in the morning, the afternoon being left free. In the evening a ball was held at the Park Lane Hotel ; the guests were received by Mrs. Wilfrid Ashley. Dancing continued until 2 a.m., a cabaret entertainment being interpolated.

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THE NATIONAL PHYSICAL LABORATORY.

Report for Year 1929 Shows Good Progress—Work in Connection with the Grid—New a.c. Measurements.

THE Executive Committee of the National Physical Laboratory has published its report for 1929, and under the heading of research in the electricity department, electric standards division, are included investigations directed to improvement in the methods of measurement. A bridge method has been developed for high precision measurements of self-inductance and effective resistance at high frequencies; the measurement of the phase angles of potentiometers, potential dividers, etc., has been studied; the apparatus for the measurement of the relative phase and amplitude ratio of input and output voltages of amplifying systems has been further investigated and improved; and a comparison has been made of bridge and wattmeter methods of measuring total losses. The surface resistivities of various dielectrics have been examined under prolonged exposure to the action of light. Work on the primary standards has been proceeding steadily in accordance with the programme laid down by the Electrical Standards Committee. The Lorenz apparatus is being prepared for a fresh determination of the ohm in absolute measure, and work on the Campbell alternating current bridge method has continued: various improvements in detail have been effected. Good progress has been made in the overhaul and reconstruction of the current balance and its re-erection will be completed shortly. Standard cells have been set up during the year in accordance with the standing practice, and comparisons have been made with the batches of previous years. It is concluded from these comparisons that the standard can be reproduced with a probable error not exceeding one part in 100 000. Work has been done also on inductance and capacity standards. The laboratory secondary standard of inductance on which all ordinary determinations of inductance and capacity are based has again been compared with the primary standard: the maximum variation observed during the past three years has been two parts in 100 000, and the standard seems now to have reached a steady state.

In the programme of work for the Radio Research Board the accurate measurement of frequency is of primary importance, and examination has been made into the means of securing the highest accuracy possible in the comparison of the tuning fork used in measurements against the Shortt clock. The experimental and mathematical investigations into the quartz oscillator have been continued, and the influence of the circuits associated with the oscillator on its frequency and on the power output have been carefully studied. Among a number of other items of work in progress, mention may be made of the investigation into power losses in dielectrics which is in progress for the British Electrical and Allied Industries Research Association. New apparatus has been specially designed for these experiments, and the programme includes measurements on typical dielectrics under a wide variety of conditions.

Alternating Current Measurements.

The Electrotechnics Division continues to be largely occupied in the development of methods of carrying out alternating current measurements. A new standard of accuracy in testing and in practice has been introduced by the use of current transformers having nickel-iron cores. This has required re-examination of the whole range of a.c. carrying resistors from 2 000 A downwards, and determination of the phase angle due to their inductances to the order of 0·05 minute. The new transformers can be used for the accurate measurement of large currents, the secondary current being a constant fraction of the primary to about one part in 10 000 at all loads. Considerable advance has been made with the installation of precision measuring apparatus in the high voltage laboratory. Two electrostatic voltmeters have been installed, so that simultaneous readings may be made on the primary and secondary sides of the transformers, and an electrostatic wattmeter will also be provided. A special potential dividing resistor has been designed for the calibration of electrostatic voltmeters of this type, by which any voltage up to 550 can be obtained in steps of 0·1 volt. The method of measuring peak voltage described in the report for 1928 has been used for voltage measurements in testing work and for measuring the ratios of the supply transformers. Another method has been tried, using a condenser divider, a voltmeter being charged through a rectifying valve to the maximum peak voltage on the low voltage arm of the divider. The work involves the accurate measurement of the mean value of a small intermittent current, and different methods of doing this are under investigation. High voltage tests of insulator systems for transmission lines have been made during the year, several in connection with designs for use on the 132 kV national scheme. Tests have been made of vertical suspension insulator systems, both dry and under artificial rain. For high voltage tests of insulators in oil it has been decided, with the approval of the High Tension Committee, to instal a tank of insulating material, 14 ft. high and 4½ ft. in diameter. Tanks to contain the oil and centrifuging equipment for purification will also be needed. For the British Electrical and Allied Industries Research Association investigations have been in progress into dielectric losses in cables at high voltages and into the thermal properties of power cables, the work being done on a long length of cable laid along the tank building. Good progress has been made in the Wireless Division during the year with research for the Radio Research Board. Investigation has been made into the vertical distribution of radiation from an antenna, by observations in an aeroplane at Farnborough and Grimsby. The study of antenna systems for beam transmission has been continued and a simplified method of effecting the calculations to determine the field at varying distances has been developed.

Short Wave Investigations.

In the research on very short waves, analysis has been made of the various circuit arrangements suitable for transmission, and a 500 W transmitter based on the result of this work has been in constant use for experimental transmissions. A 1 000 W equipment is under construction. The apparatus has been employed with receivers of special design for attenuation measurements and direction finding experiments. Experiments have been continued with the rotating loop beacon devised by the Royal Aircraft Establishment and a beacon of improved design has been erected by the Air Ministry, in co-operation with the Board of Trade, at Orfordness. In connection with interference of wireless transmissions a programme of research on the spectral energy distribution of electric disturbances of the types which occur in wireless practice has been submitted to the Radio Research Board. Work has been continued on methods of absolute measurement of current at radio frequencies, and the method involving the passing of the current through a known resistance of mercury and observing the rate of expansion has been so far developed as to give a direct measurement of a current of 10 A consistently to a few parts in a thousand. Other subjects investigated include the measurement, at radio frequencies, of resistance and reactance, and of the power factor of variable condensers.

The work of the Photometry Division has been largely devoted to the study of two main problems. In connection with the fundamental measurements of candle power and the establishment of suitable standards, much attention has been given during the past few years to the use of a photo-electric cell, in place of the human eye, for the comparison of luminous intensities. The chief difficulty met with to-day in candle-power measurements is that light sources differ in colour. The response of the photo-electric cell to lights differing in colour is not ordinarily in proportion to that of the normal eye, and in interpreting measurements made with the cell a variable factor has to be employed to reduce the results to a standard basis. The study of different types of cell has led to the evolution of a more suitable type, the response of which approximates much more closely to that of the eye, and further improvement in this direction may be anticipated. The advance made, however, has led to the substitution of the photo-electric cell for the eye in much of the routine standardisation work, thus eliminating the uncertainties due to fatigue of the human observer, or to differences between one observer and another. A large amount of work in the introduction of the photo-electric cell for a variety of measurements remains to be done in ensuing years. The second outstanding feature of the year's work is the continued advance made in the study of glare in relation to lighting problems. This work is done with the advice and under the control of the Illumination Research Committee.

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CIRCUIT BREAKERS.

Research Work and Manufacture and Assembly of Plant.

MESSRS. A. Reyrolle and Co., Ltd., and British Brown-Boveri, Ltd., exhibited at the St. James Picture Palace, Palace Street, London, last Friday, interesting cinematograph films dealing with oil circuit breakers.

The Brown-Boveri film depicted the whole process of rupturing heavy currents under oil, and the fundamental phenomena that enter into the process were portrayed by slow-motion pictures of the actual rupturing in a specially constructed circuit breaker with heavy glass sides illuminated by flood lights of 200 000 c.p. The development of the arc and the gas bubble during the rupturing process were clearly seen. With a single pair of contacts, 10 000 kVA at 8 000 V and 24 000 kVA at 8 000 V were broken. Tests were then shown on a breaker fitted with an explosion chamber, 10 000 kVA at 8 000 V being interrupted.

In the next test, multiple break contacts were used, and it was noticeable how the duration of the arc and the work done by the switch were diminished. This test showed 10 000 kVA at 8 000 V being ruptured by three pairs of contacts in line. This part of the film clearly demonstrated the advantages of the multi-break principle.

The next portion of the film dealt with the problem of counteracting the repulsive forces which are created between the contacts when closing breakers on short-circuit currents exceeding 10 000 A and which tend to make the contacts open again. A slow motion picture with a glass walled breaker showed that the repulsive forces are so considerable that with solid contacts the circuit is broken twice in succession and the contacts finally weld together, that repulsion and welding can happen also with the plug type of contact, and that contact repulsion can be prevented by the use of solenoid contacts wound in the same sense, and, therefore, attracting one another. Messrs. Brown-Boveri have developed contacts of this form so dimensioned that the effect of all the repulsive forces is balanced by that of the attractive force, so that solenoid contacts make it possible to close the breaker without danger on very heavy short-circuit currents. A normal oil circuit breaker was equipped with three different types of contact, and each in turn closed on a short circuit current of from 30 000 to 50 000 A. One pole was equipped with brush contacts and ordinary arcing contacts; another with plug contacts, and the third with solenoid contacts. When the solenoid contacts were closed the only visible indication that a heavy current had passed was the violent movement of the cables to the switch. On opening up the switch it was seen that the brush and plug contacts had been considerably damaged and burnt away; the solenoid contacts were undamaged.

The film exhibited by Messrs. Reyrolle demonstrated the manufacture, testing, and installation of switchgear of the metal-clad type, which had been designed as a practical application of the results of research similar to that which had been illustrated in the previous film, and also as a result of research into many other factors. A notable feature was a view of Reyrolle "self-grip" contacts after making 70 000 peak amperes at 17 000 V four times in succession.

Advantages of Multi-break System.

Mr. Brierley, of Reyrolle and Co., said the views of Messrs. Brown-Boveri and Messrs. Reyrolle on the subject of circuit-breaking had developed on parallel lines. Although the actual details of construction might not be exactly identical, both companies advocated open-type circuit-breakers embodying the multi-break principles for high-power and high-voltage switchgear. Research appeared to them to have proved the wisdom of advocating multi-break principles in preference to the explosion-pot principles adopted in America, and actual multi-break designs were being used for parts of the 66 kV and 132 kV systems now being erected in Great Britain.

The Reyrolle film also included some views of the high-power short-circuit test plant recently built at Hebburn, for the purpose of carrying out further research work at considerably greater powers than have hitherto been available in Great Britain. The film included an actual oscillograph record of one phase of a three-phase short-circuit obtained on the Hebburn testing plant. The initial peak current was 70 000 A, which, at the circuit voltage of 17 000, corresponded to a short-circuit of 1 500 000 kVA.

Finally, a film was exhibited showing details of the electrified St. Gotthard Railway.

BOOK REVIEWS.

High Voltage Cables: Theory and Practice of their Design and Operation. By P. DUNSHEATH. (London: Sir Isaac Pitman and Sons.) Pp. xii + 161. 10s. 6d.

The author's name is sufficient to assure us that this resumé of present day knowledge and experience in the design of high-voltage cables should be sound, but it is also wonderfully complete. When we had read it to the end and noted that the last page number was only 158 we were astounded, for it seemed hardly credible that so much information could have been contained and so clearly expressed in so short a space. As Mr. Dunsheath truly says in his preface, the subject is in such a state of flux and the development of theoretical conceptions of practical designs so rapid that the attainment of finality in the printed record is not easy, but he has brought us completely up to date "with the finger pointed in the direction of future development."

The first chapter gives curves showing the variation of capital cost, transmission losses, and transmission costs, with the voltage and the kilowatts transmitted. For the same kW transmitted transmission costs, of course, fall as the voltage increases, but the fact is clearly brought out that, except for very great loads, capital cost does not continue to decrease as the voltage increases; for instance, for a 10-mile transmission of 20 000 kW the capital cost is a minimum at 66 kV and actually increases with higher voltages, while for loads over 50 000 kW the 132 kV cable is fully justified. A table shows also that the kilowatt-carrying-capacity—if one may use the term—of ·1, ·2, and ·3 sq. in. cable is not quite proportional to the voltage and is a long way from being proportional to the sectional area; a ·1 sq. in. 33 000 V cable can transmit 7 200 kW, but a ·3 sq. in. no more than 13 500 kW.

Chapter II deals with the fundamental properties of a dielectric—capacity, conduction and absorption—and a discussion of the various theories put forward to explain the last of these is particularly interesting. The third chapter is on dielectric loss and power factor. It is explained that the departure from true quadrature between the voltage and the current is a measure of the imperfection of the dielectric, and that the probability that absorption is the underlying cause of normal dielectric loss has become almost a certainty in the light of recent experimental evidence. The factors affecting the "V-curve" connecting dielectric loss and temperature are discussed, and the methods available for the measurement of dielectric loss are described and compared.

The next chapter, on "Stress and Breakdown," leads us logically to the intersheath, and deals with ionisation and the other causes which contribute to the breakdown of a dielectric. The importance of the time-voltage characteristic is emphasised, and it is shown that indiscriminate testing of a cable far beyond its working voltage may diminish its useful life at working voltage even if it does not break down under test.

The physical properties of impregnated cables and causes of breakdown form the subject of the next chapter. It is suggested that when failures have been restricted to no-load periods they are probably due to the pressure of a partial vacuum—either by an increase of internal volume due to bending, or to sealing up the ends in the factory while the cable is still hot—followed by high mechanical pressures induced by expansion of the dielectric under load temperatures. It is interesting to read that experts are still not agreed on the use of resin as a constituent of the impregnating material, or whether the formation of "cable cheese" should be regarded as a cause or an effect of breakdown; but it is still more disappointing, in view of the impracticability of no-load tests on large cables with A.C. at very high voltage, that "there can be no true fixed ratio between the d.c. and a.c. breakdown voltage unless the conditions are very closely defined." Unfortunately this ratio must in the nature of things be a more or less arbitrary value as some of the causes of breakdown under alternating current conditions are entirely absent under direct current.

The next four chapters of the book are concerned with the actual construction of high voltage cables, current rating, sheath loss and jointing. The reason for abandoning the ordinary 3-core construction ("belted" 3-core cables) at 33 000 V and over is explained, and the author expresses the opinion that there is a good deal to be said in favour of metallised cores at 22 000 V or even at lower voltages. At 66 000 V the diameter and weight of 3-core cable is getting excessive, and at still higher voltages the use of single core, he says,

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seems at present to be the only solution. The final chapter, "Special Cables and Systems," is all too short, but it could hardly be otherwise, as the 66 000 and 132 000 V cables which it describes have not been in commission very long. Included in the cables described is the one which has been adopted for the 132 000 V cable portion of the grid by the Central Electricity Board.

The present reviewer has derived so much pleasure and instruction from Mr. Dunsheath's work, that it would be ungrateful if he did not correct a slight historical inaccuracy in the opening chapter. The manufacture of the ordinary type of cable with stranded conductor and lead sheath was not commenced soon after Ferranti's paper-lapped copper tubes, but preceded them. In fact Ferranti's stiff tubular cable was designed to take the place of a lead-covered cable insulated with impregnated cotton which had failed to withstand 10 000 V. This previous cable was in a sense tubular also, for its central conductor was composed of six strands of No. 9 S.W.G. copper round a jute core, and the present writer gained some of his early experience in fault localisation during the factory tests on this 6/9 concentric cable which was stripped, re-impregnated and re-lead-covered for use on 2 000 V pressure. The dielectric thickness was so ample for this lower voltage that he would not be surprised to hear that some lengths of this cable are still carrying current.

F. C. R.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Stoke Pageant—An Omission.

[To the Editor.]

Sir,—In connection with the celebrations of the bicentenary of the birth of Josiah Wedgwood now being carried out at Stoke-on-Trent, I venture to draw your attention to Episode Eight of the Historical Pageant, described in the handbook as an "allegorical portrayal of the Modern Potteries Industries."

The industrial and commercial development of the Potteries is represented in the episode, symbolically by personifying the industries, and before the spectator pass the Ceramic Queen with attendant pages and princes representing coal, coke, gas, petroleum, dyes, printing and potters' colours. No mention, however, is made or representative appears of electricity.

This is a matter to which I think your paper as the mouthpiece of electrical opinion in this country might well draw attention, particularly when one reflects on the great progress which electricity supply has made in this district. The omission is all the more remarkable having regard to the great success which has attended the introduction of electrically heated kilns in the pottery industry. Eight such kilns are already in use in the works of the principal manufacturers, including the famous Wedgwood Works at Etruria, and several others are now being erected. These developments have been greatly stimulated by the specially low rates offered for such supplies.—Yours faithfully,

C. H. Yeaman.

Stoke-on-Trent,
May 15.

Safety in Rural Electrification.

[To the Editor.]

Sir,—After reading Dr. Ekstrom's article in your issue of May 16, I experienced a sensation of surprise that so many people should have survived the dangers to which they are exposed by the use of electricity. There is a great deal of truth in his article, and whilst recognising that he has not left much unsaid, I am of the opinion that it would be equally useful to have his views on the risks attached to the use of coal fires and other homely conveniences.

It is not too much to say that all progress is obtained with some risk, until the potential victims are educated up to the proper understanding of the new process. Gas can be blown out and left escaping yet no one comes forward with an automatic tap to save the life of the ignorant blower. Fire grates are provided, but I know of no Act of Parliament or Home Office regulation to prevent the fire being laid elsewhere.

Various suggestions are made from time to time arising out of the risks attached to modern transport devices, but, in the end, the pedestrian has to look out for himself, and is gradually becoming educated to the necessary "Safety First" standard. (My dog usually looks right and left before crossing a road, and has, in consequence, reached the ripe age of 5 years.)

The fact is that most people are capable of learning, and, moreover, the small number of electrical accidents causing shock or fire shows that there is a wide gulf between the possible and the probable, as is the case with every other source of energy.

There is a great danger that exaggeration of the possibilities may add rules and regulations so stringent that the rural population will have to continue to be exposed to the risks attached to the use of paraffin oil and the like. It would be more reasonable to recognise the electrical risks and take such simple precautions as suggest themselves. Amongst these may be included the use of linoleum mats in front of cookers, etc., when installed on stone floors. The education of the consumer to some understanding of the risks should be a gradual process. There is no need to point out their existence, because the majority of people are already fully aware of them, and some are tolerably nervous about it in any case. The provision of insulated appliances and "special protective measures" is suggestive of the application of the old expression "foolproof" to domestic life, and if all our actions are to be carried out under conditions suitable for the visual and mental defective, we shall cease to progress at the same rate as our apparatus and become careless.

If the insulation breaks down or the special protective measure ceases to protect, then, according to Dr. Ekstrom, we may die a well-merited death, but it is more than probable that we shall live to ask the supply company to restore the apparatus to its original state of sin and carry on with the fatal work.—Yours faithfully,

Bedford. "Shocked."
May 16.

[To the Editor.]

Sir,—I was delighted to find such early and complete corroboration of the views that I put forward recently in Dr. Ekstrom's article on "Safety in Rural Electrification," in which he reaches exactly the same conclusions as myself. I trust, therefore, that I may be permitted to make a brief reply to one or two critics of my own article.

Mr. Tuson has assumed that I have intentionally exaggerated the evils of indiscriminate earthing, but they need no exaggeration. He uses the well-worn arguments of the all-earthing man, so I should just like to put one question to him. If he were a contractor, would he, or would he not, earth an ironclad main switch mounted adjacent to an unearthed pre-payment meter? The fact that the supply authority *should* earth the meter does not enter into our calculations, as they are a law unto themselves.

I hope, also, that Mr. Tuson has read the March technical publications, where he would have found the following—"Electrical Contractor": "We are beginning to doubt the wisdom of earthing dining-table equipment." In the "Electrical Times" "Megohm" says: "There can be no hard-and-fast rule as to whether earthing of portables should be done or not. Each case must obviously be considered on its merits."

Mr. Taylor appears to advocate a rather revolutionary wiring system, but takes no account of the tens of thousands of existing installations; what is to be done about these?

I read with considerable envy Mr. Rawll's contribution to the discussion; his two or three paragraphs convey as much as a whole page of my own writings. Naturally, I am delighted to find that, after all, he holds similar views to my own, and if he can do anything to stimulate the demand of which he speaks, he will have rendered the industry a valuable service.

I am rather surprised that no champion arose to defend the claims of lead-covered wiring systems, and can, therefore, only conclude that there is general agreement with the very unfriendly things that I said about these systems.

The I.E.E. Regulations are shortly going into their tenth edition, and may we hope that the Wiring Rules Committee will take some note of the growing weight of opinion against indiscriminate earthing? Is it too much to hope that we may find earthing definitely prohibited in some cases, especially where, as Dr. Ekstrom so clearly puts it, "the outer metallic sheath does not form an effective earth shield"?

Should, however, the earthing of "all metal likely to become alive" still be insisted upon, then we shall also be compelled to utilise some such protective system as is mentioned in Dr. Ekstrom's article, further details of which we shall await with interest.—Yours faithfully,

Folkestone, T. C. Gilbert, A.M.I.E.E.
May 17.

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NEWS IN BRIEF.

Welding Engineers' Competition—New Zealand Electrical Propaganda—Forthcoming Exhibitions—Societies' Arrangements—Appointments Vacant.

THE Physical Society will visit the Rugby works of the British Thomson-Houston Co., Ltd., on June 14.

The eleventh annual dinner of the Institute of Transport will be held on March 5, 1931, at the Connaught Rooms, London.

The summer meeting of the South Midland Centre of the I.E.E. will be held on July 2, when a visit will be made to the Maentwrog hydro electric station.

As a result of a recent Conference of Electric Power Boards, the New Zealand Government has decided to institute a Dominion-wide publicity campaign for encouraging the use of electricity.

It is reported that Amman, the capital of Transjordania, is to be electrified.

A wireless telephone service between London and Rio de Janeiro was inaugurated on May 15.

Tenders have been invited for the erection of telephone exchanges in Draycott Avenue, Chelsea, London, and at Chislehurst.

An electrical exhibition for Netherlands and Westphalia will take place at Ensehede, Holland, from June 19 to 30. Particulars from Zevenmijls, Stadsgravenstraat 50, Ensehede.

An international transport exhibition is to be held at Poznan, Poland, from July 6 to August 10. The Commercial Counsellor, Polish Embassy, 47, Portland Place, London, W.1, will supply further details.

The duty on wireless apparatus imported into India has been reduced to 12½% *ad val.* in the case of broadcast reception apparatus and components, and to 2½% in the case of other apparatus and components for wireless telegraphy or telephony.

Weymouth Electricity Committee has authorised the appointment of an architect to prepare a scheme for the provision of electricity showrooms on part of the site of 17 and 18, Royal Terrace, Weymouth, and for utilising the remainder of the site for other purposes.

The Second International Congress of the History of Science and Technology will take place in London in July, 1931. The headquarters is at the Science Museum, South Kensington, London, S.W.7, and further particulars can be obtained from the hon. secretary, Mr. H. W. Dickinson.

Matthew Murray Prizes to the amount of £5 are being awarded at the end of this session to day and evening students of mechanical engineering at the Leeds Technical College and to students of the Junior Technical School, Holbeck. These prizes will be continued from year to year as the balance of the fund allows.

The British Compressed Air Society has been formed to promote and develop the interests of British air compressor, pneumatic tool, and pneumatic appliance manufacturers, and to consider all questions connected therewith, except relationship between employers and employees. The offices are at 76, Victoria Street, London, S.W.1.

The Standing Committee appointed by the Board of Trade will hold an inquiry on July 7 and 8, and, if necessary, on July 14 and 15, as to whether imported magnetos, batteries, ignition plugs of all descriptions, etc., should be required to bear an indication of origin. The inquiry will be held at the Board of Trade Offices, Great George Street, London, S.W.1.

The "Financial Times" states that Siemens and Halske have obtained a concession to provide telephone services in the whole of Greece. The telephone system of Athens and the Piræus are first to be modernised and extended. The rights are to be transferred to a Greek company, in which Siemens and Halske will be the principal shareholders, and the whole of the equipment will become the property of the Government after 38 years.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of May 22, 1880, stated that the use of the electric light on shipboard was increasing, and mentioned that the steamers "Massachusetts" and "Rhode Island" had recently been fitted with Brush lights; the installation comprised the saloons, cabins and electric head lights.*

The Brush Electric Light Company had just received an order for nearly £20 000 worth of machinery and lamps from the British Government.

Gower-Bell telephones were being installed in the various Government establishments at Chatham.

* * *

TWENTY-FIVE years ago, according to THE ELECTRICIAN *of May 26, 1905, an experimental electric locomotive, built by the Westinghouse Company for the Swedish Government to operate at a trolley voltage of 18 000 V, with reduction to a minimum of 3 000 V, proved capable of hauling a train of 70 tons at 40 m.p.h.*

Successful tests of tantalum lamps in America and Austria were recorded.

Fulham (London) Electricity Committee has decided to organise a first aid department at the electricity works.

The annual meeting of the British Association for the Advancement of Science will be held at Bristol from September 3–10.

The Stalybridge, Hyde, etc., Electricity Board is inviting tenders for builder's work in connection with the extension of its Hartshead power station, Stalybridge.

The second British Glass Convention will be held at Buxton from September 17 to 20, 1930. Mr. Walter Chance will preside. The hon. secretary is Mr. G. Marchand, Aldwych House, Aldwych, London, W.C.2.

An assistant station engineer is required at the power station, Royal Arsenal, Woolwich.

Grimsby Corporation is inviting tenders for extensions of the turbine and switch rooms at the electricity works.

It is proposed to alter the old Borough Offices in Upper Bridge Street, Walsall, to serve the purpose of electricity showrooms and office. The total cost will be £7 795.

The seventh annual radio show at the City Hall, Manchester, will be held from October 16 to 26. Particulars from Provincial Exhibitions, Ltd., City Hall, Manchester.

Imports into Poland in February last included electric conductors, apparatus and other electrical material valued at 7 070 000 zloty (£163 114) and exports of similar goods were valued at 137 000 zloty (£3 163).

The South Wales Branch of the Association of Mining Electrical Engineers has been invited to the cable works of the Pirelli General Cable Works, Ltd., at Southampton, on August 14. Accepting members should communicate with the secretary without delay.

Electrical goods imported into the Irish Free State during March, 1930, were valued at £47 060, against £78 968 in March, 1929, and the imports of such goods in January, February and March were valued at £138 557, against £150 658 in the corresponding months of 1929.

The Dominion Water Power and Reclamation Service of the Department of the Interior, Ottawa, has issued the annual report of its activities for the year ended March 31, 1928. It describes the various administrative responsibilities of this service in regard to international waterway matters, water-power and reclamation.

Mr. D. Grant, chairman, speaking at the Conference of the Post Office Controlling Officers' Association recently, claimed that in spite of war-time interruptions of plans, enormous progress had been made in telephone development, and that the possibilities of fresh usefulness of the telegraph service were still unexhausted, as was demonstrated by the introduction of a picture telegraphy service between London and Berlin.

The sixth ordinary general meeting of the 30th session of the Scottish Centre of the Institution of Electrical Engineers was held on May 16 at the Technical College, Bell Street, Dundee, when Mr. R. H. Fowler, F.R.S., delivered the 21st Kelvin Lecture, on "Some Recent Advances in the Electron Theory of Metals." On the following day the members travelled by road to Loch Rannoch, where they inspected the Grampian Power Co.'s hydro-electric works.

The Institution of Welding Engineers offers a prize of £10 10s. and the gold medal of the Institution for the best original paper on "Welding Practices and Methods, based on My Own Experiences," by a *bona-fide* operative welder (either oxy-acetylene or electric), whether a member of the Institution or not. The competition will be judged by Major James Caldwell and Mr. L. St. L. Pendred. Entry forms from the Secretary, 30, Red Lion Square, London, W.C.1.

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PERSONAL.

MR. H. Hepworth Thompson, managing director of Holophane, Ltd., was during his recent visit to South America, the first man to speak on the telephone from Brazil to London.

After many years' service with the Liverpool Tramways Electric Power and Lighting Committee, Mr. M. H. Wardle, chief assistant, lighting department, has retired on superannuation.

The election of Lt.-Col. R. K. Morcom, of Belliss and Morcom, Ltd., as a director of the Iron Trades Employers' Insurance Corporation, Ltd., was confirmed at the annual general meeting on May 8.

Mr. F. V. L. Mathias, the Warrington borough electrical engineer, last week, on behalf of the staff and employees of the electricity undertaking, presented an arm chair to Mr. Shaw Sykes, who retired yesterday after 30 years' service.

The Electricity Commissioners announce that Mr. H. Nimmo, electrical inspector and adviser to the Government of Burma, has been appointed chief engineering inspector of the Electricity Commission as from May 15, in succession to Col. T. C. Ekin, who has retired under the age limit.

In connection with the retirement in June of Mr. J. K. Bruce, general manager of the L.C.C. tramways, Mr. T. E. Thomas, traffic manager, has been promoted to the general managership at a salary of £2 000 per annum, rising by annual increments of £250 to £3 000 a year.

Mr. S. J. Cain, engineer and construction inspector at the Luton Post Office, has been promoted chief inspector at the sectional office at St. Albans, and has been presented with a Westminster chiming clock in recognition of five years' service as branch secretary of the Society of Post Office Engineering Inspectors for the district.

In connection with the announcement in our last issue that Mr. J. W. Beauchamp had been appointed to the Central Electricity Board, we are given to understand that Mr. Beauchamp will be District Engineer in South Wales and South West England. It is expected that the scheme applicable to that area will be adopted by the Board to-day, Friday.

Mr. William Grant has completed 25 years' service as general manager of the Ayr Corporation tramways, and on May 12 he was the guest of the Tramways Social Club. During the proceedings Mr. Grant was presented with a cabinet gramophone, and Mrs. Grant with a wristlet watch.

Mr. J. Sleigh, charge engineer, South Shields Electricity Department, who has been appointed to a similar position at Hammersmith, was the recipient from the staff and employees of a handsome mahogany clock suitably inscribed.

The Council of the Institution of Electrical Engineers has awarded premiums for papers read during the Session 1929–30, or accepted for publication, as follow:—The Institution Premium to Mr. H. H. Harrison; Ayrton Premium to Messrs. B. A. G. Churcher and A. J. King; John Hopkinson Premium to Mr. L. C. Grant; Kelvin Premium to Mr. T. G. N. Haldane; Paris Premium to Messrs. H. A. Humphrey, D. M. Buist, and J. W. Bansall; Extra Premiums to Messrs. S. W. Melsom, A. N. Arman, and W. Bibby; E. H. Smythe and E. G. Weeks; T. W. Ross and H. G. Bell; W. West; Bernard Leggett; J. C. Prescott; and H. W. Taylor. Wireless Section.—Duddell Premium to Mr. J. E. P. Vigoureux; Extra Premiums to Captain P. P. Eckersley and Mr. N. Ashbridge; Mr. G. Shearing, and Captain J. W. S. Dorling. The awards for papers read before the Meter and Instrument Section and the Students' Sections will be announced later.

Major W. H. C. Coates terminated his engagement with the English Electric Co., Ltd., with whom he had been connected since their inauguration in 1919, on May 7. Originally in the engineering department of the Great Eastern Railway Co., Major Coates joined Siemens Brothers Dynamo Works, Ltd., in 1906, and remained in their service until 1915, when he held the appointment of general manager of their Eastern branches with headquarters at Singapore. He resigned this appointment on receiving a commission in the Royal Field Artillery. Joining the English Electric Co., Ltd., in 1919, he was appointed general manager for India in 1920, and held that appointment until 1923. In 1925 he proceeded to South Africa to reorganise the English Electric Co.'s business arrangements in the Union, and was managing director of their local company until recalled in 1926 to undertake a special mission to Ceylon, Malaya and the Far East, from which he returned at the end of 1928.

Obituary.

MR. R. H. SELBIE, on May 17, aged 62 years. He was general manager of the Metropolitan Railway, London.

BUSINESS ITEMS.

THE address of "The Engineer" has been changed from 33, Norfolk Street, W.C.2, to 28, Essex Street, W.C.2. Tel.: Central 6565.

AT the annual display by pupils of the Dorelle School of Dancing, held at Trinity Hall, Hounslow, on May 16, one of the items on the programme was a ballet introducing well-known advertisements. Amongst the representations were Siemens "Popular Pair." The girl carried a dummy "Pearl" and the boy a "Silvalux Opal," and, as this illustration shows, a very pretty picture was the result.

A new 1 020 line central battery telephone exchange, manufactured by STANDARD TELEPHONES AND CABLES, LTD., Columbia House, Aldwych, London, W.C., was successfully cut-over at 1.30 p.m. on May 15.

Continuing their chain of electrical exhibitions, ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD., held a successful exhibition in the Scouts Hall, Goole, from April 25 to May 3. A similar display at the Rawdon Institute, Selby, opens to-day, Friday, for ten days.

The CURTIS MANUFACTURING CO., LTD., Conduit Place, Paddington, London, W.2, state that they have recently received a number of calls for alterations and repairs to wireless apparatus, for Peter Curtis, or the British Curtis Radio Co., and they wish it to be known that they have no past or present connection whatever with either of these companies.

Mr. J. Garnett Lomax, H.M. Consul-General at Bogota, is in attendance at the Offices of the Department of Overseas Trade (London), for a few days for interviewing representatives of U.K. firms interested in the export of British goods to the Republic of Colombia. Applications for interviews to the Comptroller-General of the Department. (Reference 26 617/1930.)

The EDISON SWAN ELECTRIC CO., LTD., 123/5, Queen Victoria Street, London, E.C.4, announces that standard V.I.R. taped and braided C.T.S. Virite, lead covered cables and flexibles have been reduced by varying percentages. All orders received since April 10 will be invoiced at these reduced prices. In addition to reduction in prices the company has decided to increase the rebate discounts on yearly contracts, the revised scale of discounts being as follows:—3¾% if amounting to £100, 5% if amounting to £250, 6¼% if amounting to £500, 7½% if amounting to £1 000, 8¾% if amounting £2 500, 10% if amounting to £5 000, 11¼% if amounting to £7 500.

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STEATITE PRODUCTS.

Official Opening of New H.T. Laboratories at Burlish.

IN the presence of some 300 guests the newly established research laboratory of Steatite and Porcelain Products, Ltd. was inaugurated on May 15, when Dr. G. C. Clayton, in the unavoidable absence of Lord Melchett, switched on a surge voltage of 1 800 000. A description of the new equipment was given in our last issue.

Following a luncheon which preceded the opening of the laboratory, Sir Edward Crowe, of the Department of Overseas Trade, proposed "The Electrical Industry," and said that under the guidance of the Central Electricity Board we were on the way towards considerable progress. He hoped that we should speedily overtake the United States and Germany in the utilisation of electrical power, as we already shared with them the bulk of the world's exports in electrical machinery and apparatus. In this connection he mentioned that though our trade had increased since 1924 from £16 000 000 to £20 000 000, that of our two chief competitors had increased in even greater proportion.

Sir Philip A. M. Nash, managing director of Associated Electrical Industries, Ltd., in reply, said that this Stourport association of the porcelain and electrical industries was both interesting and important. The development of transmission of power was possible only through the perfection of insulation, and though many things had been tried glass and porcelain were the only two materials which gave satisfactory results. This was an age of transmission rather than of generation, and after mentioning what had been done in the way of exporting power from Germany to France, Poland, Switzerland and Czecho-Slovakia, Sir Philip said he believed that there was actually under consideration the possibility of using the water strongholds of Norway for generation, and transmitting power to Sweden, across the Baltic, to Germany. Just as a common railway gauge made possible the organisation of a system of international transportation, so, he believed, should we see in the future, a network of lines for the international transmission of power to the industrial centres of the world.

Sir John Brooke, Electricity Commissioner, gave the toast "Steatite and Porcelain Products, Ltd.," which was acknowledged by Mr. C. S. Garland, managing director of the company.

Dr. G. C. Clayton read a speech which Lord Melchett had intended to deliver, wherein tribute was paid to the assistance which the German pioneers in the steatite industry had given to the Stourport undertaking. Skilled workmen had been loaned to train British employees until such time as they could get along without them. After describing the equipment for research installed in the new laboratory, Lord Melchett said that he felt strongly that the porcelain industry in this country had arrived at a stage when its rationalisation could produce maximum advantages to all concerned.

ULSTER ELECTRICITY SUPPLY.

Adoption of New Scheme by Northern Ireland Government.

MR. J. M. KENNEDY, of Messrs. Kennedy and Donkin' has submitted and the Government of Northern Ireland has accepted an interim report upon the problem of electrical development in Ulster. The area dealt with in the report lies south of an imaginary line from Belfast to Dungannon and east of a line from Dungannon to Newry, it has an area of about 1 200 square miles, and has a population of 304 000. In the area there are 19 supply undertakings, three of which—Bangor, Holywood and Lisburn—take, or are about to take, their supplies from Belfast, while the others operate local generating stations. Mr. Kennedy is of opinion that electricity can be made available at the various centres of distribution at a lower cost than would be possible under the individual development of separate generating stations. It is proposed that a public, non-profit-earning authority or board should have power to purchase supplies at cost from the Belfast undertaking, and should be empowered to take over the existing distributing undertakings in the area at a cost of £250 000. A map showing the most important features of the proposed h.t. transmission scheme accompanies the report. The capital cost of the main transmission system is estimated at £245 000, and estimates of consumption and revenue indicate that the scheme should be self-supporting.

I.E.E. LONDON STUDENTS.

Report for the Session 1929-30 Shows Large Increase in Membership.

THE report of the London Students' Section of the I.E.E. for the present session shows that the number of students and graduates under 28 in the Section is now 1 535, an increase of 228 since last session. This increase in numbers is partly due to the new conditions whereby graduates between the ages of 26 and 28 have the privileges of students, but apart from this the number of new students joining the Institution has been about the same as in previous years. Eleven meetings have been held during the session, the average attendance being 112 members and visitors, an increase of 63% above the attendances last session. The Committee attribute this increase principally to the system of monthly notices which has been adopted during this session. Thirteen visits have been held during the session, the attendance being very satisfactory in most cases. Saturday afternoon visits continue to be very popular. The summer meeting was held from August 3 to 14, and consisted of a tour through northern France and a stay of five days in Paris; 26 students from London and the provinces took part.

The Committee states that the Council have agreed to the publication of a "Students' Journal" dealing mainly with the happenings in the Students' Sections. This journal will be supplied to all students and graduates under 28 in addition to the existing journal. The date of publication will be announced later. The Committee are considering a system of district representation, as it is felt that a large number of members have no adequate representation on the Committee. This is being considered in detail, and subject to the approval of the Council it is hoped to establish this new system next session.

IN PARLIAMENT.

Extension of Time Granted for Lochaber Water Power Company's Works.

A BILL promoted by the Lochaber Water Power Co. seeking an extension of time for the completion of works and amendment of the scheme, was considered last week by a Select Committee of the House of Lords. Mr. Keith, K.C. for the company, said although 66 % of the capital had been expended, only 33% of the water power had been obtained. The central feature of the scheme was a tunnel from Lake Treig through the mountains, coming out on the western flank of Ben Nevis. The tunnel was 15 miles in length and 15 ft. in diameter. The tunnel had been completed, and it was designed to carry the water for the whole scheme, which explained why the expenditure had been so large. The aluminium works for which this power was required were situated at Fort William. The works were authorised by Act of Parliament in 1921, which provided for their completion by July 28, 1931. The company also asked for power to abandon certain works, having discovered a less expensive and equally effective alternative. It was proposed to alter the site of the dam, thereby shortening the tunnel and saving approximately £78 000. Two proprietors of land had agreed to the scheme. The other landowner affected was Sir John F. Ramsden, who objected on the ground of damage to the letting value of deer forests, and because he would be unable to sell land in the Spey Valley at an adequate price while these works were in progress. When the 1921 Bill was promoted the company had come to an agreement with Sir John. The Committee decided to approve the Bill, subject to the 1921 agreement of the company with Sir John being renewed.

Transport Provisions in Glasgow.

A Select Committee of the House of Commons has had under consideration during the past fortnight Glasgow Corporation's Bill, which contains clauses relating to 'buses and tramways. Bailie Dollan said, during the last seven years the tramways had contributed nothing to the common good fund on account of competition. The tramways were run as a continuous service. The 'buses ran on the profitable routes at profitable times of the day. The Committee sanctioned the clauses giving the Corporation power to abandon tramways and run omnibuses, and agreed to grant protection to the Corporation trams and 'buses against the setting down or picking up of passengers by other 'buses in the city or in Renfrew or Rutherglen. No protection was given in regard to other routes outside the city.

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CANADIAN TARIFFS.

Increased Preference for British Electrical Apparatus and Machinery.

BRITISH electrical machinery and apparatus manufacturers would be well advised to make a careful study of the new tariff changes proposed in the budget resolutions introduced in the Canadian House of Commons on May 1. It may be recalled that the threat of the American tariff to Canadian business has led to the adoption by the Canadian Government of a policy of switching over, wherever possible, trade now carried on with the United States to British or Canadian manufacturers. This is likely to be effected by the reduction of "preferential" rates on articles not largely made in the Dominion concurrently with the raising of the general tariff rates on American goods. In the case of goods of which a considerable proportion of the demand is met by Canadian producers, the market will be thrown farther open to British competition by the raising of the general tariff rates, whilst leaving the "preferential" rates at much the same percentages as previously. It is notable that decreases are proposed in no less than 270 tariff items, so far as the "preferential" rates are concerned, and free entry is conceded in 589 items out of the 1 188 items making up the complete tariff. Imports valued at $200 000 000 are affected by the increase in the margin of preference. Free entry under the British preferential tariff is provided on all non-specified machinery, such as engines, boilers, electrical equipment, etc., which is of a class or kind not made in Canada, coupled with increases in the general tariff rates. Lighting fixtures, heating and cooking apparatus, vacuum cleaners, refrigerators, are among the electrical equipment affected by the changed rates.

The following is a selection from the new Iron and Steel Schedule showing the new rates on electrical apparatus and machinery :—

Tariff Item		British Preferential Tariff	Intermediate Tariff	General Tariff
315a	Carbon electrodes exceeding thirty-five inches in circumference or outside measurement	Free	20 p.c.	20 p.c.
350	Wire of all metals and kinds, n.o.p.	15 p.c.	17½ p.c.	20 p.c.
351	Wire, single or several, covered with any material including cable so covered, n.o.p.	20 p.c.	27½ p.c.	30 p.c.
351a	Wire, twisted, braided or stranded, including wire rope and wire cable, coated or not, n.o.p.	17½ p.c.	22½ p.c.	25 p.c.
409o	Equipment for generating electric power for farm purposes only, viz.: engine, gas tank, generator, storage battery, and switchboard; and complete parts of all the foregoing	Free	10 p.c.	10 p.c.
410j	Battery renewal preparations for miners' electric safety lamps; all for use exclusively in mines	Free	Free	Free
410m	Diamond drills and core drills, not including motive power, and electrically operated rotaly coal drills, of a class or kind not made in Canada, and integral parts of the foregoing, for use exclusively in mining operations	Free	Free	Free
410n	Diamond drills and core drills, not including motive power, and electrically operated rotary coal drills, n.o.p., and integral parts of the foregoing, for use exclusively in mining operations	Free	10 p.c.	10 p.c.
415	Electric vacuum cleaners and attachments therefor; hand vacuum cleaners; and complete parts of all the foregoing, including suction hose, n.o.p.	12½ p.c.	20 p.c.	25 p.c.
415a	Refrigerators, domestic or store, of all kinds, completely equipped or not	12½ p.c.	20 p.c.	25 p.c.
415b	Washing machines, domestic, with or without motive power incorporated therein; complete parts of washing machines	Free	15 p.c.	25 p.c.
415c	Clothes wringers, domestic, and complete parts thereof	10 p.c.	15 p.c.	25 p.c.
415d	Sewing machines, with or without motive power incorporated therein; complete parts of sewing machines	10 p.c.	15 p.c.	25 p.c.
423	Electrical dental engines	Free	15 p.c.	20 p.c.
428b	Engines or boilers, of a class or kind not made in Canada, and complete parts thereof, n.o.p.	Free	15 p.c.	20 p.c.
428c	Engines or boilers and complete parts thereof, n.o.p.	15 p.c.	25 p.c.	30 p.c.
443	Apparatus designed for cooking or for heating buildings—			
	(1) For coal or wood	Free	22½ p.c.	25 p.c.
	(2) For gas	Free	22½ p.c.	30 p.c.
	(3) For electricity	Free	22½ p.c.	25 p.c.
	(4) For oil	Free	22½ p.c.	25 p.c.
	(5) N.o.p.	Free	22½ p.c.	25 p.c.
443a	Electric tumbler and rotary switches and electric relay switches for automatic oven control, when imported by manufacturers of electric apparatus designed for cooking or for heating buildings, for use exclusively in the manufacture of electric apparatus designed for cooking or for heating buildings, in their own factories, under regulations prescribed by the Minister	7½ p.c.	20 p.c.	25 p.c.
443b	Parts, when imported by manufacturers of electric switches for use exclusively in the manufacture of electric tumbler and rotary switches and electric relay switches for automatic oven control, for use on electric apparatus designed for cooking or for heating buildings	Free	12½ p.c.	17½ p.c.
444b	Lamp shades, n.o.p., and shade holders	15 p.c.	27½ p.c.	30 p.c.
445	Electric light fixtures and appliances, n.o.p., and complete parts thereof	15 p.c.	27½ p.c.	30 p.c.
445a	Electric head, side and tail lights, electric torches or flashlights	15 p.c.	27½ p.c.	30 p.c.
445b	Electric arc lamps and incandescent electric light lamps	15 p.c.	27½ p.c.	30 p.c.
445c	Electric telegraph or telephone apparatus and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445d	Electric wireless or radio apparatus and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445e	Electric and galvanic batteries, n.o.p., and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445f	Electric dynamos or generators and transformers, n.o.p., and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445g	Electric motors, n.o.p., and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445h	Electric insulators of all kinds, n.o.p., and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445i	Electric sad irons and complete parts thereof	15 p.c.	25 p.c.	27½ p.c.
445j	Electric apparatus, of a class or kind not made in Canada, n.o.p., and complete parts thereof	Free	15 p.c.	20 p.c.
445k	Electric apparatus, n.o.p., and complete parts thereof	15 p.c.	25 p.c.	30 p.c.

I.E.E. SCHOLARSHIPS.

Two New Scholarships Established by the Council for this Year.

THE Council of the Institution of Electrical Engineers have established the following scholarships, the first awards of which will be made this year :—

Duddell Scholarship.—Of the annual value of £150, tenable for three years. Each candidate must be nominated (not later than June 15, 1930) by a corporate member of the Institution. Preference will be given to candidates whose fathers or a near relative are, or have been, members of the Institution. Open to British subjects under 19 years of age on July 1, 1930, who have passed the Matriculation Examination of a British University or an examination exempting from Matriculation, and wish to take up a whole-time day course in Electrical Engineering.

Ferranti Scholarship.—Of the annual value of £250, tenable for two years. Each candidate must be nominated (not later than August 15, 1930) by the Professor or Teacher under whom he is working or has worked. Preference will be given to candidates whose fathers are, or have been, members of the Institution. Open to British subjects under 26 years of age on July 1, 1930, who are Students or Graduates of the Institution. have been such for not less than two years, have completed to the satisfaction of the Council a recognised electrical engineering course of at least three years, and desire to carry out whole-time research or post-graduate work.

Applications (specifically mentioning the name of the Scholarship) for particulars and nomination forms should be addressed to the Secretary of the Institution, Savoy Place, London, W.C.2.

I.M.E.A. CONVENTION.

Golf Competition in Aid of the I.E.E. Benevolent Fund.

AS in previous years, there will be a golf competition under medal play for the "G. P. Dennis" trophy at this year's I.M.E.A. Convention, which opens at Eastbourne on Monday. The competition will be held on the course of the Royal Eastbourne Golf Club, Compton Place Road, Eastbourne, and will be open to all those who possess a convention badge, from the afternoon of May 24 until 5 p.m. on May 29. Any number of cards can be taken out during this period.

It is hoped that all golfers attending the conference will play at least one round, and those who cannot find time to play may forward their entrance fee as a subscription to the funds to Mr. R. N. Torpy, either care of the Secretary, or to the Queen's Hotel, Eastbourne.

Rotary convertors are the subject of a new issue by the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2. The reference is K.80.

List N.T.L. No. 9, relative to the company's cables, has been issued by the ENFIELD CABLE WORKS CO., LTD., of 296/302. High Holborn, London, W.C.1. This list cancels N.T.L. No. 8.

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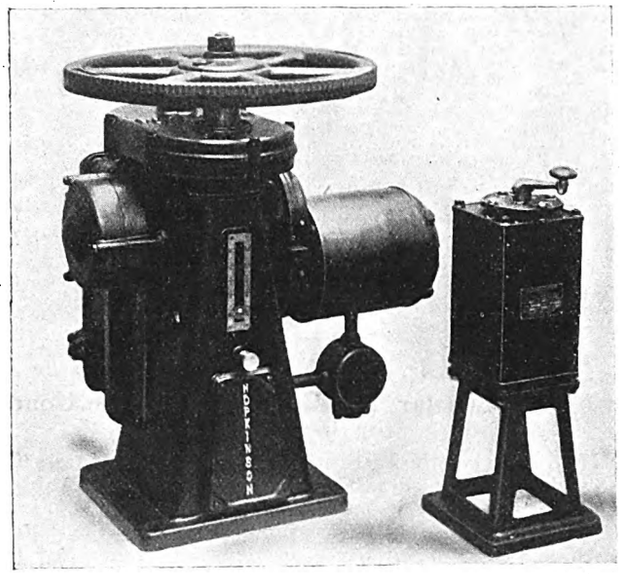
REMOTE CONTROL.

Electrically Controlled Steam Valves—Modern Power Station Practice.

THE principle of "distant" electric control for steam valves is now beginning to be extensively adopted, and the great advantages are obvious, especially in these days of very high pressures and large boilers and mains, rendering hand operation more and more difficult. During the past few years HOPKINSONS, LTD., of Huddersfield, have devoted special attention to the self-contained electrically operated steam valve, and now have a complete range of such valves for d.c. and a.c. supply and suitable for all pressures. The arrangement includes positively operated limit switches of special design, housed in the main casing, which control the travel of the valve spindle and in the design of these limit switches, no trigger springs are used. Also, the design is such that either wedge or mushroom valves are closed down completely, no final hand operation being necessary. There is a positive magnetic clutch device which comes into action when the small electric motor has attained full speed, and results in a slight blow or jerk being given momentarily, so that the valve always commences to open at once, even if it has not been in use for a long period. The valves can be operated by the ordinary handwheel as usual when desired, without disconnecting the electrical gear in any way.



Hopkinson electric control unit on floor stand with reversible controller and emergency push-button type switch.

The valves themselves are of the usual standard types, suitable for pressures up to 900 lb. or over, and for superheated steam temperatures up to 1 000 deg. F. such as recently ordered for the Delray No. 3 station, Detroit. As regards the motors, for either a.c. or d.c., these are generally mounted direct on the valve, but may also be fixed alongside on a separate column, and are arranged to give a high horse power for a short period. The actual power used, of course, is not great, an example being 6 H.P. for a 12 in. valve at 400 lb. pressure, while the motor is of ample capacity.

Various methods are available for operating the valves from the control panel, and often a small reversible drum controller is used, having a dial showing the actual position of the valve with respect to opening or closing. In another arrangement the panel is provided with push buttons for "open," "shut," and "stop" positions. Emergency panels are usually arranged for "shut" only, but any desired arrangement can be embodied to suit the individual conditions. An important feature of the systems installed by Hopkinsons is that once a push button is operated it remains in the "operative" position until the travel is complete, or the "stop" button is brought into operation. A complete system of interlocks is provided, so that no damage can be done if the wrong button is pressed, and among notable stations recently equipped, or to be equipped on these lines, may be mentioned the Barton station of Manchester Corporation, the new Kirkstall power station at Leeds, and the Yallourn station of the State Electricity Commission of Victoria, Australia.

LIGHTING PLANTS.

Small Plants for Country House Installations.

AT this season many think of installing lighting plants in summer residences and house boats. Several models of lighting sets are offered by the DELCO-LIGHT Co. (of Frigidaire House, Chapter Street, London, S.W.1), and among them may be mentioned Model 15 C1, which gives 110 V service. This Delco plant can operate motors up to 1½ H.P., or the pulley attachment can be used for driving shafting that supplies mechanical power up to 3 H.P. The generator operates when 300 W or over are taken from the line, so that only small loads are allowed to be fed from the battery. The 4-cylinder engine is air-cooled and copper pinned, and has a specially designed Delco-Light Zenith carburetter with one simple adjustment. The generator has an overhung armature direct connected to the engine; its full load output is 1 500 W. The switchboard controlling the automatic operation is mounted on the generator frame. The dimensions of the set are: height 27 in., length 38 in., and width 17 in.

Another new plant is the "Semoco" portable lighting set of SMALL ELECTRIC MOTORS, LTD. (Eagle Works, Church Fields Road, Beckenham, Kent.) This is a particularly light and handy set especially suggested for use in hot dry climates where sand and dust abound. As this suggestion infers, the engine is entirely enclosed and air-cooled by a centrifugal fan; and the dust-proof generator is of the enclosed-ventilated type. The engine cylinders are 60 m/m. bore, 80 m/m. stroke, 598 c./c. The pistons are of aluminium alloy and are fitted with 3 gas and 1 scraper rings. Roller bearings are fitted throughout and the gudgeon is of the floating type. The engine is equipped with a B.T.H. magneto and Solex carburetter (sand proof). The speed is 1 600 r.p.m. and the available H.P. is 3½. The generator is specially designed to withstand rough treatment. It is fitted with a cast steel body and aluminium end covers. It is doubly impregnated for tropical conditions and able to withstand considerable overloads with a low temperature rise.

THE SOCIAL SIDE.

THE G.E.C. eleventh annual sports and gala will be held at the G.E.C. London Sports Ground, Preston Road, Wembley, on July 5.

The Alton Battery Sports Club football team was successful in winning the Harvey Charity Cup and also the Alton and District Junior League. The team nearly succeeded in winning a third cup, and it is interesting to note that it was not defeated on its own ground all through the season. In fact it is necessary to go back to November, 1928, before finding a match on which the visitors were successful.

Arrangements are now being made by the Liverpool and District Electro-Harmonic Society for the fourth annual Allied Electrical Trades Golf Tournament which will take place on the course of the West Derby Golf Club on May 27. The tournament will be a stroke competition under handicap and is open to all members of the Society and friends who are engaged in the allied electrical trades within a radius of 10 miles from the Liverpool Town Hall. A putting competition and optional sweepstake will also be arranged. The competitor engaged in the electrical industry who returns the best net score will receive the Allied Electrical Trades Gold Challenge Cup and replica. Several other prizes have also been presented. Following the competition there will be a luncheon in the Club House, when the prizes will be distributed. The latest date for entries is May 23. Mr. E. G. Pulford, Jun., of 108, Whitechapel, Liverpool, is hon. secretary and Mr. W. A. Sloane, of 24, Preeson's Row, Liverpool, assistant hon. secretary.

GLANDS FOR CONDENSERS.

The B.E.S.A. has recently published a specification dealing with brass tubes and screwed glands for condensers for land purposes upon similar lines to the specification issued in 1921 for tubes and glands for marine purposes. The present specification, however, provides for eight sizes of screwed glands, from ⅝ in. to 1½ in. inclusive, and has, as in the case of the specification for marine purposes, clauses covering the quality of material, the dimensions of the tubes and the glands and mechanical and hydraulic tests.

Copies No. 378-1930, may be obtained from the B.E.S.A., 28, Victoria Street, S.W.1, price 2s. 2d. post free.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

CLYDEBANK CORPORATION.—Electrical installation at new Public Baths in Bruce Street, Clydebank. Forms of tender from Mr. J. W. Johnston, town clerk; deposit £1.

ST. JOHN'S CHURCH, BECKERMET, CUMBERLAND.—Electric light installation. Particulars from the Vicar.

BAKEWELL RURAL DISTRICT COUNCIL, May 24–31.—Electric light wiring and accessories in 30 houses at Beeley, Youlgreave and Tideswell. Specification, etc., can be seen at the office of the Clerk until May 24.

Low Tension Cable.

DARTFORD URBAN DISTRICT COUNCIL, May 24.—Supply of about 1 000 yards of l.t. cable. Further particulars from the Electrical Engineer, Electricity Works, Dartford.

MANCHESTER CORPORATION, May 24.—Supply and erection of two rotary balancers, d.c. switchgear, cables, wiring, etc., at Haweswater, for the Waterworks department. Specification, etc., from the Engineer, Waterworks Offices, Town Hall, Manchester; deposit £2 2s.

MARGATE CORPORATION, May 24.—Electrically-driven booster pump set, with compression tanks, etc. Further particulars from the Borough Engineer, 40, Grosvenor Place, Margate.

STAFFORDSHIRE EDUCATION COMMITTEE, May 24.—Electric light installation in existing Infants' Council School, Pelsall, near Walsall, which is to be enlarged and converted into a Senior Mixed Council School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

WEST RIDING EDUCATION COMMITTEE, May 24.—Electric light installation in head teacher's house at Slathwaite Wilbirlee Council School. Specification from Mr. W. Heeley, 4, Macaulay Street, Huddersfield.

HARROGATE CORPORATION, May 26.—Construction of cooling reservoir at the electricity works. Tenders to the Borough Engineer.

LONDON COUNTY COUNCIL, May 26.—Supply, laying, etc., of cables at Blackwall Tunnel, in connection with new ventilating plant. Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £1 1s.

EAST GRINSTEAD URBAN DISTRICT COUNCIL, May 27.—Supply and erection of 320 kVA, three-phase, 50 period 11 000 V alternator and switchgear, and 200 kW reversible rotary, complete with transformers and switchgear. Specification from Mr. G. E. Coldwell, Council Offices, London Road, East Grinstead; deposit £1 1s.

HULL CORPORATION, May 27.—Three 50-line, common battery, private branch telephone exchange switchboards. Forms of tender from the Manager and Engineer, Corporation Telephones Dept., Mytongate, Hull.

MERTON AND MORDEN URBAN DISTRICT COUNCIL, May 28.—Additional wiring at Council Offices. Specification, etc., from Mr. G. Jerram, Council Offices, Kingston Road.

COMMISSIONERS OF H. M. WORKS, etc., May 30.—Electric light shades, etc. Forms of tender from Controller of Supplies, King Charles Street, Westminster, S.W.1.

OGMORE AND GARW URBAN DISTRICT COUNCIL, May 30.—Supply, erection and connecting up of about 2 000 route yards of 11 000 V overhead service line, with short lengths of interconnecting cables. Specification, etc., from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £1 1s.

FARNWORTH URBAN DISTRICT COUNCIL, May 31.—Supply of l.t. cable. Specifications, etc., from Mr. A. J. Atkinson, Electricity Department, Albert Road, Farnworth, Lancs.

PORTADOWN URBAN DISTRICT COUNCIL, May 31.—Supply, erection, etc., of eight sets of electric motors and pumps and automatic switchgears at three pumping stations. Specifications can be seen and forms of tender obtained at the offices of Messrs. Taylor and Wallin, 1, Saville Place, Newcastle-on-Tyne; deposit 10s.

UPPER STOUR VALLEY MAIN SEWERAGE BOARD, May 31.—Treble ram pump (to deliver 15 000 gallons per hour), electric motor, automatic central gear and accessories. Particulars and tender form from Mr. G. P. Deeley, 13, Church Street, Stourbridge; deposit £1 1s.

BALLYMENA URBAN DISTRICT COUNCIL, June 2.—Provision of electricity supply equipment for the township. Specifications, etc., from Mr. James Scott, 358, Royal Liver Buildings, Liverpool; deposit £2 2s.

LIVERPOOL CORPORATION, June 2.—Supply of 41 motor-generator sets for cinema arc work, suitable for operation on 400 V, three-phase, 50 period supply, and to give d.c. output of 80A at 70 V. Tenders to Mr. Walter Moon, town clerk, Liverpool.

BELFAST WATER COMMISSIONERS, June 4.—Electrically-operated pumping plant. Specification, etc., from the Secretary, Water Office, Belfast; deposit £1.

CLACTON URBAN DISTRICT COUNCIL, June 4.—Two transformers and e.h.t. and l.t. switchgear (all of British manufacture) for Great Clacton sub-station. Specification, etc., from the Electrical Engineer and Manager, 1, Arcade Buildings, Station Road, Clacton-on-Sea; deposit, £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15 kW motor-generator set, battery trickle charger, milking booster, and spare parts. Specification (No. 10) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of works supply sub-station 3 300 V and 400 V metal clad switchgear. Specification (No. 9) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

LIVERPOOL CORPORATION, June 6.—Installation of automatic telephone exchange at Central Police Station, Dale Street, Liverpool. Specifications from Mr. Walter Moon, town clerk, Municipal Buildings, Dale Street, Liverpool.

GLASGOW CORPORATION, June 9.—One year's supply of l.t. and e.h.t. cables, small insulated cables and flexibles, electric cookers, meters and electric kettles. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow, C.2.

CENTRAL ELECTRICITY BOARD, June 11.—Construction of site works, foundation works and buildings in the area of the North-West England and North Wales Electricity Scheme. Specification (N.W.E.-P.F.2) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 11.—Supply and erection of 33 kV transformers. Specification (No. S.E.E.–G.T. 1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.1; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 19.—Supply and laying of 33 kV and other cables in connection with Central England Electricity Scheme. Specification (C.E.-G.C.3) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 23.—Supply and erection of 66 000 V and other cables in connection with Mid-East England Electricity Scheme. Specification (M.E.E.-G.C.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade, (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

ABIDJAN (IVORY COAST).—Provision of electric power station and distribution system, under 50 years' concession. Details from Agence Economique de l'Afrique Occidental Française, 159, Boulevard Haussmann, Paris.

SOUTH INDIAN RAILWAY CO., LTD., May 23.—Supply of electric cables and wires. Specifications, etc. (5s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

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INDIAN STORES DEPARTMENT, May 26.—Two vertical and two horizontal centrifugal pumps, switchgear, etc. (Reference A.X. 9 416.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of 110 kV suspension insulators, for Mangahao power scheme, section 215B. (Reference B.Z. 6 300.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27—Supply of cable clamps for 110 kV suspension insulators, for Waitaki power scheme—section 54. (Reference B.X. 6 217.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, May 27.—Supply of 110 kV suspension insulators for Waitaki power scheme—section 53. (Reference B.X. 6 216.)

GREAT SOUTHERN RAILWAYS CO., May 28.—Six or 12 months' supply of electric cables (form No. 129), electric lamps (form No. 137), etc. Forms of tender (6d. each) from the Stores Superintendent, Inchicore, Dublin.

CAPE TOWN MUNICIPALITY, June 4.—Supply of heavy current d.c. testing motor generator, and starting gear (specification No. 494/1930). (Reference B.X. 6 341.)

AUCKLAND HARBOUR BOARD, June 10.—Supply of submarine cable (contract No. 902). (Reference B.X. 6 354.)

MELBOURNE CITY COUNCIL, June 11.—Supply of paper insulated, lead sheathed cables, suitable for use on three-phase, 50 cycle system at 6 600 and 420 V. (Reference B.X. 6 415.)

COPENHAGEN LIGHTING DEPARTMENT, June 12.—Two electrically driven gas compressors, with minimum hourly capacity of 20 000 cu. metres of gas at pressure of 1 metre water column. (Reference A.X. 9 598.)

BULAWAYO MUNICIPALITY, June 13.—One 5 000 kW turbo-alternator condensing plant, switchgear, transformers, etc. (Reference B.X. 6 321.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

MELBOURNE CITY COUNCIL, June 18.—Supply and installation of automatic electric signals for traffic control (contract No. 2 787.) Reference B.X. 6 421.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of 100 000 3¼ in. and 30 000 2 in. lead clips. (Reference B.X. 6 375.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, August 6.—Two pumping units, for Ameria pumping station, including two Diesel engines, two centrifugal pumps and two small d.c. generators, electrically driven compressor, 10 kW auxiliary d.c. generator, with engine, etc. Specifications (£1 os. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, August 17.—Supply and erection of 15 electric pumping stations, with pumps, motors, switchgears, etc., in the isolated basins, Oswin Province. Specifications, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (£10 5s. per set, not returnable.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, August 17.—Supply and erection of 15 electric pumping stations, with pumps, motors, switchgear, etc., at the isolated basins between Esna and Aswan. (Reference A.X. 9 594.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 19.—Three single phase transformers, to step up from 22 000 V to 57 600 V between phases, for Penrose sub-station, Arapuni power scheme, section 308. (Reference B.X. 6 427.)

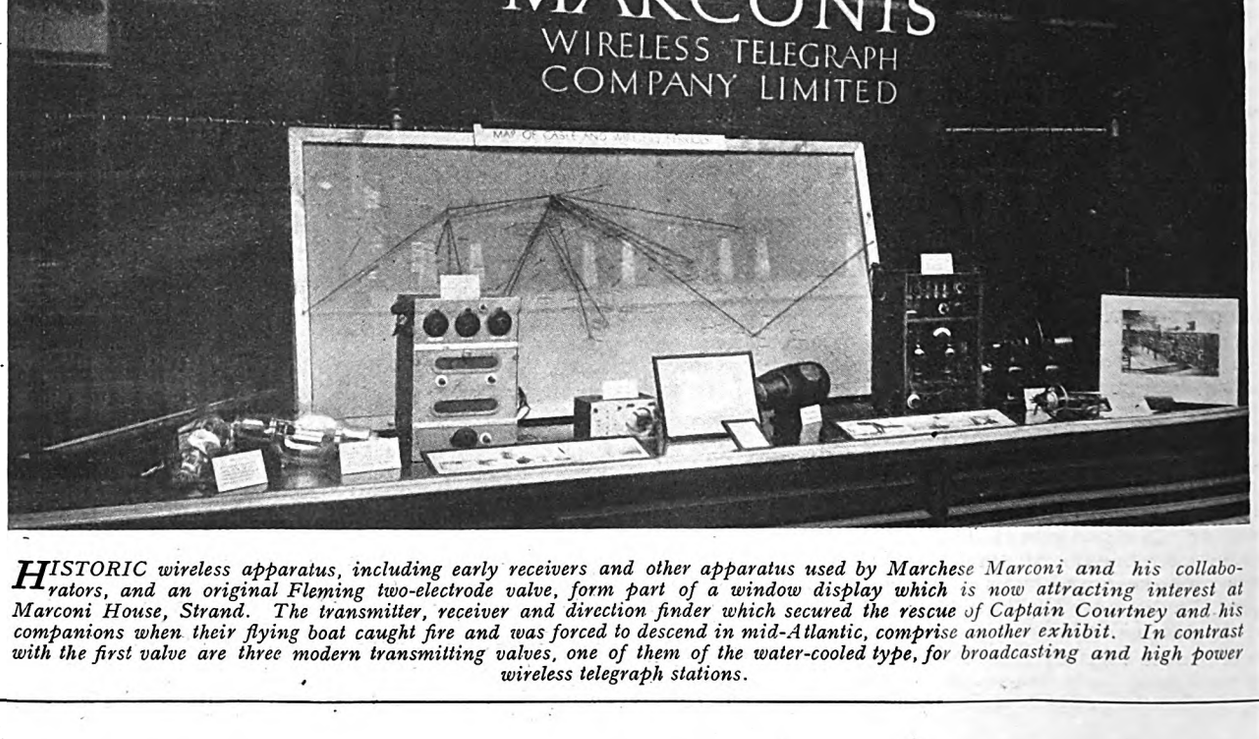
THE "JOHN BENN."

New London Ferry Boat Christened After Founder of Benn Brothers, Ltd.

THE many years of civic work given to London by the late Sir John Benn (the founder of Benn Brothers, Ltd., publishers of THE ELECTRICIAN) will be commemorated in a striking way next Friday (May 30). On that day the "John Benn" a newly-built ferry-boat, will make her maiden trip from the South Pontoon, Woolwich. She has been given her name by the London County Council as a tribute to the late Sir John and with the cordial consent of the members of his family.

In the years of useful service that lie before the new vessel there will, not inappropriately, be reflected something of the inspiring endeavours of the man from whom her name is derived, although her course will be through waters less troubled than those which Sir John found it necessary to navigate in his efforts to remould the administration of London in a nobler and more efficient shape.

When the new boat makes her maiden trip there will be present a large gathering of the children and grandchildren of Sir John, together with a large party of boys from the John Benn Hostel in Stepney, through which the present baronet, Sir Ernest Benn, has, on his part, commemorated his father's life and work.



HISTORIC wireless apparatus, including early receivers and other apparatus used by Marchese Marconi and his collaborators, and an original Fleming two-electrode valve, form part of a window display which is now attracting interest at Marconi House, Strand. The transmitter, receiver and direction finder which secured the rescue of Captain Courtney and his companions when their flying boat caught fire and was forced to descend in mid-Atlantic, comprise another exhibit. In contrast with the first valve are three modern transmitting valves, one of them of the water-cooled type, for broadcasting and high power wireless telegraph stations.

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WORK IN PROSPECT.

ASHBY-DE-LA-ZOUCH.—Houses (26), for the Rural Council. Particulars from the contractors, Harris Bros., Marebay. Derby.

BIRKIN.—Parish hall extensions. Particulars from Tennant and Smith, Ropergate Chambers, Pontefract.

CHICHESTER.—Houses (72), for the City Council. Particulars from the architects, Whitehead and Whitehead.

DERBY.—New Mitre Hotel, Allenton, for Marston, Thompson and Evershed, Ltd., Burton-on-Trent.

ECCLES.—Two schools to cost £68 800, for the Borough Education Committee. Particulars from the Director of Education.

HUDDERSFIELD.—Further proposed housing schemes. Particulars, Mr. L. Smith, 26, Ramsden Street, Huddersfield.

LEWISHAM.—Cinema theatre, High Street. Particulars from the architects, J. S. Beard and Clare, 101–3, Baker Street, W.

MIRFIELD.—Sunday School. Particulars from Marriott, Son and Shaw, Church Street, Dewsbury.

ROTHWELL.—Proposed school (£30 000). Particulars from Mr. H. Wormald, County Hall, Wakefield.

WEYBRIDGE.—Additional 18 houses. Particulars, the Surveyor.

WILLASTON.—Church schools. Particulars, Willink and Dodd, Liverpool.

WINCHESTER.—Houses (132), for the City Council. Particulars from the City Surveyor.

WOLVERHAMPTON.—Branch library, Low Hill, to cost £4 984. Particulars, the Town Clerk.

WRENTHORPE.—Proposed new hotel. Particulars, Mr. James Parish, architect, Vicar Lane, Leeds.

YORK.—School, for the Roman Catholic Managers. Particulars, Rev. M. O'Connell, St. George's Rectory.

YORK.—Works extensions, for "The Yorkshire Herald" Newspaper Co., Ltd. Particulars, Blackmore, Sykes and Co., Scale Lane, Hull.

METAL AND CHEMICAL PRICES.

TUESDAY, May 20.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£59 10 0	15s.	—
Electro Wirebars	,,	£61 10 0	£1 0 0	—
H.C. Wire, basis	per lb.	9 1/16d.	1/16d.	—
Sheet	,,	9 1/8d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0 1/16d.	1/16d.	—
Brass (60/40)—				
Rod, basis	per lb.	8 1/4d.	—	1/4d.
Sheet ,,	,,	8 3/8d.	—	—
Wire ,,	,,	9 1/8d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 10 0	—	10s. 0d.
Foreign or Colonial	,,	£17 16 3	—	11s. 3d.
Tin—				
Ingot	per ton	£143 15 0	—	£1 17s. 6d.
Wire, basis	per lb.	2s. 0d.	—	4 1/2d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£16 7 6	—	£1 5s. 0d.
Mercury	per bottle	£22 12 6	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2 1/2d.
Sodium Bichromate—Per lb., 3 1/2d.

Rubber—Para fine, 7 1/2d.; plantation, 1st latex, 6 1/2d.

∴ The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co. Ltd.

COMING EVENTS.

Friday, May 23 (To-day).

PHYSICAL SOCIETY.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London. Discussion on "Magnetism," opened by Sir Alfred Ewing, with a contribution on "Ferro-Magnetism and Hysteresis." 3-4.30 *p.m.* and 4.30 to 5.15 *p.m.*

ROYAL INSTITUTION.—21, Albemarle Street, London. Paper by Mr. R. S. Whipple on "Some Scientific Instrument Makers of the 18th Century." 9 *p.m.*

Friday, May 23—Monday, May 26.

INSTITUTION OF ELECTRICAL ENGINEERS (WESTERN CENTRE).—Sudbury Park Hotel, near Chepstow. Summer meeting.

Monday, May 26—31.

I.M.E.A. CONVENTION, EASTBOURNE Winter Garden, Devonshire Park.—Delegates Assemble. President's reception, 8.15 *p.m.*

Tuesday, May 27.

INSTITUTE OF PHYSICS.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Presidential address by Dr. W. H. Eccles on "The Influence of Physical Researeh on the Development of Wireless." 5.30 *p.m.*

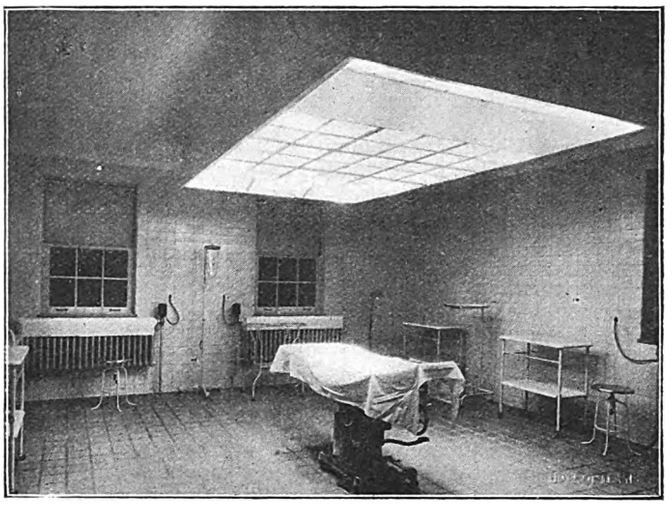
Wednesday, May 28.

POLYTECHNIC ENGINEERING DEPARTMENT.—307–311, Regent Street, London. Lecture IV (Course of six lectures by Mr. W. H. Date on "Thermionic Valves." 6.30 *p.m.*

HOSPITAL LIGHTING.

New Shadowless Equipment for Operating-Table Lighting.

THE problem of hospital table lighting calls for a very high intensity of concentrated illumination which must be practically shadowless, but must give a high vertical component of intensity, ensuring penetration into deep cavities. The



An example of Holophane operating-table lighting.

intensity must be confined to the wound area, at the same time sufficient illumination must be given around the room to prevent eye-adaption difficulties, and yet not so much as to compete with the wound illumination. The high intensity should be produced without striations or glare, and the light unit should be as unobtrusive as possible. To fulfil these conditions, a special unit has been developed by HOLOPHANE, LTD., Elverton Street, London, S.W.1, consisting of a number of prismatic plates formed into a panel or false ceiling of relatively large area. The prism construction of the plates is such as to refract the light rays which reaches them into a converging beam of high intensity. Each plate is 12 in. square, and is formed with quarter-concentric prisms. They are used in groups of four, each group forming one large lens 24 1/4 in. square, having a 12 1/4 in. focus. The complete unit consists of either 15 groups of 4 plates each, approximately 10 ft. by 6 ft., 18 groups 12 ft. by 6 ft., or 21 groups 14 ft. by 6 ft. Over each group of four plates is fitted a lamp and reflector in such relation to each other that the maximum beam strikes the centre of the operating area, this with a 15 group system, the combined 15 concentrating beams coming from different directions, build up and focus their rays over the predetermined area.

The method employed differs from a reflector system in so much that concentration from the large refracting area secures adequate diffusion, avoids harmful shadows and absolutely avoids glare. The overflow from the lens system gives sufficient general illumination to avoid contrast glare, and the optical characteristics of the lens are such that a three-dimensional soft or dissolving spot is developed to take account of varying thicknesses of bodies and heights of tables. The illumination results taken with a 15-lens system employing 15 150 W lamps—i.e., 2 250 W—have been plotted by the company, the maximum horizontal illumination being 1 050-ft. candles, the illumination on a plane 45° from the vertical 725 ft.-candles, and the illumination on a vertical plane facing the centre of the table 175 ft.-candles, and these intensities without any semblance of glare.

THE LEAD MARKET.

The market opened last week with a firm tone, and according to James Forster and Co., 7s. 6d. per ton higher, while on the Tuesday prices were steady at a further 2s. 6d. advance. Since then the market has steadily declined, and prices are now 15s. down from the top. In sympathy with the firmer tone in London, the American price was raised on May 13 to 5·60 cents. Closing prices on May 16 were £17 15s. for May and June, and £17 16s. 3d. for July and August, a fall of 5s. per ton on the week.

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ELECTRICITY SUPPLY.

Battersea Power Station and the Fume Problem—Burton-on-Trent and the Central England Scheme—Proposed Voltage Change at Weymouth—Supply in the Aberdeen Area.

HARROGATE Electricity Committee recommends the Council to borrow £59 473 for various works.

Rawtenstall Corporation has decided to seek borrowing powers for £20 000 for the extension of electricity mains.

The Holderness Trust, Ltd., has applied to the Electricity Commissioners for a Special Order to supply the Wigtonshire area.

Carlisle Electricity Committee has authorised the electrical engineer to invite tenders for the supply of cables during the ensuing year.

Bradford Electricity Committee has decided to provide automatic switchgear for further sectionalising supplies for traction purposes, at a cost of £1 380.

The switching on of the electricity supply at Barnard Castle took place last week. Energy is taken from the Cleveland and Durham County Electric Power Co.

Application for a Special Order for authority to supply electricity in an area within three miles radius of the town hall is being made by Kendal Town Council.

The Saskatchewan Legislature recently voted $3 000 000 for expenditure by the Saskatchewan Power Commission, including $750 000 for h.t. transmission lines.

The City Electrical Engineer of Inverness is to prepare a plan and an estimate of cost of promoting a Special Order for the extension of the Corporation's supply area.

Bradford General Purposes Committee has decided that, for experimental and comparative purposes, half the length of Canterbury Road be lighted by electricity and half by gas.

The Newcastle-upon-Tyne Electric Supply Co.'s Weardale electricity project is to be carried a stage further by the extension of the overhead transmission lines to Rookhope and Cowshill.

The borough electrical engineer of Eccles is to obtain information with reference to schemes of assisted wiring, with a view to the adoption of a scheme when the new showroom is established.

Biggar T.C. is to borrow £2 000 for its electricity supply scheme. The Clyde Valley Co., which is to supply the town, expects to have the scheme completed by the beginning of the next lighting season.

Lichfield City Council proposes to extend the supply to Alrewas by means of an 11 000 V overhead transmission line, at an estimated cost of £5 448. A loan and an unemployment grant are to be sought.

Chichester Corporation has decided to apply for an unemployment grant, with a view to carrying out schemes of extensions in connection with the electricity undertaking at an estimated cost of £58 016.

Wrexham T.C. has applied for an unemployment grant towards the cost of changing over from d.c. to a.c., and in the event of a grant being received will apply for a loan of £7 770 for carrying out the work.

Burton-on-Trent Electricity Committee has obtained sanction to borrow £4 458 in connection with the extension of the electricity mains from Hartshorne to Milton to give an alternative supply to Milton waterworks.

Cardiganshire County Council has received a letter from Mr. W. Thomas, of Pontypridd, asking the Council to support a scheme for supplying hydro-electric power in the Rheidol Valley, and it has been referred to a committee.

The Electricity Commissioners for Northern Ireland have informed Portstewart U.D.C. that they are now prepared to agree to the installation of an additional generating set having a rated capacity of 75 kW, increasing the capacity of the station from 67 to 142 kW.

Electricity Distribution of North Wales and District, Ltd., has given Whitchurch U.D.C. an assurance that electricity will be available for the district during the present year at a price less than the maximum of 9d. per kWh. The Council has approved the company's proposals.

Nantwich R.D.C. has received from Audlem P.C. a letter urging the necessity of the parish being supplied with electricity before September 20, in view of the closing down of the gas company. The R.D.C. will apply to the North-West Midland Electricity Co. for a supply of electricity for the parish.

East Ham Corporation has received sanction to borrow £24 985 for the extension of distribution cables in various streets. The Corporation has approved the estimate submitted by the Borough Engineer, amounting to £1 440, for the erection of the Plashet sub-station buildings, and the work is to be proceeded with.

Weymouth Electricity Committee has decided that the 50 kVA transformer at Overcombe be removed and a 200 kVA transformer substituted, utilising the 50 kVA at Osmington. The Preston scheme is to be modified by providing a kiosk with a 100 kVA transformer, which will be connected with the Overcombe transformer.

Aberdeen T.C. has applied to Kincardine County Council for sanction to a scheme for supplying North Kincardineshire. The Grampian Electricity Supply Co. has informed the County Council that it has prepared a scheme for supplying the whole county, and Aberdeen's application is being left over for the new County Council to consider.

The Ministry of Transport has informed Westminster City Council that the London Power Co. has not yet completed the experiments with regard to the treatment of sulphur fumes in connection with the erection of the electricity power station at Battersea. The Electricity Commissioners are pressing the company to complete the experiments and make a report as soon as possible.

Hampton U.D.C. has been informed that terms have been provisionally agreed between the London and Home Counties Joint Electricity Authority, and the Twickenham and Teddington Electricity Supply Co. for the transfer of the electricity undertaking in the district. Representatives of Hampton Council are to discuss with the officers of the Authority the question of the lighting of streets by electricity.

Colchester Electricity Committee has obtained the approval of the Unemployment Grants Committee of the completion of the outer h.t. ring main at a cost of £19 500, and the laying and erection of electricity lines in various parishes at a cost of £20 430.—The Committee has asked the consulting engineer to proceed with the survey of routes for further e.h.t. transmission lines to serve Tiptree, Manningtree and Mistley.

The question of the amount of the contribution which the Central Electricity Board will make towards the cost of the extension of the switchgear and switchhouse at the Burton-on-Trent power station, necessitated by the operation of the Central England Scheme, has now been agreed, and Burton Electricity Committee has decided to obtain tenders for the supply of switchgear and the extension of the switchhouse.

Marylebone (London) B.C. seeks sanction to borrow £18 567 for carrying out improvements of the public lighting in about 9 miles of streets in the borough. The proposal involves the substitution of 270 single-bracket standards and 21 double bracket standards for 667 converted gas-standards which are used for low power electric lighting. Lamps of 750 c.p. are to be used on the single-bracket standards and 560 c.p. on the double-bracket standards.

In reference to Weymouth Corporation's application for permission to alter the electricity supply system in certain areas in the borough, the Electricity Commissioners have asked for information as to the voltage, etc., of the existing system and as to the system and pressures now proposed to be adopted. The Commissioners have also suggested that the Council should make application in respect of the whole of the borough, which would enable the alteration to be carried out as and when convenient. The Electricity Committee proposes to comply with the suggestion.

The Weald Electricity Supply Co. had informed East Grinstead R.D.C. that 80 applications have been received from residents at Forest Row for a supply of electricity, and the company has asked for the Council's consent to an application for a Special Order. The Council has decided to approach East Grinstead U.D.C. with regard to terms for a supply from that body, and to ask the Commissioners for guidance. East Grinstead U.D.C. has declined an offer by the Weald Electricity Supply Co. to purchase the council's electricity undertaking for £10 000, plus capital charges on outstanding loans of about £43 000, as the amount offered is considered inadequate.

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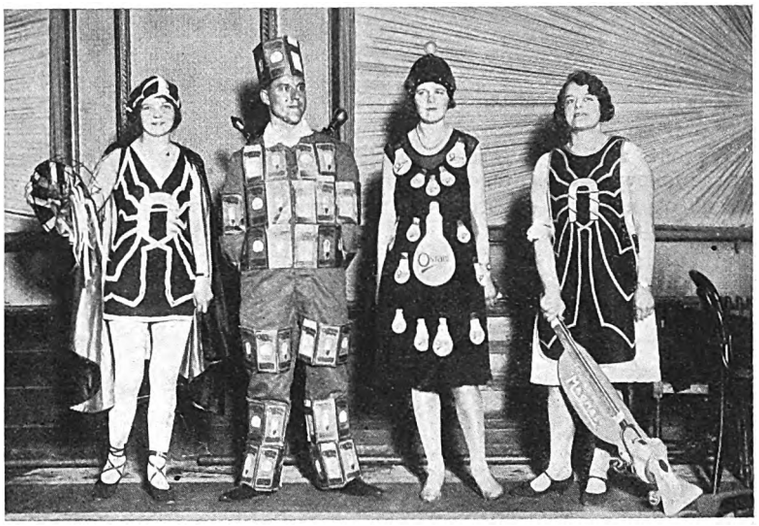
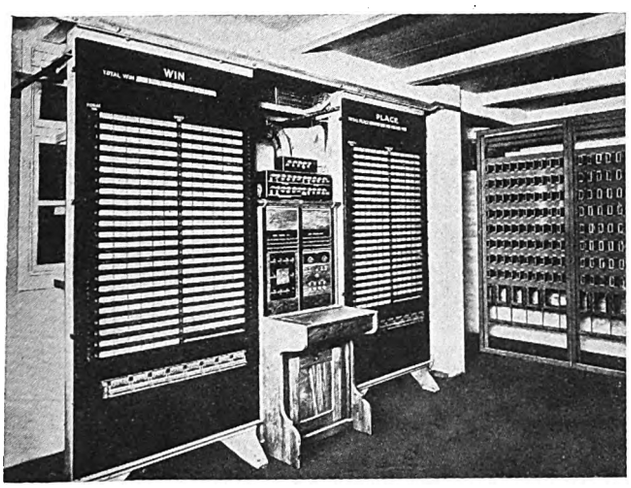
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Mrs. C. H. Yeaman as Queen Erminilda in the Stoke-on-Trent Historical Pageant, in connection with the Josiah Wedgwood bi-centenary celebrations which were inaugurated by Princess Mary on Monday.



The majority of the dancers at the British Empire Ball, held at Belfast last week, assumed costumes representative of British enterprise. Among the most notable trade personalities may be mentioned the "Mazda" and "Magnet" girls. "Mazda" lamps were represented by the popular dancing girl in feathered ballet skirt, while the "Osram" products were featured as above.

Mrs. Wilfrid Ashley, President of the Electrical Association for Women, occupied the chair at a well-attended luncheon at the Park Lane Hotel, London, on May 15, following the annual general meeting. A report of the speeches and other details of the conference are given on page 646.



The first detailed account of the R.C.B.C. standard all-electric totalisator, which is manufactured by the British Thomson-Houston Co., Ltd., and the Automatic Telephone Manufacturing Co., Ltd., was published in THE ELECTRICIAN of February 7. The main control room at the Newmarket course, seen here, bears a striking resemblance to that at Thirsk, but caters for 45 runners.

Mr. Vincent Z. de Ferranti, chairman of Ferranti, Ltd., at the outset of his flight from Hollinwood to Stourport, to attend the opening of the h.t. laboratory of Steatite and Porcelain Products, Ltd., on May 15, the laboratory being equipped with Ferranti transformers. The aeroplane is normally used in connection with radio research. See page 652.

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FINANCIAL INTELLIGENCE.

Abstracts of Accounts of Electrical Manufacturing and Equipment Companies—Dividends Declared, Recent Quotations and Yields on Investments.

By "AUDITOR."

BANK RATE (1929–30).

1929.			1930.	
Feb. 7 ..	5½%	Nov. 21 ..	5½%	Feb. 6 ..	4½%
Sept. 26 ..	6½%	Dec. 12 ..	5 %	Mar. 6 ..	4 %
Oct. 31 ..	6 %			Mar. 20 ..	3½%
				May 1 ..	3 %

THE profits realised by certain electrical manufacturing and equipment concerns during the past financial year, are given in the following table, together with some recent quotations and the yields :—

ANALYSIS OF RESULTS OF CERTAIN ELECTRICAL MANUFACTURING AND EQUIPMENT COMPANIES WHOSE 1929 (or 1929-30) ACCOUNTS HAVE BEEN SUBMITTED.

	Brought Forward £	Profit £	Total £	Carried Forward £	Annual Dividend %	Recent Price	Par Value £	Yield	Remarks
Associated Electrical Industries	101 850	261 812	363 662	109 241	6	27/9	1	4·3	The dividend was maintained on a much larger capital. Output was satisfactory, and orders have since increased.
" " 4% M. Deb. Stk.	—	—	—	—	4	74	100	5·4	
" " 8% Cum. Pref.	—	—	—	—	8	52/6	2	6·1	
Automatic Telephone Mfg.	93 483	118 802	212 285	118 285	12½	37/6	1	6·7	Controlled by International Automatic Telephone Co., Ltd.
Babcock and Wilcox	118 363	665 530	783 893	75 992	15	55/6	1	5·4	The reserve fund now amounts to £900 000, apart from a dividend equalisation fund of £400 000
" " 6% Cum. Pref.	—	—	—	—	6	22/6	1	5·3	
" " 5% Cum. 2nd Pref.	—	—	—	—	5	—	1	—	
British Aluminium	33 843	279 793	313 636	35 559	10	44/6	1	4·5	The reserve fund amounts to £1 050 000, and the depreciation reserve to £1 000 000.
" " 5% Prior Lien Deb.	—	—	—	—	5	99	100	5·05	
" " 6% Pref.	—	—	—	—	6	21/6	1	5·6	
British Insulated Cables	250 089	636 550	886 639	280 806	15	75/6	1	3·9	As a consequence of the settlement of taxation and other claims, the sum of £300 000 has been transferred to a dividend equalisation reserve.
" " 5% M. Deb. Stock	—	—	—	—	5	98	100	5·1	
" " 5½% "A" Cum. Pref.	—	—	—	—	5½	21/–	1	5·2	
" " 6% Cum. Pref.	—	—	—	—	6	23/3	1	5·2	
British Thomson Houston	203 066	166 196	369 262	205 262	5	—	1	—	The ordinary share capital is held by Associated Electrical Industries, Ltd.
" " 4½% Deb. Stock	—	—	—	—	4½	—	100	—	
" " 7% Deb. Stock	—	—	—	—	7	102	100	6·8	
" " 7% Cum. Pref.	—	—	—	—	7	24/–	1	5·8	
Clifford (Charles)	44 773	14 483	59 256	39 196	15	59/6	1	5·04	The reserve amounts to £80 000.
" " 6% Cum. Pref.	—	—	—	—	6	19/6	1	6·15	
Consolidated Signal	673	25 259	25 932	840	12	35/–	1	6·8	The profit figure represents dividend received from Westinghouse Brake and Saxby Signal Co.
" " 6% Cum. Pref.	—	—	—	—		18/–	1	6·6	
Craigpark Electric Cable	2 200	19 025	21 225	3 625	10	—	1	—	New shares are being issued at par.
" " 6% Cum. Pref.	—	—	—	—	6	—	1	—	
Crystalate Gramophone Record	13 920	66 539	80 459	12 582	33⅓	3/1	1/–	10·8	Investments in associated companies amount to £166 241, at cost.
" " 8% Pref.	—	—	—	—	8	9/9	10/–	8·2	
Davis and Timmins	21 316	26 068	47 384	20 819	20	44/6	1	8·9	£4 912 was transferred to reserve.
" " 6½% Cum. Pref.	—	—	—	—	6½	20/–	1	6·5	
Edison Bell	9 780	28 146	37 926	8 676	10	14/8	1	13·6	£3 000 was written off preference share issue expenses, leaving a balance of £9 000
" " 7½% Cum. Pref.	—	—	—	—	7½	—	1	—	
Edison Bell (International	—	5 620	5 620	5 620	—	7/–	1	—	First accounts.
Edison Swan Electric	18 929	50 965	69 894	13 250	10	—	4/–	—	The company guarantees the principal and interest of Edison Swan Cables, Ltd., 5½% debentures. Controlled by Associated Electrical Industries, Ltd.
" " 7½% Cum. 1st Pref.	—	—	—	—	7½	24/6	1	6·1	
" " 5% 1st Deb. Stock	—	—	—	—	5	85	100	5·9	
" " 5½% 2nd Deb. Stock	—	—	—	—	5½	87	100	6·3	
Electrical Apparatus	1 770	8 627	10 397	968	Pref.	—	1	—	Controls Bray, Markham and Reiss, Ltd.
" " 10% "A" Cum. Pref.	—	—	—	—	only	—	1	—	
" " 8% "B" Cum. Pref.	—	—	—	—		—	1	—	
Enfield Cable Works	31 650	129 408	161 058	33 559	25	85/3	1	5·9	The reserve is £160 000 against a share capital of £550 000.
" " 7½% Pref.	—	—	—	—	7½	26/3	1	5·7	
Ericsson Telephones	18 235	64 087	82 322	19 322	8	—	1	—	Debentures were redeemed in December 1929
" " 7% Cum. Pref.	—	—	—	—	7	20/–	1	7	
Hall Telephone Accessories (1928)	4 631	40 365	44 996	4 719	12	14/6	10/–	8·3	Share capital was increased to £175 000 in February, 1929.
International Automatic Telephone	69 736	133 517	203 253	82 579	12½	33/6	1	7·5	Patent rights and goodwill stand in the balance sheet at £360 000.
" " Deferred	—	—	—	—	12½	32/6	1	7·7	
" " 7% Pref.	—	—	—	—	7	—	1	—	
Johnson and Phillips	80 903	102 514	183 417	123 417	10	38/3	1	5·2	£20 984 was provided for depreciation of machinery, etc., and £15 217 as reserve re debenture sinking fund.
" " 6% 1st M. Deb. Stock	—	—	—	—	6	100	100	6	
Lancashire Dynamo and Motor	7 809	18 157	25 966	7 227	5	—	1	—	Controls Crypto Elec. Co., Ltd. The company may pay off all or any of the debenture issue at 103% at any time.
" " 6% 1st M. Deb.	—	—	—	—	6	—	100	—	
" " 5½% Cum. Pref.	—	—	—	—	5½	—	1	—	
Laurence, Scott and Electromotors	7 861	50 118	57 979	11 285	10	—	1	—	First accounts since the acquisition of Electromotors Ltd.
Lesser (S.) and Sons (1928)	7 663	25 150	32 813	4 461	10	—	10/–	—	£6 353 has been written off the preliminary expenses.
" " 8% Cum. Pref.	—	—	—	—	8	20/–	1	8	
London Elec Wire Co. and Smiths	22 759	110 620	133 379	30 075	7½	—	1	—	The net profit in 1928 was £110 276.
" " 7½% Pref.	—	—	—	—	7½	23/9	1	6·3	
Mather and Platt	106 006	228 398	334 404	109 855	15	43/3	1	6·9	The preference shares have a priority as regards capital up to £10 10s. each.
" " 5% Cum. Pref.	—	—	—	—	5	8·8	10	5·7	
Midland Elec. Mfg.	13 193	45 182	58 375	14 640	22½	75/6	1	5·9	Share capital was increased to £187 500 in March, 1929.
" " 7½% Cum. Pref.	—	—	—	—	7½	23/9	1	5·3	
National Elec. Construction	5 604	17 850	23 454	5 221	12½	23/3	10/–	5·4	The reserve is now £40 000.
" " 5% Debs.	—	—	—	—	5	—	100	—	
Peters (G. D.) and Co.	14 752	1 632	16 384	14 624	—	—	1	—	Canadian business sold.
Pye Radio	—	62 686	62 686	12 022	—	—	—	—	The final figures indicate satisfactory progress under difficult conditions.
" " Deferred ordinary	—	—	—	—	100	8/3	1/–	12·1	
" " 8% Cum. Partg. Pref'd Ord.	—	—	—	—	10	21/7	1	9·3	
Reason Mfg.	4 706	4 271	8 977	5 087	100	—	5/–	—	Entire share capital is held by Allen, West and Co., Ltd., by whom the preference dividend is guaranteed.
" " 7½% Cum. Pref.	—	—	—	—	7½	—	5/–	—	
Rist, A. (1927)	572	5 458	6 030	1 230	—	—	—	—	Taxation and depreciation have been provided for, and £2 000 written off preliminary expenses.
" " Deferred	—	—	—	—	—	—	—	—	
" " 8% Cum. Partg. Pref'd Ord.	—	—	—	—	8	—	10/–	—	
Simms Motor Units	27 141	44 651	71 792	27 958	10	24/–	1	8·3	£100 000 preference shares were issued in February, 1929.
" " 6% Cum. Pref.	—	—	—	—	6	—	1	—	

The principal items in the accounts of Brush Electrical Engineering Co., Ltd., for past two years, are compared below :—

BRUSH ELECTRICAL ENGINEERING CO., LTD.

	Dec. 31, 1929.	Dec. 31, 1928
Trading Profit	£125 247	£141 948
Net Profit	58 988	67 406
Allocated to Depreciation, etc.	16 289	16 682
To Reserve	5 413	6 010
Creditors	122 897	135 360
Stock	219 899	226 592
Debtors	202 214	231 754
Cash	134 759	82 748
Dividend	10%	10%

Recently the ordinary stock was quoted at 129. There are four issues of debentures aggregating £257 753. Last year, 1% was paid out of undivided profits in addition to the dividend of 10%.

The continued expansion of Ever Ready Co. (Great Britain), Ltd., is reflected in the following comparative figures :—

EVER READY CO. (GREAT BRITAIN), LTD.

	Mar. 31, 1930.	Mar. 31, 1929.
Trading Profit, etc.	£263 760	£224 840
Net Profit	244 555	209 804
To Reserve, etc.	31 272	41 130
Preference Dividend	20 000	20 000
Ordinary Dividend	189 980	148 000
Stocks	74 857	66 097
Debtors	150 196	97 280
Cash	95 834	6 262
Creditors	66 517	43 805
Dividend	35%	35%

At 30s. 6d., the preference shares, which enjoy a dividend of 10%, return 6·56%, while at 19s. the 5s. ordinary shares yield 9·21%.

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COMPANY NEWS.

Extension of Cawnpore Co's. Plant—Chairman of Brush Co. on Trade Unions' Policy—Ferranti's Rearrangement of Capital—Directors' Reports, &c.

ANOTHER 1s. 3d. fall in the price of Bournemouth and Poole Supply ordinary shares has brought down the quotation to 58s. 9d., compared with 62s. 6d. a month ago. County of London shares have dropped half-a-crown to 46s. 3d. Newcastle shares have zig-zagged back 6d. to 26s. 3d., and Yorkshire Power have shed 7½d. Victoria Falls shares have eased 7½d. to nearly 63s. Clyde Valleys have provided a bright spot, the ordinary improving from under 37s. to over 38s., and the 8 per cent. preference putting on 6d. to 28s. 6d. Calcutta Supply shares have regained last week's 1s. 3d. loss, and the Tramways Company's ordinary shares have also improved to 12s. 6d.

British Electric Traction 6 per cent. preference stock is a point higher, as also is the 5 per cent. preference stock of the British Columbia Electric Railway. Underground Electric Railways ordinary shares are 6d. down at 22s. 6d., London Electric Railway 4 per cent. preference and Metropolitan 3½ per cent. debenture stocks are each ½ a point lower, and Central London Railway 4 per cent. debenture stock has dropped a point.

Cables and Wireless Stocks have been an up-and-down market, and close slightly lower than a week ago, the "A" ordinary at just under 50, and the "B" at below 23. American Telephone and Telegraph stock is steady at 255; Marconi International Marine shares are down to £2 again. Radio Corporation of America shares are below 49. Internationals are unchanged and Hydros ⅛ up.

International Automatic Telephone shares at 32s. 6d. are 1s. 3d. down, as also are British Insulated Cables at 75s. W. T. Henley's ordinary are 2s. 6d. lower at 127s. 6d., and Siemens ordinary shares at 24s. 4½d. have lost 7½d. General Electric ordinary are unchanged at 51s. 3d.; the "A" preference have improved 3d. to 23s. 9d. Crompton Parkinson ordinary have risen from 23s. 9d. to nearly 24s. 6d., but Ever Ready 7 per cent. participating preference shares have weakened from 30s. to 29s. 6d.

Last Annl. Divd.%	Description.	This Week.	Last Week	1926 to 1929 Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98½
6½	" " "C" 6½% Cm. Pf. Stk.	106	106	117½	98½
15	B'mouth & Poole El. S. Ord. ..	58/9	60/-	78/-	29/9
6	" " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	48/1½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stk.	81	82½	81	77½
4	Central Elec. Sup. 4% Deb. ..	95½	95½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	27/6	27/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord. .	38/1½	36/10½	44/6	26/6
8	" " " 8% Pref.	28/6	28/-	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	46/3	48/9	68/6	25/9
6	" " 6% C.P.	23/-	23/-	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/6	24/6	27/-	21/6
(*g*)	Electric Supp. Corp. Ord.	46/10½	46/10½	59/6	29/6
6	" " 6% Cum. Pref.	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord.	12/6	12/6	23/6	10/-
6	" " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	90	90	92	80½
—	Hydro Electric Securities ..	46⅞	46⅞	87	20
—	International Holdings	6⅜	6⅜	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	28/-	28/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	29/6	29/6	37/6	23/-
5	London Power Co. 5% Deb. Stk. ..	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	172	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	28/6	28/6	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	26/3	26/9	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord.	23/1½	23/9	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	11½	9½
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	27/6	27/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/-	20/10½
8½	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
7	S. London E.S. Ord.	27/6	27/6	30/11	23/9
6½	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
7	Tokyo Elec. 1st Mt. Ster. Bonds ..	95	95	98½	86½
5	Urban E.S. Ord.	33/9	33/9	46/6	18/-
	Victoria Falls Power Ord. ..	63/1½	63/9	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	94½	93½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	" " " 6% Pf. Stk.	131½	130½	133	103½
6	Calcutta Trams Ord.	12/6	11/10½	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)	77	77	74½	54
4½	" " " 4½ Pf.	80½	80½	85½	78
4	" " " 4% Deb. ..	79	80	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	78	78	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	" " " " 4% Pf. Stk.	71	71½	77	68
4	" " " " 4% Deb. ..	79	79	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95	95	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	75½	75½	75½	62
5	" " " 5% Deb. ..	79½	79½	72⅜	65½
4	Met. Rly. Cons. Ord. Stk. ..	66½	66½	81	54½
3½	" " 3½% Pf. Stk. ..	64½	64½	76	60½
3½	" " " 3½% Deb. ..	71	71½	73⅜	67½
5	Met. Dist. Rly. Ord. Stk. ..	77½	77½	81⅜	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	115½	115½	118⅜	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	89½	89½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
(*i*) 9	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	22/6	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	87	87	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb.	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	27/-	27/-	58/6	26/3
8	" " " 8% C.P.	50/7½	50/7½	56/9	49/6
4	" " " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	76/3	99/4½	56/-
6	" " " 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref.	23/6	23/6	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	127½	127½	153⅜	120
15	Callender's Cable Ord.	72/6	72/6	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref.	26/10½	26/10½	28/3	25/-
12	Consolidated Signal Ord. ..	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	24/2½	23/9	27/-	14/-
6	" 6% Cum. 2nd Pf.	19/-	19/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	16/3	16/3	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	20/-
4	" " 1st Mt. Deb. ..	69½	69½	75	68
20	Enfield Cable Works Ord. ..	85/-	85/-	112/6	60/-
7½	" " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P. ..	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb.	89	89	103½	86
6	" " Conv. Deb.	67½	66½	107⅜	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	18/9	92/3	17/10½
10	" " 7% Partic. Pref. ..	29/6	30/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	21/3	13/9
10	General Elec. Ord.	51/3	51/3	81/3	26/6
6½	" " "A" C.P. ..	23/9	23/6	26/-	22/-
7½	" " "B" C.P. ..	26/6	26/-	27/9	22/9
7	" " 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	127/6	130/-	136/10½	69/3
12½	International Auto. Telephone Ord	32/6	33/9	50/6	35/-
10	Johnson & Phillips Ord. ..	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref. ..	23/9	23/9	25/6	22/3
10	Nat. Elec. Construction (10/-) ..	23/9	23/9	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	24/4½	25/-	36/6	23/6
10	" " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " Deb. Stk.	92½	92½	95	88⅜
10	Telegraph Const. Ord. (£12) ..	20½	21½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	$255	$255	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3⅜	Anglo-Am. Teleg. Ord. Stk. ..	59½	59½	63½	56½
6	" " 6% Prefd. Stk	103½	102½	105½	91
1½	" " Deferred Stk.	24⅜	25	27··	22
8	Anglo-Portuguese Tele. Ord. ..	21/10½	21/10½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	49½	51½	90½	73½
—	"B" Ord. Stk.	22½	25½	104	33
—	5½% Cum. Pref. Stk. ..	93½	93½	99	90
3½	Eastern 3½% Pref. Stk. ..	64½	64½	70½	58½
4	" 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10) .	32	32	43½	26
—	International Teleph. & Teleg. ..	$65½	$64½	161½	48½
15	Marconi Int. Mar.	40/-	41/3	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½*	99½	102½	95
12	Oriental Telephone Ord.	55/7½	55/7½	65/-	41/-
—	Radio Corporation of America ..	48½	50½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
	Western Tel. 4% Deb. Stk. ..	78	78	82	75

(*a*) 19/16d. per share. (*b*) 1s. 9·2d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·477d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2⅜d. per share. (*h*) 88s. 2·136d. (*i*) 9%, plus special bonus of 30% from sale of omnibus company's shares. * Ex dividend.

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Directors' Reports, etc.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Intm. div. of 6% actual, tax free, will be payable on June 2.

CITY OF BUENOS AYRES TRAMWAYS CO. (1904), LTD.—Qrtrly. div. of 1/3 (same as last year) is announced.

SHANGHAI ELECTRIC CONSTRUCTION CO., LTD.—An extraordinary mtg. will be held on May 28 to consider resolutn. to alter articles of associatn. to comply with statutory provisions, etc.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Fin. div. on ord. shs. of 20%, tax free, makg. 30%, agst. 25%, for year ended March 31. Scrip bonus of 100% is being made to ord. shhldrs.

ISLE OF WIGHT ELECTRIC LIGHT AND POWER CO., LTD.—Net rev. for 1929, £28 314. After provisn. for income tax, int. and sinkg. fund and pref. div., blce., includg. £1 032 brt. in, is £18 896. Fin. div. 4%, tax free, agn. makg. 8% for year. Fwd. £396, agst. £1 032.

CARMARTHEN ELECTRIC SUPPLY CO., LTD.—Directors have received an offer from General Electric Co., Ltd.,.to purchase the whole of the issued ord. shs., with all pfts. or divs. accrued, at 47s. p. sh. in cash, plus int. from Jan. 1 at rate of 10% p.a. on nom. value. Board recommends acceptance of offer.

SWANSEA IMPROVEMENTS AND TRAMWAYS CO.—Rev. for 1929, £135 062, agst. £136 546. After deductg. all exes. and providg. £20 000 for renewals, surplus was £9 865, agst. £11 101, plus £5 185 brt. in. Ord. div. 6%. Fwd. £4 651.

MADRAS ELECTRIC TRAMWAYS (1904), LTD.—Gross pft. for 1929, £25 879. After provisn. for London offices exes., sinkg. fund and depreciatn. (£7 500), blce. is £8 741, plus £1 703 brt. in. Divs. on pref. shs. paid on Sept. 30, 1929, and March 31, 1930, required £6 000. Fwd. £4 444.

UNITED POWER AND LIGHT CO.—Net income for year ended Feb. 28, 1930, $10 416 358, agst. $6 503 624. Earngs. available for common stk equivalent to $2·35 p. sh. on new class "A" and "B" capitalisatn. of company, compared with $1·60 p. sh. on number of common shs. previously outstandg.

GENERAL ELECTRIC CO. OF NEW YORK.—Total income for 1929, $70 821 976, agst. $57 332 432; surplus for year $25 054 826, agst. $8 313 494; cash divs. (6%) on special stk. amtd. to $2 574 819, regular divs. on common $32 449 285, and extra cash divs. on common $7 210 949. Orders received totalled $445 802 519 (£89 160 504), increase 28%.

ROSS ELECTRIC LIGHT AND POWER CO., LTD.—Rev. for 1929, £4 163; pft. £1 561, agst. £1 522; after takg. into acct. int. on debs. £562, less int. on deposit acct. £11, and providg. for depreciatn., income tax, directors' fees, writing off part cost of change-over of consumers' apparatus and expenses of Special Order, net loss is reduced to £6 269.

ELECTRICAL FINANCE AND SECURITIES CO., LTD.—After deductg. deb. and other int., contributn. to sinkg. fund and other expenses, amtg. in all to £15 785, pft. for 1929 was £24 090, agst. £15 399, plus £5 337 brt. in. Fin. div. proposed on ord. shs. of 6%, with bonus of 2½%, makg. 12½% for year, agst. 10%. Fwd. £9 175. A further £53 200 of deb. stk. has been issued since Dec. 31 last.

CANADIAN GENERAL ELECTRIC CO., LTD.—Operatg. pfts. for 1929, $5 337 029, agst. $4 494 666. Depreciatn. deductn. $908 144 left net pft. $4 428 885, increase $734 220. Pfd. divs. at $599 043 and $3 446 394 appropriated for further reductn. of book value of mfg. plants and other properties left surplus $383 448. Previous blce. brt. fwd. $3 204 626 made pft. and loss blce. $3 588 074, agst. $3 204 626.

YORKSHIRE TRACTION CO., LTD.—Rev. for 1929, £282 013, agst. £225 896. Deductg. exes. and int., and setting aside £37 000 to renewals acct., blce. is £27 998, agst. £18 070. To res., £8 000 (same), div. on pref., £1 622, agst. £1 551. Div. on ord.. 10% (same), fwd. £22 476, agst. £17 102. L.M.& S. and L.& N.E. Railway Companies have acquired joint int. in company equal to that of Tilling and British Automobile Traction, Ltd.

YORKSHIRE (WOOLLEN DISTRICT) ELECTRIC TRAMWAYS, LTD.—Receipts for 1929, £315 607, agst. £271 759. After providg. for exes., includg repairs and maintenance, and placing £45 000 to renewals acct., blce. is £19 924, agst. £19 456. To res., £10 000. Ord. div. 6% (same). Fwd. £14 618, agst. £17 893. L.M.& S. and L.& N.E. Railway Companies have acquired int. in company equal to that of British Electric Traction Co.

UTILITIES POWER AND LIGHT CORPORATION.—Gross earngs. for 1929, $52 348 686, agst. $43 240 584 in 1928. Net income, after depreciatn. and income taxes, was $7 617 657, agst. $4 496 882. Income available for pfd. stk. divs., $46.87 p. sh. After pfd. divs., earngs. equalled $4.79 p. sh. on 1 355 214 shs. of class A stock. Amongst principal acquisitns. during year were Shropshire, Worcestershire and Staffordshire Electric Power Co. and Reading Electric Supply Co., Ltd., both acquired through the Greater London and Counties Trust Ltd.

RIO DE JANEIRO CITY IMPROVEMENTS CO., LTD.—Rev. for 1929, £338 156, agst. £321 343; net blce., £188 150, agst. £170 554. To res., £30 000. Div. 10%, tax free; fwd. £37 661, agst. £22 644.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—The scheme for the reorganisatn. of the sh. cap. has been confirmed by Canadian Courts and supplemental charter has been granted giving effect to arrangemt. Shhldrs. will be notified when the new definitive certs. in respect of the registered shs. of no par value will be ready for delivery against surrender of existg. sh. certs. Hldrs. of share warrts. to bearer will in due course be requested to present their warrts. for purpose of having same endorsed to represent shs. of no par value. Under the scheme the $100 Pref. shs. will be converted into no par ord. in ratio of six for one, and old $50 ord. sh. for sh. into new no par ord.

INTERNATIONAL PAPER AND POWER CO.—First annual rpt. shows earngs. for 1929, after all prior charges and deductn. of depreciatn. reserves, of $4 011 762 for the pfd. and common stks. of International Paper and Power Co., substantially same as the $3 949 206 realised for same stks. in 1928. Earnings of company showed progressive increases each quarter during 1929. For full year earngs. available for depreciatn. and for divs. on the shares of International Paper and Power Co. amtd. to $13 151 265, total div. paymts. on shs. of company to $8 834 511 (pfd. divs., $6 447 651 and class A common divs., $2 386 800), and depreciatn. to $9 139 503, leaving deficit for year of $4 822 749.

SIEMENS BROTHERS AND CO., LTD.—Rpt. for 1929 states that greater volume of orders was secured, and mfg. increased, only exceptn. to greater activity in the various shops at Woolwich works being in the case of submarine telegph. cables, for which demands continued small. A larger proprtn. of orders carried out has been for overseas, but to secure this work low prices had to be accepted. Issue to Siemens and Halske, A.G., of 450 000 ord. shs., unissued blce. of company's authorised cap., has been completed. Pft. of £314 465 is shown by accts. agst. £335 758 before charging int. on and redemptn. of 4½% deb. stock. The pref. div. requires £55 000. Div. for year on ord. shs., 7½% (same). Fwd. £338 511, agst. £313 360.

Company Meetings.

FERRANTI, LTD.—At meetings of holders of the 6% cumulative preference shares and the 7% preference shares on May 16 resolutions were passed to convert and consolidate the two classes of preference shares into one class, to increase the ordinary share capital to £400 000, divided into 800 000 ordinary shares of 10s. each, to capitalise £200 000 of the undivided profits and allot 400 000 ordinary shares of 10s. each, credited as fully paid, to the ordinary shareholders. The total capital will be increased to £900 000.

PHILIPS GLOWLAMPWORKS, LTD., EINDHOVEN.—At the meeting on May 16 the chairman stated that the company had sold its interest in the General Electric Co. of New York at a price considerably in excess of the purchase figure. The General Electric Co. of New York retained its interest, 20% of the share capital, of Philips' Glowlampworks. Liquid assets had increased by approximately £1 250 000, and the financial position was favourable. The board had decided to erect a factory in Australia, for which it would be unnecessary to issue new shares. Turnover and profit during the present year had been larger than in the corresponding period of 1929. With regard to the sale of the Lorenz shares, the sales of Philips' receiving sets had to be stopped in Germany, but the sales of valves continued as before. The report and accounts were adopted.

CRAIGPARK ELECTRIC CABLE CO., LTD.—Dr. Magnus Maclean, presiding at the meeting on May 12, said there had been a large output during the year, resulting in a gross profit of £47 718. There was £15 223 cash at bank and in hand. Reserve at £20 000 would become £30 000 if the recommendations put forward were carried. That would bring the reserve to the figure at which it stood before the large transfer was made to write off losses through drop in price of rubber. The company had been able to accomplish that in two trading years and pay 10% dividend this year in addition. If the company was to be progressive it was essential to instal certain additional plant, involving some works reconstruction,

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and to erect a building for offices and stores. To provide for these the directors propose to issue 15 000 new ordinary shares. The report and proposals were adopted.

CAWNPORE ELECTRIC SUPPLY CORPORATION, LTD.—Mr. J. G. B. Stone, presiding at the meeting on May 13, said the cost of generating and distributing electricity in the past year was £56 143, a reduction of over £1 000. They generated just over 37 000 000 kWh, compared with just under 32 000 000. This showed a satisfactory reduction in generating costs per kWh. Electricity sold exceeded the 1928 figure by nearly 20%. The amount transferred to profit and loss account was £79 944, against £75 063. They had transferred £27 500 to depreciation and renewals account, £2 500 to general reserve, £4 000 to income tax account and £7 827 to debenture sinking fund. A final dividend of 7%, making 10% for the year, was recommended, leaving £6 241 to carry forward. Two of the existing turbines at the Riverside station were to be replaced by others of greater output, a new turbine and alternator was to be added, and larger and more modern switchgear was being put in.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Sir A. Henry McMahon presided at the meeting on May 13, and, after dealing with the figures in the accounts (abstracted in our issue of May 9), said the new automatic telephone system at Singapore was brought into operation on April 18, and the successful completion of this work reflected great credit both on their own staff and that of the contractors, the General Electric Co. of London. The new system was working satisfactorily, and they anticipated appreciable economies in working. The position in Mauritius was still far from satisfactory. Unless the sugar production industry was placed upon a remunerative basis the outlook for the future in that island could not be regarded as encouraging. The Bombay Telephone Co. showed continuous progress, and paid a dividend of 6%, as against 4% for 1928. The debenture stock which they held in that company was convertible into ordinary shares as from July 1 next, and those shares would participate in any higher dividends declared upon them, instead of earning a fixed interest of only 6½%. The dividend of the Bengal Telephone Corporation had increased from 7½% to 8%. During the year the Madras Telephone Co. made an issue of shares to the existing shareholders, of which the Oriental Co. was the largest, and they had increased their holding by 25 754 shares. To stimulate local interest they placed upon the market a certain number of these shares, and 4 325 were taken up. The Madras Co. offered concessions to its subscribers in the form of a reduction of rates. In the case of the Rangoon Telephone Co. there was a slight set-back, though the company had been able to maintain its dividend at 7%, tax free. The Hong-Kong Telephone Co. showed good progress with an addition of 464 exchange lines, and they might look for better results when the new automatic system was in full operation. They had since learned that the change-over took place on May 3.

BRUSH ELECTRICAL ENGINEERING CO., LTD.

Reduced Price Level Due to Competition—Importance of Economy of Production—General Reduction of Wages Undesirable—Trade Unions' Absurd Restrictions.

THE forty-first general meeting of the Brush Electrical Engineering Co., Ltd., was held on Tuesday, at the Holborn Restaurant, London, W.C.

Mr. E. Garcke (chairman of the company) said, in the course of his speech: The credit on the profit and loss account shows £140 529, compared with £153 857, and, after deducting all expenses, which show a reduction on nearly all the items, there is a surplus of £58 988, compared with £67 406. After making the agreed reserve and paying the standard dividend of 10% for the year on the ordinary stock, the net surplus distributable under the co-partnership scheme is £2 787 for 1929, compared with £11 711 for 1928, and with £10 764 for 1927, £8 835 for 1926 and £8 751 for 1925.

I will explain in a moment why this setback has taken place. Speaking generally, the business of the company has not undergone any change for the worse. The general condition of the company is satisfactory, and the financial position is strong, our liquid assets, not counting stock of goods and material, being 45 per cent. of our total capital in debentures and ordinary stock. The products of our manufactures continue to enjoy the high reputation of previous years.

The reason for the decline in profits is due to the policy based on sound business principles which I have explained to the stockholders on previous occasions—that we decline to do business at a loss. During the past year the trend of competition has still further reduced the low price level that prevailed already in 1928 and previous years, and we have deliberately declined to take orders which, if we had accepted, would, I feel sure, have still further reduced our net profits. The relatively small setback, which I sincerely hope is only temporary, if the general conditions of industry in the country can be improved, does not at present hit the stockholders. They receive, if you approve, the same dividend which they have received for many years past, but the reduction of the co-partnership surplus from £11 700 to £2 700 is a great disappointment to the employees of the company, especially as the co-partnership surplus has been an increasing one for each year since the inauguration of the co-partnership scheme. About 25 per cent. of the stockholders are employees of the company.

The chairman proceeded to review at length the industrial conditions of the world at the present time, pointing out, *inter alia*, the apparent paradox that while the basic industries of Great Britain were in a depressed condition, the general standard of living in the country was higher than ever before. In his opinion, if methods were not changed and the economy of production was not raised, there would be disillusion some day. Great Britain must export more if they wished to continue to import as much as they did. Continuing, he said: We have demonstrated in this company the considerable benefits that result from a well-thought-out co-partnership scheme. The relations between the management and the works are excellent, by reason of the collaborations that take place from time to time and of mutual interests that have been established. The co-partners have had the benefit, during several years, of seeing the surplus increase. This year they have an adverse experience, but they have taken it in good spirit, and we are all working hard, by conjoint efforts, to make good, and I hope we shall succeed; but what I want to say quite generally, and not with any reference to particular undertakings, is that the most serious barriers to successful co-partnership are the rigid Trade Union regulations, which prevent the man who does more, or better, than another from being paid better, and the converse by which a slacker is paid as much as one who does his best. We all have experience of people who, unfortunately, are not able to do as well as others, but under trade union regulations a dead level of uniformity has to be maintained.

Then there are the absurd restrictions as to output and the resistance to labour-saving machinery. We must all, however, recognise—and sympathise—that the fear of unemployment on the part of men who see the volume of work diminishing is only natural, and this fear of unemployment is going to be a serious obstacle to rationalisation of industry, by reason of the displacement of labour and consequent temporary unemployment that may follow on the adoption of the new policy. "Rationalisation" is a clumsy word, and has many technical definitions. Broadly, it is best understood as working and carrying on industry in a rational way. Therefore, if rationalisation means displacement of labour, something must be done to deal rationally with this problem. Platitudes would not suffice, but why have any unemployment at all? This is a common-sense question which very few seem willing to tackle. Under our present system we are asking for it. Nature is appealing to our senses and our reason to be put to service by men for the welfare of man, and yet man is encouraged to stand by, idly clamouring for employment.

I set my face against general reduction of wages, because I feel convinced there is no remedy that way, but only more trouble. Under present conditions our principles should, I submit, be: (1) Greater economy by elimination of waste; (2) higher efficiency by elimination of inefficient machinery and methods; (3) larger output to neutralise low prices, by removal of trade union restrictions; (4) better relations between all concerned in industry by adoption of well-thought-out schemes of co-partnership appropriate to such industry; and (5) nationally and internationally—that is to say, politically—we must revise our general outlook by taking off our personal blinkers. The report and accounts were unanimously adopted.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ADAMSON, Mr. W., 27, Cold Bath Road, Harrogate, electrical contractor. £38 17s. April 11.

BULL, John, 6, Exeter Street, Plymouth, wireless dealer. £17 19s. 7d. March 28.

FORD, Mr. R. H., 16, Benbow Street, Devonport, wireless dealer. £23 4s. 6d. March 28.

GREENTREE, H. J. and Co., 11, Commercial Road, Southampton. electrical engineers. £11 9s. April 8 and £14 16s. 5d. March 18.

LINCS. ELECTRICAL CO., LTD., 72, St. Peters Avenue, Cleethorpes, electrical dealers. £14 6s. 10d. April 16.

P.G.S. RADIO, 36, High Street, Plumstead, wireless dealers. £16 2s. 1d. March 26.

PHILIP HENRY ELECTRICAL CO., 56, Pershore Street, Birmingham, electrical dealers. £17 19s. 3d. March 28.

RICHARD BROS., Victoria Road, Rhyl, electricians. £17 9s. 3d. March 27.

SLATERS RADIO SERVICE, 9, The Causeway, Wirksworth, wireless dealers. £34 5s. 5d. March 12.

SOUTHERN ELECTRIC ENGINEERING CO., 9, Bedford Circus, Exeter, electrical engineers. £16 16s. 6d. March 10.

SUMMERS, Eric, The Parade, Perranporth, electrical engineer. £35 4s. 10d. April 1; £37 4s. 2d. March 27; and £30 os. 4d. April 7.

TAPLIN, Mr. H. C., Clifford Street, Southampton, electrical contractor. £17 2s. March 28.

Deeds of Arrangement.

BRADFORD, Oliver Hubert, 2A, Hill Street, and 38, Broad Street, Griffithstown, electrical and wireless engineer. Dated May 14, filed May 19. Trustee, R. H. Coath, 67, Queen Street, Cardiff. Secured creditors, £5; liabilities unsecured, £780; assets, less secured claims, £109.

DRING, Richard, 257, Freeman Street, Grimsby, and 52, High Street, Cleethorpes, electrician. Dated May 7, filed May 13. Trustee, A. G. Pearson, 1, Town Hall Street, Grimsby. Liabilities unsecured, £2 529; assets, less secured claims, £1 481.

FERRIDAY, Lancelot, Empire Arcade and West Villas, Stockton-on-Tees, wireless dealer. Dated May, 9, filed May 14. Trustee, J. V. Baines, 115, High Street, Stockton-on-Tees. Liabilities unsecured, £277; assets, less secured claims, £90.

SQUIRES, Herbert Leslie, 2B, Sparkenhoe Street, Leicester, radio and electrical instrument dealer. Dated May 9, filed May 16. Trustee, E. R. Carr, 10, Gallowtree Gate, Leicester. Secured creditors, £40; liabilities unsecured, £366; assets, less secured claims, £195.

Receivership.

BARNETT (C.) LTD. F. T. Smith, of 150, Southampton Row, W.C.1, was appointed Receiver and/or Manager on May 5, 1930, under powers contained in debentures dated November 15, 1928, to March 1, 1930.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HILLER, J., 52, Whitechapel Road, E.1, electrical and radio expert. A meeting of the creditors was held on May 16 at the offices of Mr. James Mortimer, accountant, 12, Coleman Street, E.C., when the representative of the Marconiphone Co., Ltd., the largest crecitors, presided. A statement of affairs was submitted which disclosed liabilities of £1 115, of which £982 was due to the trade; there were private creditors for £82, and the bank were creditors for £51. The assets amounted to £212, less £14 preferential claims, a deficiency of £917. According to an approximate trading account for the year ended May 15, 1930, the sales were £6 000, against purchases of £4 600; there was a gross profit of £1 350; the expenses were £1 969, and there was a net loss of £619. It was reported that the debtor commenced business about five years ago in partnership with his brother. Two years ago the partners executed a deed of composition to a trustee, and in May, 1929, the partnership was dissolved, and since then the debtor had been trading on his own. The debtor was called into the room and said that although he had sold a considerable number of wireless sets during his trading, in the majority of cases his customers knew very little about wireless, and in practically every case they were delivered on the hire purchase system. If anything went wrong with the sets the debtor had a service agreement to put them right, and if that were not done the customers, in many cases, would not pay the instalments due. In practically every instance the debtor lost money on the transactions. He made an offer to his creditors of 2s. 6d. in the £, to be paid within a month, which, after discussing the position, the creditors decided to accept.

PETO SCOTT CO., LTD. (THE), manufacturers and distributors of wireless apparatus, 77, City Road, E.C., 62, High Holborn, London, W.C., and at Liverpool and Manchester. The creditors met on May 15 at the Society of Incorporated Accountants, London. It was stated that the position of the company was due to insufficient working capital, although the accounts for the past financial year showed a very substantial profit, and the directors felt justified in proposing a scheme for reconstruction.

A statement of affairs showed ranking liabilities of £29 275, made up as follows: trade creditors and expenses £12 716; British Radio Gramophone Co., Ltd., £7 586; Mrs. A. M. Worthington, £7 133; and partly secured creditor, £1 840. The total claim of the latter was £15 840, but securities valued at £14 000 were held. In addition, there was a fully secured creditor for £1 298. According to the books, the assets totalled £25 303, and they were estimated to realise £14 010. After allowing £1 069 for preferential claims, the net assets were £12 941, or a deficiency of £16 334. The assets comprised Holborn lease £250; lease of Keystone Works, £1 000 plant and machinery, £789, estimated to realise £250; furniture, fixtures and fittings, £1 043, expected to produce £250; stock, £10 102, valued at £3 000; deposits, £150; cash at bank, £110, and book debts £12 369, estimated to realise £9 000.

It was stated that the directors had been in consultation with some of the principal creditors, and the financial houses concerned in the hire purchase business, with a view to a scheme being carried through without any meeting being held. The negotiations proceeded favourably up to a recent date, when they broke down. The directors then decided to call meetings of the shareholders and creditors in connection with the voluntary liquidation of the company, but a petition had been presented for compulsory liquidation. A conference of the principal creditors had taken place the previous day, when it was decided that the hearing of the petition should be adjourned for a month, and that active steps should be taken to bring forward a proposal for the carrying on of the business and making arrangements with the creditors. It was also decided by the principal creditors that if an acceptable scheme was not brought forward, then neither the shareholders nor the creditors would oppose a winding up order.

After a short discussion, the creditors unanimously decided to confirm the resolution passed by the principal creditors. The following are the principal creditors: Cossor, A. C. Ltd., £286; Colvem, Ltd., £139; Cole, E. K., Ltd., £185; Edison Swan, £432; Ede and Townsend, £105; Formo Engineering Co., £136; Ferranti, Ltd., £291; General Electric Co., Ltd., £687; Garnett Whiteley, £326; Jackson Bros., £138; Kolster Brandes, Ltd., £321; London Electric Wire Co., £173; Mullards Wireless Service Co., Ltd., £747; Oldham Accumulator Co., £220; Philips Lamps, Ltd., £2 231; Rich and Bundy, £160; Regent Radio Supply Co., £189; Radio Instruments, £106; Radio Manufacturers Association, £123; Standard Battery Co., £162; St. Helens Cable and Rubber Co., £187; Ultra Electric Co., Ltd., £363.

London Gazette, etc.

Bankruptcy Information.

GARTSIDE, Harry, The Arcade, Waterfoot, Lancashire, trading as H. TAYLOR AND CO., electrician and wireless dealer. Receiving order, May 13. Debtor's petition.

Notice of Dividend.

THORNTON, William Haigh, 25, Bridge Street, Burnley, electrical and wireless engineer. First and final dividend, 4¼d. per £., payable May 28, Official Receiver's Office, District Bank Chambers, Blackburn.

Application for Discharge.

LEE, Edward Francis, trading as FRANCIS NEWTON, 340A, Kings Road, Chelsea, S.W.3, electrical engineer. Hearing, June 20, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Partnership Dissolved.

BOOKER AND TARRAN (Lawrence Edward BOOKER and Martin Smith TARRAN), motor and electrical engineers, the Garage, Waltham Street, Hull. By mutual consent as from March 28, 1930. Debts received and paid by M. S. Tarran, who will continue the business.

Bankruptcy Proceedings.

RICHARDS, Sydney Ernest, and NEILSON, Alan Kelson (trading as RICHARDS AND NEILSON), wireless and electrical engineers, 182, Tulse Hill, London, S.W. At the statutory first meeting of creditors, held at Bankruptcy Buildings, Carey Street, a joint statement of affairs was submitted showing liabilities £554 and assets nil. It appears from statements that have been made by the debtor Richards that in February it was decided to dispose of the business as a going concern to his wife, and Mrs. Richards is now carrying on business as an electrical and wireless engineer in her own name, he acting as her manager. He states that he and his partner filed their petition because they had no means of meeting the claim under certain promissory notes.

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THE ELECTRICIAN, May 30, 1930.

ANNUAL I.M.E.A. CONVENTION & POWER STATION NUMBER.

THE ELECTRICIAN

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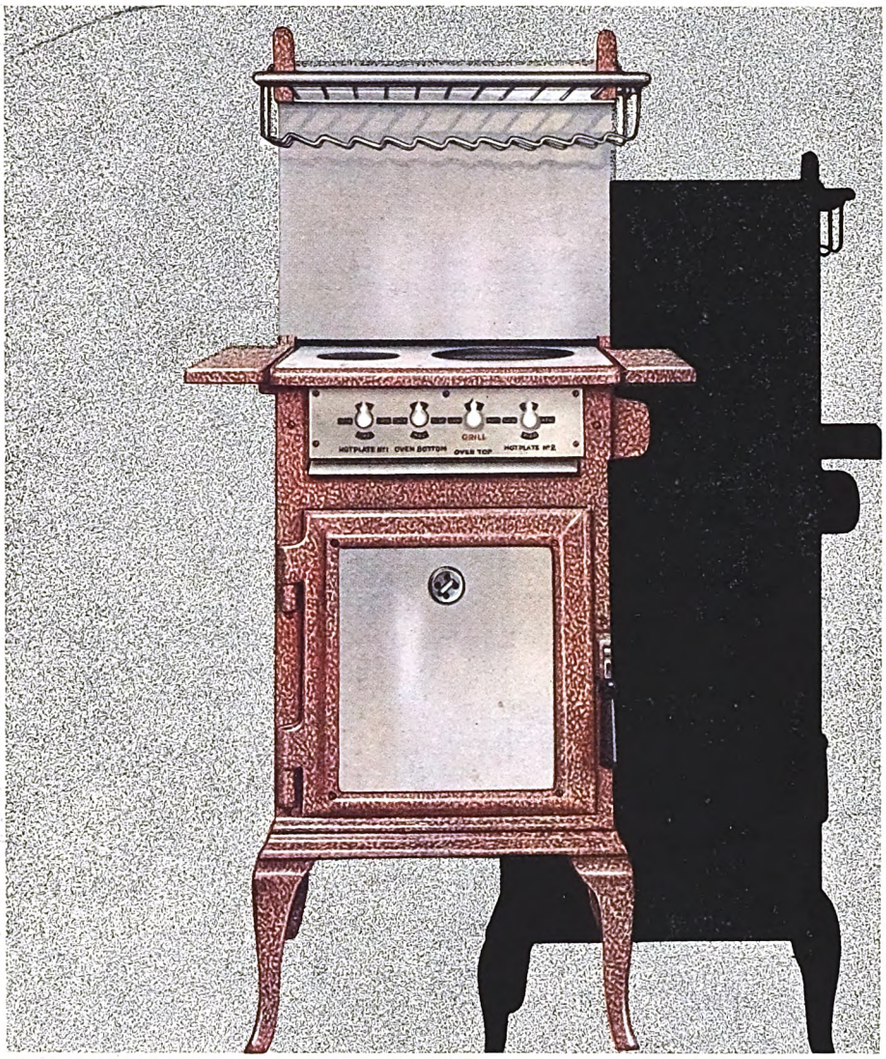

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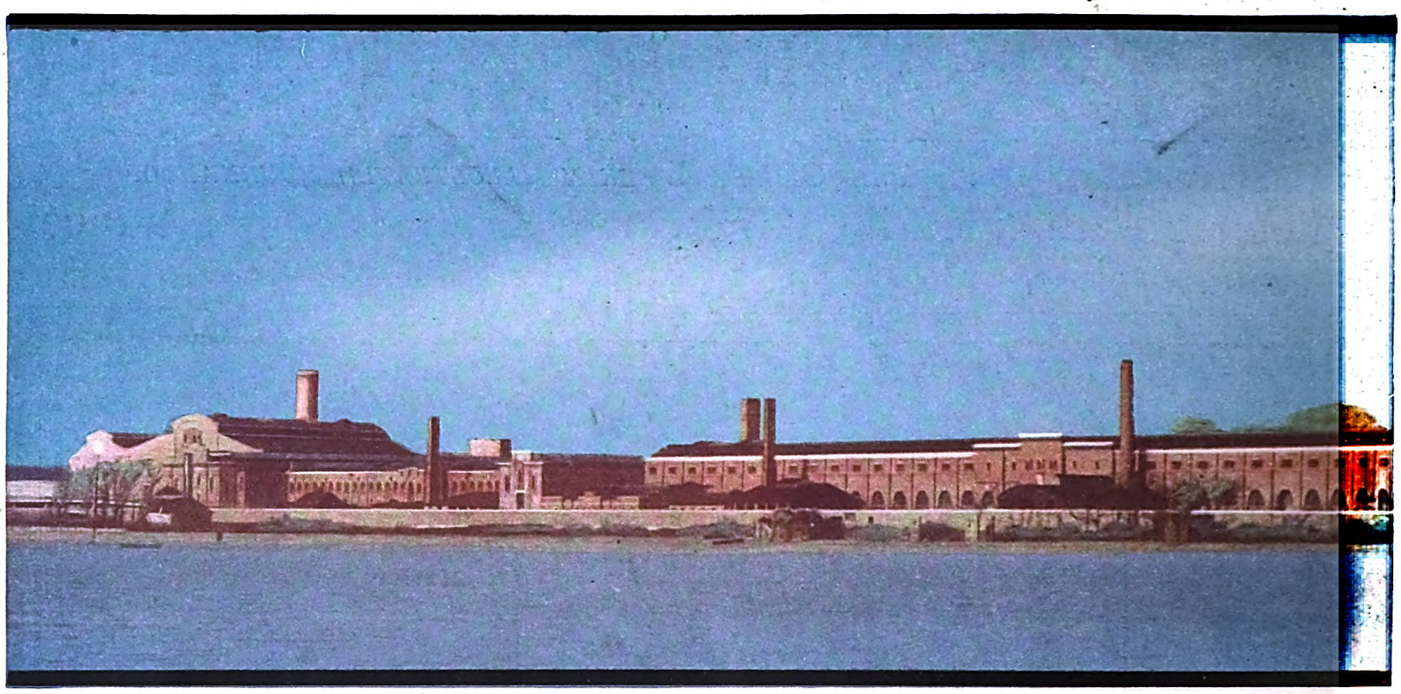

Part of the new works at Woolston, Southampton: floor space 400,000 sq. ft., this illustration, of which only half appears on this page, is continued on the inside back cover

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Continued on inside back cover

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

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Rural Electrification Policy.

IN a foreword to the fourth report of a series by the Rural Electric Service Committee of N.E.L.A. on "Developing Electric Service for the Farm," Mr. C. S. RUFFNER, chairman of the Board of the New York Power and Light Corporation, writes: "The time has long since passed for the power industry to consider electric service to farms as an experiment, something to be entered upon gingerly, to be done with as little trouble and expense as possible, and to be regarded as more or less of a charitable enterprise. Farm service should be a fixed part of the industry's commercial and new business activities, and should be recognised for what it is, one of the most promising methods of load building at our disposal." Mr. RUFFNER points out that the benefits of the application of electric power to industry generally have been increased efficiency, higher wages and lower prices for the manufactured article; the farmer has not prospered in anything like the same degree. Without entertaining any illusions as to an overnight transition from poverty to prosperity, it is permissible to predict that providing the farmer with more efficient power at a lower cost will give him an advantage that he has hitherto lacked.

In these difficult days of deflation, with prices of agricultural produce at levels which are generally unremunerative throughout the world and productions almost everywhere in excess of demand, the condition of the farmer is, or should be, a matter of serious concern to all governments. Even in the most highly industrialised countries agriculture is the largest single industry, and, as the source of food supply and of the raw materials of so many of the secondary industries, its maintenance on a reasonable level of prosperity is of supreme importance to the State. There can be no doubt that the depressed condition of farming in this country since the war has reacted to a very considerable extent on the internal demand for a great many of the products of our factories, thereby preventing that reduction in the cost of production which can only be achieved by operating at a higher percentage of works' capacities than has been the case in so many of our principal industries in recent years. It would be unduly optimistic to imagine that a large extension of rural electrification will, in itself, suffice to bring back prosperity to British farming. Yet it can render powerful aid in that direction, given an adequately co-ordinated system of low tariffs, assisted wiring, hire or hire purchase plans for the acquisition of machinery and a well considered instructional campaign.

Mr. RUFFNER regards as the prime requisites in rural service activity the adaption of apparatus to the requirements of the farm—in this field America and the Continental countries of Europe are a long way ahead of us—ability to sell the farmer appliances at a price that he can afford to pay and the framing of tariffs which will permit him to operate them economically. Even in the United States it would seem that greater co-operation in this field between manufacturers and supply undertakers is needed. Doubtless we shall learn a great deal from the Bedfordshire experiment, but without waiting until the knowledge to be acquired from that quarter has been accumulated and sifted, we can with some confidence lay down certain principles that are inseparable from a successful policy of extending rural electrification. Distribution must be undertaken by large units—a three county basis is probably the minimum area that can be effectively developed in the less industrialised parts of the country. Undertakings must build up the rural load in much the same way as a railway company builds a branch into a thinly populated district. Progress towards an adequate return on the capital expended may be slow, but with vision and capable management the reward will eventually be reaped.

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Current Topics.

I.E.E. Summer Meeting.

ON Monday the summer meeting of the I.E.E. opens in Dublin, and those taking part will number about 200. An attractive programme of visits to various points of interest in the Irish Free State and Northern Ireland has been arranged. Chief among these is the Shannon hydro-electric plant and distribution system. This has been the subject of severe criticism on economic grounds, but it may be recalled that Colonel WILFRID ASHLEY, M.P., in a speech in Edinburgh, on the occasion of the opening of the Central Scotland grid, expressed the opinion that it was going to become a great success by developing the rural load. There is a disposition in some quarters to regard conventions and meetings as excuses for joy rides. We believe this to be an entirely wrong-headed view. The papers read at the I.M.E.A. Convention this week and the discussions that followed them have been as usual of a highly instructive character, and the social side of such gatherings has a very real value in bringing together men and women from all parts of the country, enabling them to exchange views on current problems and stimulating the birth and dissemination of fresh ideas.

Devonshire Park Exhibition.

THIS year's electrical exhibition at Eastbourne, held in connection with the I.M.E.A. Convention, is one of the largest yet staged, and over forty well-known firms are taking part. Perhaps the outstanding impression gained from a visit to the Winter Gardens is the large number of manufacturing firms which cater for electrical water heating on the thermal storage system. Practically every stand features this contribution to domestic science, and the variety of apparatus from which to choose is almost embarrassing. Without doubt manufacturers are fully alive to the possibilities of developing the off-peak load, and, though many supply authorities already encourage consumers by special tariffs to instal thermal storage plants, there remain many who have yet to be convinced of the wisdom of giving such facilities. Another popular exhibit at Eastbourne is the electric washer, and one exhibitor advises us that certain builders are now installing these washers in houses for sale, instead of the more common gas boiler. The builders themselves claim that the inclusion of these washers in the purchase price of the house increases their chances of selling, and one builder alone has placed an order for over 1 000 machines. This figure is worth noting by supply engineers, for with 1 000 washers concentrated in one area the load is considerable, while the more usual necessity of first establishing that load has been kindly shouldered by the builders.

America and Unemployment.

THERE seems to be a growing impression in England that America is likely to be tempted to follow our example and make some official provision for relief of unemployment. That impression is not unnaturally fostered by our social reformers, who would be glad to have the moral support of America for their own bad economics. An American body, the National Association of Manufacturers, has just issued a pamphlet which examines this question at some length and disposes of any fear of the introduction of the dole on the other side of the Atlantic. Two quotations are sufficient to show the attitude of America. Mr. HOOVER, addressing the President's Conference on Unemployment in 1921, declared: "In the other countries that have been primarily affected by unemployment as a result of the war, solution has been had by direct doles to individuals from the public treasury. We have so far escaped this most vicious of solutions that can be introduced into government." On February 25, 1929, the Committee on Education and Labour of the United States Senate in its report said:—"Government interference in the establishment and direction of unemployment insurance is not necessary and not advisable at this time. Neither the time nor the condition has arrived in this country where the systems of unemployment insurance now in vogue under foreign governments should be adopted by this Government." Unemployment has, it is true, increased greatly in the past fifteen months, but it will take more than a temporary depression to induce the robustly individualistic people of the United States to experiment with the decadent social nostrums that have done so much to weaken the fibre of our own population.

A Hydro-Electric Problem.

ONCE more a considerable area of the United States faces the possibility of a serious shortage of hydro-electric power, on account of the absence of any prolonged rainfall since last summer, when power plants throughout the country burnt nearly three million additional tons of fuel to make up for the rainfall deficiency. In the Pacific north-west the situation is again becoming acute. It will be recalled that last December the City of Tacoma, which depends for its light and power upon a municipal hydro-electric plant, "borrowed" the aircraft carrier "Lexington" which was connected up with the city's distributing lines as a generating plant for 30 days at a cost to the taxpayers of more than half a million dollars. For two years there has been a subnormal precipitation in Washington and Oregon, and already the temporary relief of spring rains has been largely exhausted. This again brings to the front the importance of the "run-off," which varies much more than "rainfall." When the ground is very dry it absorbs all the rainfall, and there is no run-off, which means that no part of the rainfall finds its way to the streams to become available for generating hydro-electric power.

New Light in Ancient India.

ALTHOUGH the Southern generating station of the Calcutta Electric Supply Corporation was only opened a little over three years ago, the growth of demand for current has already necessitated the installation of a new unit. A 20 000 kW turbo-alternator with boiler equipment is now being put in, and provision is being made for the replacement of existing plant at the Cossipore station by larger and more modern units. A cable tunnel under the Hooghly to carry current from the Southern station to Howrah is being built and should be completed in about a year's time. Thus, in spite of the disturbed political conditions, electricity is making great headway in India, even in places where religious prejudice might be expected to form a barrier. Lord MESTON, in his speech as chairman at the annual meeting of the Calcutta Electric Supply Corporation, gave an instance of the new order of ideas. The ancient Hindu temple at Serampore has now been electrically lighted for over a year, the switching on of the current having been performed with appropriate ceremony.

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WEATHER conditions were not too promising on Monday morning when the registration office opened for the issue of badges to members attending the 35th Annual Convention of the I.M.E.A. at Eastbourne. Later in the day an improvement began, and by tea-time, when the trickle of arrivals that had been flowing since morning began to gain volume, the sun came out and the sky cleared. Eastbourne was plainly making a great effort to redeem its reputation, which had been sadly tarnished by a week-end that moved even the residents to unguarded comments in the presence of visitors.

In the exhibition marquee the finishing touches were being given to a comprehensive exhibition of domestic electrical appliances, and in the grounds outside the Winter Garden trial flights of the Osram captive balloon—shaped exactly like a lamp bulb—were being staged.

The list of members and visitors attending the Convention contained 1 102 names, easily establishing a new record, and all the hotels along the front from the neighbourhood of the pier to the western end of the Parade had their share of the influx.

At the President's reception in the Winter Garden on Monday evening the members and visitors soon established contact. Dancing followed until shortly before midnight and the first evening in Eastbourne was an enjoyable curtain raiser for the more solid business of the Convention.

On Tuesday morning the official opening took place in ideal weather conditions. Members of the Council met at 9.30 a.m. and shortly afterwards the large hall of the Winter Garden began to fill up. The Mayor of Eastbourne, Councillor Lieut.-Col. ROLAND GWYNNE, D.S.O., who was accompanied by the Deputy Mayor, Alderman Miss HUDSON, welcomed the members of the Convention, who remarked that he should have accompanied the other Mayors of Sussex towns to France that day in connection with a ceremony in one of the French towns adopted after the war, but when he learned that the I.M.E.A. Convention was coming to Eastbourne he had felt it incumbent on him to be present. The Mayor and Deputy Mayor then withdrew and Mr. BRYDGES gave his presidential address. Much merriment was caused by a slip of the tongue by which he converted "sanguine" into "sanguinary" when referring to the Electricity Commissioners' estimate of the reduction in the cost of production of electricity to be expected as a result of the standardisation of frequency.

Alderman R. S. CHATFIELD's paper on "Obligations of Electricity Committees" was, at his request, taken as read, but he elaborated some of the chief points brought out in the paper before the discussion took place. This over, the members were grouped for the official photograph in the grounds outside the Winter Garden, the sun continuing to shine with an intensity which caused the stall holders in the exhibition marquee to arrange for further ventilation in readiness for the official visit in the afternoon.

In the evening the Mayor and Deputy Mayor held a reception in the Winter Garden. There were dancing and music afterwards until midnight.

Wednesday was an interesting day. In the morning Mr. G. H. LAKE's paper on "Pulverised Fuel Firing as Affecting Economic Boiler House Operations" was taken, and in the afternoon there was a motor-coach excursion to Brighton with the alternatives of inspecting the power station or the Fishergate sub-station of the grid, with tea at the Royal Pavilion provided by the Brighton Electricity Committee and Council. The evening was free from any formal function and visitors had an opportunity of appreciating the beauties of Mr. BRYDGES' new lighting scheme on the parades.

Thursday was Women's Day. Mr. J. W. BURR's paper on "Electrical Heating of Buildings" was the first item on the programme, and Mr. A. E. MCKENZIE then set going a discussion on "Domestic Water Heating." After luncheon, arranged by the Electrical Association for Women, in the Tea Room, the exhibition was inspected, the DEPUTY MAYOR and Mrs. CHATFIELD receiving the visitors. Meanwhile the Local Authority Committee members and the members of the A.M.E.E., were holding their meetings, and the afternoon arrangements ended with the tea provided by the Eastbourne Electricity Committee for the Women's Day visitors. The Convention's annual dinner and dance were held at the Grand Hotel last night.

To-day brings the formal part of the Convention to a close, the annual general meeting taking place in the morning when the president, vice-president and officers for the ensuing year will be elected.

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PRESIDENTIAL ADDRESS.

How the Grid will Influence Trade—Overhead Lines and the Sussex Downs—Brighton's Part in the National Scheme.

By J. K. BRYDGES, M.I.E.E.

IN his Presidential address on Tuesday, Mr. J. K. Brydges said that his mind went back to those days of his early experience in the U.S.A. when electricity was used only for lighting and tramways. Public street lighting then consisted either of 10 ampere direct current arc lamps arranged to burn in series of from 20 to 50 lamps per machine or low voltage carbon filament incandescent lamps, run either in series with

The President and Mrs. Brydges who received the I.M.E.A. delegates on Monday evening.

the arc lamps, or in separate series across the alternating current supply. Arc lamps were used in the main thoroughfares and the incandescent lamps in the less important streets. In the event of the burning out of the filament of an incandescent lamp, a simple cut-out, consisting of two contacts separated by a thin piece of paper which punctured, came into operation and closed the circuit of the faulty lamp. The switchboard consisted of a number of circuits, grouped on one, or more, machines, as parallel running was unknown in those days, and when circuits were switched from one machine to another the supply was interrupted—a drawback that would never be tolerated in these days. Distribution was by overhead wires supported by glass insulators fixed on wood pins attached to wood cross arms, screwed to untreated cedar or chestnut wood poles from which the bark only had been removed. Small transformers for each house, or group of houses, were attached either to the poles or the sides of the buildings with small high and low tension fuses contained in boxes cast in the transformer cover. It could well be imagined what a delightful job it was to replace a blown fuse on a rainy night, sitting on a transformer near the top of a high pole, as high tension switches for controlling individual transformers were unknown in those days. Similar types of plant were, at that time, and even later, in use in this country, examples being found in the early days of the Eastbourne Electric Light Company, when the lighting of the parades was effected by open type arc lamps, arranged in two series circuits, supplied from Brush constant current dynamos each driven by a single acting horizontal engine mounted under its respective locomotive type of boiler. The alternators were rope driven by slow speed horizontal engines and at a later period high speed single acting engines directly coupled to dynamos were introduced.

It was in 1885 that the steam turbine was invented by Sir Charles Parsons and a steady conflict of opinion commenced between advocates of the old and the new type of steam driven prime movers, similar to that which existed in the earlier days of electricity supply between the two systems of direct current generation in conjunction with accumulators and of alternating current generation with static transformers.

Continuing, the President said, probably the main reason for the decision to use alternating current was the continued increase, during the last twenty years, of the use of electricity for industrial and domestic purposes. So long as the system applied to lighting only, it mattered little; but now that industry had come more and more to rely upon electric energy the decision would appear to be a very wise one and, indeed, a very necessary one. The effect of this progress had been to increase the density of the demand on the distributing mains, which, in order that they may be maintained of an economic area, must consequently be fed at more frequent intervals.

These preliminary remarks were little more than retrospection and, perhaps, a prophecy of what may be standard practice in the future. After all, far as we had progressed, we were still on the fringe of a wider field in which electricity was bound to find a premier place. There could be no shadow of doubt that, both nationally and economically, electricity was the force to which we must look in the future for all those industrial developments on which the country depended for its place in the sun. It was not so many years since, that is, in January, 1867, that Dr. Siemens communicated to the Academy of Science in Berlin, and a little later Wheatstone, to those interested in London, the details of the first dynamo, commonly called the Wheatstone machine, and this was exhibited to the comparatively few then interested in that which was destined to revolutionise industry. That was just over sixty years ago, and who could say that we had not progressed since?

We prided ourselves, not without reason, upon the conditions of our electrical developments to-day. There was hardly a town of the meanest importance in the kingdom which did not boast its own supply and, even in villages, small industries were run with the aid of a motor and the local supply.

But were we to take those lines as final? Were we to remain inert and be satisfied with the contemplation of what, a few years ago, would have been regarded as perfection? Perhaps we would have been inclined to do so had it not been for the War, which upset all our pre-conceived ideas of economic security. Before 1914, we possessed perhaps the greatest economic unit in the world, and that lay in our coal mines. It was still there to a certain extent, because experience had proved to our foreign competitors that, in the long run, English coal was the best and cheapest. But conditions had changed. Unless we could bend business conditions to the change which had come over Europe and even America during the last ten years, we should be left behind in the race which, to us, was a vital one.

Overhead Charges.

What we needed more than anything else to enable us to regain our position in the forefront of nations was cheap energy and power. We should not get it from the coalfields; we should not get it from them even if the distressed miner gave his labour for nothing. But we could use him and his industry and, in the long run, restore what he had lost, by a judicious blend of coal and electricity. We should, in other words, bring about a happy condition of affairs resulting in the lowering of overhead costs. This was the black spot of British industry—the cost of production. Lower the cost of production within economic limits and the languishing flower of trade would raise its head like some garden bloom after a welcome shower of rain. And, unless our industrial experts were entirely wrong, we should bring this about through electricity. And this raised the question of rationalisation.

Now what is rationalisation? Like most long words with an imposing air of pomposity, it had a simple meaning when you came to examine it. After all, it was no more than a distribution of rations in properly organised circumstances. In our case it meant the gathering together of all the electrical forces in the Kingdom and distributing them to the greatest advantage amongst the industrial troops of the nation.

The Central Electricity Board was created with the object of assimilating the generation of the whole country, so as to supply in bulk to local authorities and power companies authorised to control electricity within their various areas. It was the business of the Electricity Commissioners to prepare and transmit to the Board the different schemes for dividing the country into districts, and these decided which existing stations shall be retained or new ones created. The various schemes also embraced inter-connection by main transmission lines known as the "grid" and each scheme provided for the standardisation of frequency. It need hardly be said that the main principle of policy in this direction would be to concentrate production in approved areas in order to reduce cost to the lowest economic figure.

At the moment there were some 620 undertakings in the practical area, possessing between them 490 generating

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stations. And whilst some of these could be regarded as more or less obsolete, others stood out as some of the most efficient in the region of electrical undertakings. At the same time, we must not lose sight of the fact that this mass of stations, working individually and without economic consideration, had reduced a large amount of plant to comparative uselessness, or, perhaps, inefficiency, being required only to carry the "peak load" and to provide a proper measure of safety in case of a breakdown. Few, therefore, would be found to argue that this was anything like an economic system. True, the combined capacity of these plants would generate electricity in a greater measure than the country required, though, on the other hand, nearly every station was inadequate to deal with the calls on its area. Hence the call for the "grid," which would bring about a radical change and link these solitary units up so as to form one single system.

It is only two years since the Act came into operation and already schemes for six areas had been adopted, and one was under consideration, embracing 68 per cent. of Great Britain and 95 per cent. of the population. In these, 116 stations had been selected and 340 will ultimately be closed down. It was estimated that these schemes would release about £10 000 000 represented in plant which had hitherto been more or less inefficiently employed. Contracts for nearly £11 000 000 had already been placed; indeed, over two parts of the "grid" current had already been passed. It had been arranged to spend a similar sum on the standardisation of frequency, the Electricity Commissioners estimating that their six schemes will, in as many years of operation, reduce the cost of production by £11 000 000, which should be liquidated for the benefit of the public. Whether or not this is a sanguine estimate time only would show.

On the face of it, therefore, the promoters of this tremendous revolution appeared to have good grounds for their optimism. The scheme for rationalising supplies would, at a conservative estimate, involve an expenditure of something over £33 000 000, which sum would probably be covered by a Government loan. Already approximately £18 000 000 was the sum the Commissioners had consented to raise, the Board being entitled to ask for a Government guarantee for all the capital it needed. In May of last year the Board decided upon a preliminary issue of £3 000 000 and in January a further £7 000 000, these without Government guarantee, which seemed to show that the Board had the courage of their convictions. The Board had two sources of revenue, the one dealing with the standardisation of frequency, and the other from commercial sales. It should be noted in passing that the Government decided that the cost of standardisation should be a direct charge on the industry. The 1926 Act, therefore, gave the Board powers to recover the interest and sinking fund from the Electricity Commissioners, but, in the main, the Board's revenues would be derived from the sale of electricity.

The Operation of the Grid.

Although the Commissioners seemed to regard their scheme as being, in every way, economically sound, and believed that very substantial savings would be effected by their various schemes, it was by no means certain that these sanguine estimates would materialise, at any rate not for some years to come. "I am speaking now of the consumer who is looking forward to the time when his light and power will cost him, on an average, a great deal less than it does at present." In time, no doubt, the new departure would be a boon and a blessing to man, but it seemed as if that day was not likely to dawn just yet. The fact must be borne in mind that electric light and power was, in this country, still, to a certain extent, a luxury—it was certainly dearer here than in many other countries. If one read the various Acts bearing on this subject carefully, it looked as if the distributors and not the consumers would be the first to benefit from the lowering of costs. Capital charges —interest and sinking fund—had to be met until the plants taken over were paid for; in other words, consumers must meet these burdens as they cannot be liquidated by any other means.

"Without being unduly pessimistic, I have felt it my duty to point out that there are yet many obstacles in the way of that electrical millennium which seems to have been confidently anticipated in more than one quarter. That we are progressing and that there are better times ahead for the consumer of electricity is beyond question."

Mr. Brydges then alluded to the opposition which had been going on for a considerable time, in Eastbourne, with regard to the erection of lattice steel towers, "incorrectly called 'pylons,' to quote Sir Harry Haward" on the Sussex Downs. The agitation has had powerful interests behind it, powerful enough, at any rate, to ensure the reception of an influential deputation from the district to the Premier who, in person, debated the subject of it. As was anticipated, the deputation was informed that, much as Mr. MacDonald regretted the fact, there could be no deviation from the scheme as already laid down by those responsible for it. "And, after all is said and done, I think it will be found, when the work on the Downs is finished, that the passing of time and its mellowing hand will show that the evil has been considerably exaggerated." In an essentially commercial community like ours, the amenities of the countryside must, occasionally, suffer. It was a deplorable fact, no doubt, but there was no getting away from it. We could not live in Arcadian simplicity and hold our own in trade conditions with the rest of the world unless we made some sacrifice, so far as the artistic side of life was concerned. It was maintained that portions of the new overhead line between Brighton and Hastings should be placed underground. But, in the economic conditions under which we were suffering at the moment, such a desideratum was entirely outside the range of practical politics. To bury these lines, not only locally, but all over the country, would have swamped the new scheme entirely. It seemed to him that the opponents of the towers lost sight of these hard facts in their very laudable endeavour to point out to the powers-that-be that the line, as projected, would pass over considerable stretches of the beautiful Sussex downlands and seriously affect the amenities of the district. It was also pointed out that the town of Eastbourne had expended a large sum of money in purchasing a considerable area of the Sussex Downs, with the object of securing control thereof and thus preventing the erection of objectionable structures which would detract from the beauties of the landscape. Still, as the result of many protests made by local authorities here and there, considerable alterations were made by the Central Electricity Board in the route of the transmission lines, as originally laid out.

Lt.-Col. Roland Gwynne, Mayor of Eastbourne, and the Deputy Mayor, Ald. Miss Hudson, whose civic welcome to the Convention was given on Tuesday.

So far as the main grid in his part of the country was concerned, Eastbourne was on a ring main which served the counties of Sussex and Kent, extending from Brighton on the west to Folkestone on the east. The line between Brighton and Tunbridge Wells passed through Three Bridges, where facilities would be provided for the supply required by the Southern Railway for the electrification of the Brighton section of their line. As regards the secondary lines, alterations had also been made with a view to reducing the length of the line in this county without any diminution of the service given therefrom. The amended scheme provided a double circuit line between Eastbourne and Newhaven via Polegate, Hailsham and Lewes. In respect to the secondary line from Brighton, the ring originally designed had been replaced by two lengths of duplicate lines from Brighton to Hurstpierpoint and from Three Bridges to East Grinstead and Horsham. These secondary lines had resulted in comprehensive schemes for distribution in the areas hitherto unoccupied or only partly so. Eastbourne itself was proposing to take a supply from the secondary line in connection with an Extension Order covering Hailsham, Polegate, Pevensey, etc. Brighton was the only selected station on the south Coast in this district, but

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arrangements had been made with Hastings whereby the station there would be available for grid purposes for some time. The general arrangement of the grid sub-stations at Eastbourne and Hastings were on similar lines comprising two three-phase transformers, each of a capacity of 20 000 kVA and a voltage ratio of 132 kV/11 kV, but at Brighton the design was dissimilar on account of the different conditions which had to be met with.

It might be of interest to mention that Worthing was now receiving a supply from Brighton through a secondary line, and that a feature of this line was the use of spun reinforced concrete towers which were the first example of this type to be used in the country.

Since Mr. Brydges had already alluded to the layout of the grid scheme and its reactions on the rural amenities, he decided to make no further reference to the subject. Possibly the time was not far distant when all cables would be underground, owing to the recent important departure that had been made in the design and construction of cables suitable for operation at the extra high pressure of 132 000 V.

Cable Difficulties.

It was a far cry to the early days of our industry when Ferranti made the first high pressure paper insulated cable, and very little development in that direction had taken place since until quite recently. In the interim, between the year 1888, when Ferranti first pointed the way, and the present moment, there were many serious obstacles on which he did not dwell—referring in particular to cable difficulties—which had recently been overcome mainly by covering each core of a high pressure three-phase cable with a lead sheath, thus reducing the electrical stresses within the cable to such dimensions as did not permit of active ionisation. Following this departure a method of construction of a cable was devised having a duct or hollow core, and at suitable intervals along its length external containers were fitted so as to accommodate the excess oil due to expansion. When the loads on this cable were such as to produce heat and consequent expansion of the impregnating oil, the amount of oil due to expansion moved through the duct into the external containers which in turn pressed it back into the cable as the temperature and expansion decreased. This method relieved undue pressure on the lead sheath and prevented the formation of voids, and thus the conditions which invited ionisation were overcome.

There were yet many difficulties in the way towards the electrical millennium which the general public had been led to expect. We were adopting a gigantic scheme of which few of us in this country had had working experience. One could foresee many obstacles before the ambitious programme was safely accomplished. There would be difficulties in paralleling large generating stations each operating with its own power factor, and similar troubles could be anticipated with smaller stations synchronising their plants with the grid supply. The use of high voltage may overcome surging dangers to some extent, but there still remained the secondary grid to reckon with.

The Trade Associations.

Concluding his remarks, Mr. Brydges said that though the British Electrical Development Association, the British Electrical and Allied Industries Research Association and the British Engineering Standards Association were outside the sphere of his address, he could not conclude without paying brief tribute to the part they had played in making the high standard what it was, and what it was going to be in the future. Not forgetting, of course, the Electrical Association of Women. As a mere matter of evolution woman came after man, and, as some anonymous cynical philosopher remarked, she had been after him ever since. But not so very long after in these progressive days. Much water had flowed under bridges since the days of the "Votes for Women," and to-day, so far as we were concerned, it seemed to be more of a case of "Volts for Women" and "Watts in the Home." There was yet another branch for the E.A.W. to which he made allusion, and that was in regard to salesmanship. To-day most of our fittings, including domestic fires, were so refined and artistic that they must of necessity appeal to the artistic tastes which lie dormant in every woman. One could see a wide field in showroom and kitchen demonstration in which our women could play a wonderful part.

OBLIGATIONS OF ELECTRICITY COMMITTEES.

The Duties of the Committee Man—Developing the Domestic Load—Profits and the Relief of Rates—The Income Tax Problem.

By ALDERMAN R. S. CHATFIELD.

At the conclusion of the Presidential Address, Ald. R. S. Chatfield read a paper entitled "Obligations of Electricity Committees to Municipal Electricity Undertakings," and said that in every municipal body, one could name two or three, or perhaps more, committees whose chairman would each contend that his committee was more important to the welfare of the people than another. Without entering into any discussion as to which was the most important, everyone must admit that no committee did more or shouldered bigger responsibilities to promote the general well-being of the community, not only in regard to its health, its comfort, its safety, but also its prosperity and advancement, than did the electricity committee. Although it was realised that we were, as yet, still in the early stages of electrical development in this country, nevertheless the author only stated a truism when he said that the use of electricity had so permeated every human activity to-day that it could safely be described as an essential raw material for every form of manufacture and commerce. It followed then that the deliberations of an electricity committee were just as important nationally as locally. The committee had to provide for the future, just as much as for the present. Unless future requirements were properly and efficiently anticipated, industrial development was retarded, and that in turn militated against the prosperity of the country. "Give us electricity—Give us cheap electricity," demanded industry. "Give us electricity for lighting and power for working appliances at rates we can afford," demanded the housewife. If we are to progress, their demands must be met. The solution rested with every member of an electricity committee, and therefore, as one who, after serving an apprenticeship as a committee man for a number of years, occupied the chair and had seen more of the inner working of an electricity supply undertaking than the ordinary committeeman, the author endeavoured in his address to explain in simple terms some of the obligations of members of electricity committees to municipal electricity supply undertakings.

Ald. R. S. Chatfield, chairman of Eastbourne Electricity and Street Lighting Committee.

Every member of a municipal electricity supply committee occupied a responsible position, and had very definite obligations to fulfil if he was to justify the trust reposed in him by the council, the chairman of the committee, the engineer, and the consumers generally. There must be a very large number of members of electricity committees who had not really taken their responsibilities to heart, or probably had never really considered their obligations, and it was these that the author principally had in mind. It should be remembered that an electricity committee was composed of a number of people who were prepared to give some of their time and leisure to matters connected with the development of the municipal electricity supply area, and that they constituted the link between the supply undertaking, the electricity consumers and the general body of ratepayers.

The newly-elected committee man should first of all realise that he had become directly associated with a great and important industry with enormous possibilities of development both in respect to supplies for lighting, heating and cooking, and in respect to the provision of electrical apparatus, which, apart from its importance in improving the load factor, also provided opportunities for profitable retail trading in the department showroom either by direct trading or by arrangement with the local branch of the Electrical Contractors' Association. He should from the first take every opportunity of studying his subject. His obligations did not end with

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attendance at meetings and taking an intelligent interest in the proceedings. He should, throughout his period of service, be prepared to devote himself to the whole question of electricity supply, particularly distribution, and to seize every opportunity of educating non-consumers to the abiding benefits of electricity. His general interest in matters electrical should not be confined to his own undertaking, but should be extended to the whole of the electrical world. It was only by his knowing what was going on outside his own undertaking that he could acquire an adequate knowledge of the subject. He should obviously practise what he preached and use electricity and electrical appliances in his own home.

The committeeman should use his best endeavours to ensure that the benefits of a continuous supply of electricity were available to every ratepayer, whatever his means may be, and that such supply was given as cheaply as possible.

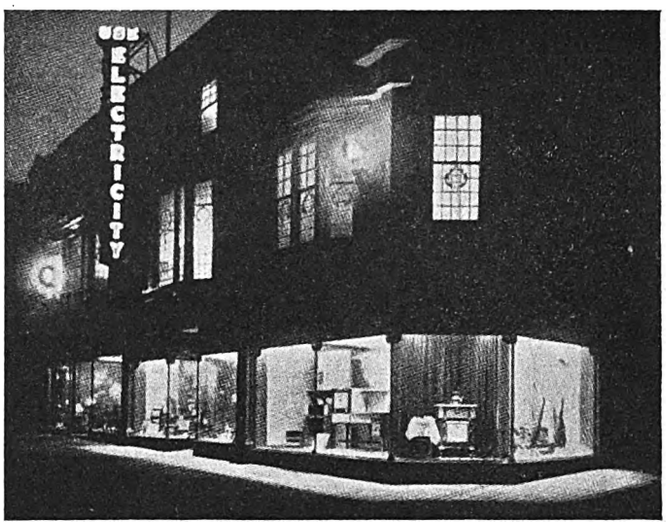
Future extensions and developments of a supply undertaking were matters requiring constant attention. Throughout the country one could not fail to be impressed with the rapid growth of electricity supply. Everywhere could be seen new power stations being erected and extension work being carried out, and now the national grid system was being established a still greater acceleration of supply might be expected. This was a matter which concerned every committeeman. He would be asked before long to vote large sums of money for development and extension works, and in the interests of efficiency and economy he should work both for to-day and for several years ahead.

Many committees were keenly alive to the fact that some method must be devised for connecting up to non-consumers a supply which they could afford. There was not the slightest doubt that everyone wanted electricity, but it was not everyone who could afford to pay cash down for the necessary wiring, etc. A number of schemes were in operation throughout the country, the most popular probably being the assisted wiring scheme. This certainly meant tying up capital, but in the long run it was highly productive and profitable. The surest way of promoting the wider use of electricity was to introduce cheap rates, and this question was one of great importance to the committeeman. Cheap rates for lighting encouraged a higher intensity of light being used, which in turn increased materially the units consumed. Cheap rates for power meant that electricity would be used in the home more freely for heating, cooking and washing. Large consumers using power for industrial purposes should be given every consideration, and if present electricity rates were economically too high every avenue should be explored to see if the granting of special rates was possible.

Having provided the ratepayers with cheap rates and placed them in a position to take a supply, it devolved upon the electricity committee to so handle finances and so fashion their outlook that facilities for rapid development were made possible. To do this the committee should, when carrying out extensions, take a very long view to ensure that distributing mains of ample capacity were laid down to meet future needs for at least five years, bearing in mind the class of home and the domestic load that would eventually have to be carried by the new distributors. The number and size of the houses should be taken into consideration, and where open space occurred between them allowance should be made against the time when it was built upon.

Extensions Attendant with Difficulties.

Owing to the fact that the future had not been fully provided for, all sorts of difficulties had been met with when extensions had been needed. Fully developed land with highly valuable capital sites had to be purchased purely through lack of vision when the initial supply was laid down. The expensive method of burrowing under the ground had even had to be resorted to. Particularly in new districts the rule should always apply that the planning of the electricity distribution system was settled at the time of planning the streets. Land should be acquired when yet in the agricultural state, making full provision for giving a supply to the new area, and protecting it against spoliation of its amenities by kiosks and sub-stations being erected wherever they could be squeezed in. The committee man, as a representative of the people and a trustee of his own undertaking, should take his share of the responsibility of seeing that his undertaking is run on sound business lines. The suggestion offered was that the electricity committee should be independent of any other committee, and have, as far as possible, plenary powers, reporting from time to time to the Council as a whole, who would judge them on their balance sheet as in the manner of shareholders. It was practically impossible for the electricity committee to make suggestions for expenditure for development work, etc., to a separate finance committee, as members of that committee could have no possible knowledge of the requirements of the undertaking, and the duties and responsibilities of the committee might



Ald. Chatfield pointed out in his paper the importance of showroom accommodation, and here is seen Electric House, the showrooms of the Eastbourne undertaking.

be hindered in consequence. It was necessary, however, that the electricity committee should have at all times the opportunity for consultation with the corporation's financial adviser.

An important side of the business requiring the keen interest of committee members was the showroom of an electricity supply undertaking. The various apartments should be well furnished, and the various fittings and appliances, etc., tastefully displayed. The staff of assistants should be fully qualified to discuss electricity from all angles with potential users. Demonstrations of the appliances should always be a special feature. The windows should be well dressed and attractive, and at night should be a blaze of light, as an example to local shopkeepers, and a silent tribute to the power and attractions of electricity.

Good street lighting was an essential factor to the comfort, convenience and safety of the community, and was a matter which concerned members of electricity committees, if that committee was the one responsible for street lighting. A satisfactory system of street lighting was one that permitted of the adequate lighting of pavements and roadways for normal vehicular and pedestrian traffic, to operate as safely by night as by day. Road crossings especially should be well lighted in order that they may be negotiated with perfect safety. In planning a street lighting system many factors must, of necessity, be considered, and the requirements of each class of street and district had to be considered separately, since it was obvious that streets and thoroughfares in the principal traffic centres will require a greater degree of illumination than those situated on the outskirts of the town. There were more than local conditions, however, to which adequate consideration should be given in the design of the successful street lighting installation. Important factors such as light distribution and intensity entered into the question, these, in turn, depending upon mounting heights, spacing, candle power of lamps and the efficiency of the equipment. But these were technical considerations for the chief electrical engineer. At seaside resorts, and inland places possessing attractions, great care should be taken to ensure that the lighting be attractive and in harmony with the local conditions. Parade and pier lighting at seaside resorts, and the special lighting of certain features, required painstaking attention, as upon this depended to a large extent the popularity and, therefore, the prosperity of the resort.

The question of the utilisation of profits had been argued on many occasions. Some contended that as this was the surplus of a trading undertaking it belonged to the ratepayers, and in the event of profits being made the surplus should be used for the relief of local rates. This theory, however,

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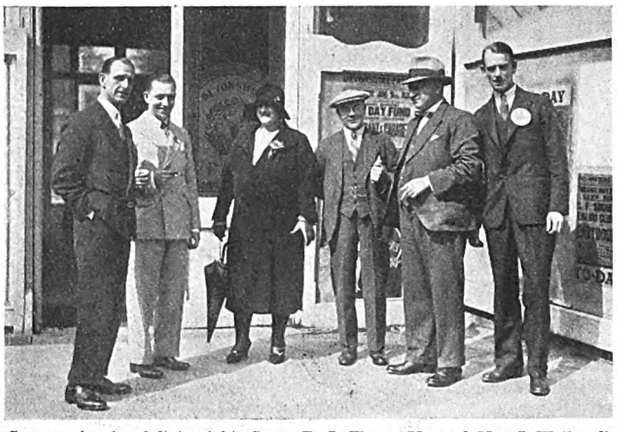
was economically wrong. The committeee were responsible for the development of the supply in their area, and any surplus should be set aside for this development work and building up adequate reserve, and not before every householder was provided with an electrical supply cheap enough for its use for power as well as lighting should the surplus be allocated for the relief of rates. If annual profits be used for rates relief consumers would never be able to have a cheap supply, growth would be hindered, and the goodwill of the



Group : showing left to right, Coun. E. J. Thorn, Mr. and Mrs. J. Wetherell, Coun. J. Hillier, and Messrs. D. Thomas and R. Cox.

undertaking would suffer. A trading undertaking of a corporation occupied a special position, and financial control should play just as important a part as in any other commercial undertaking. However successful an undertaking may be in producing an electricity supply at the lowest possible rates, their efforts could be easily nullified by careless finance. It was a first essential, therefore, that the committee should be fully alive to their responsibility in this matter and carefully consider the effect upon the earnings of the concern of all schemes of extensions and other items of capital expenditure submitted to them by their engineer and manager. An ordinary commercial business had, of course, outside competition to contend with, and in order to compete successfully must keep its organisation efficient and up-to-date, but a monopoly undertaking had not that incentive, and special care should be taken to prevent it slipping into a "good enough" policy. Reports on all important questions should therefore be submitted periodically and very carefully considered. As a rule municipal undertakings could be financed more economically than other concerns, but nevertheless care should be exercised in the method of borrowing, and loans placed with due regard to the effect on the price per unit.

Depreciation, too, was an important factor. In theory the provision for repayment of borrowed capital should be sufficient reserve for depreciation, but in an electrical undertaking it had been found by experience that obsolescence and breakdown risks rendered it imperative to provide a reserve fund of sufficient strength to meet these unforeseen contingencies. It was advisable, however, to scrutinise these requirements carefully, as too large a suspension of profits both on reserve and as working capital was undesirable for obvious reasons.

The high rate of income tax now prevailing raised the important question as to the advisability of earning profits in any undertaking. Prior to the Electricity (Supply) Act, 1926, it did not matter to any large extent because there was a right of set off against the general rate fund liability after allowance for tax retained by deduction from loan interest paid by the undertaking. Up to March 31 last, however, the Inland Revenue Authorities contended that the set off was limited to 1½ per cent. of the outstanding debt. In Eastbourne this had the effect of reducing the set off figures from £22 000 to £4 200, or a cash loss to the town of £3 560. After this date this set off would be lost unless the reserve fund amounted to one-twentieth of the aggregate capital expenditure. This being so, it seemed folly to earn large profits for the sake of paying income tax rather than to give as much benefit to consumers by a reduction in the price per unit.

In conclusion, Alderman Chatfield said there was a definite obligation on the part of electricity committees, individually and collectively, to support all those various associations which are so closely associated with electrical development. The author was aware that this particular matter was dealt with last year in the presidential address of the immediate past president, but he felt that it would not be out of place in a paper written by a chairman of committee for the information of electricity committee members generally, to make a reference to the matter again.

The author pointed out that for a number of years, and more particularly since the war, it had become necessary to consider many of the problems arising in municipal electricity supply from a national rather than from a purely local aspect. It was no longer possible to consider that the functions of a municipal electricity committee could be regarded solely from their local bearing. National legislation and co-operation in development, to mention only two factors, had led undertakings throughout the country to act in combination with others, and the view sometimes expressed in the past that an electricity committee could satisfactorily conduct its own business without relation to or interference from any outside body could now seldom be held. The association which perhaps more than any other should have the fullest support of municipal electricity supply undertakings, and of which it was surely incumbent upon every undertaking to become a member, was the British Electrical Development Association. There are also the British Standards Association and the British Electrical and Allied Industries Research Association, whose work, if not directly, did certainly indirectly, benefit municipal electricity supply undertakings by the standardising of materials and products and the improvement of design and quality. No doubt the great majority of electricity committees had already realised their obligations in this respect, but there were many who apparently had not yet done so.

Discussion.

The discussion of Alderman Chatfield's paper was opened by Alderman H. B. Vorley, J.P., chairman of the Islington Electricity Committee, who remarked that certain chairmen, including himself, were thought to enjoy the freehold of the job. Other committees made a practice of changing the chairman every two or three years. He believed that a chairman required some years of training before he became efficient. Having secured a chairman—it was not always easy to get a suitable man—the next thing was that the chairman himself should study every member that came on to the committee and find out his capacities. It must also be remembered that the vice-chairman was usually in the succession, so that it was very important that when a vice-chairman was chosen, an eye should be given to the future.

Having had considerable difficulty in getting sub-stations in the congested area in Islington, he had looked into the matter of compulsory powers of acquisition of sites by local authorities under the Act of 1929. The remedy was worse than the disease. When one wanted to obtain land for a sub-station in his district, it paid to give double the market price

Left to right: Mr. Mrs. and Miss McLean, Mrs. and Coun. Bolland, Mrs. and Mr. Jarvis.

rather than indulge in the procedure of compulsory arbitration. Apart from price, it might take twelve months or longer to attain one's object. Some alteration in the law was required to enable sub-stations to be opened in a much shorter time than at present.

It was no doubt the ideal state of affairs for an electricity committee to be able to ignore the finance committee and go direct to the Council, but he doubted if that would come in our time. It was not always recognised, however, that the

(*Continued on page 674*).

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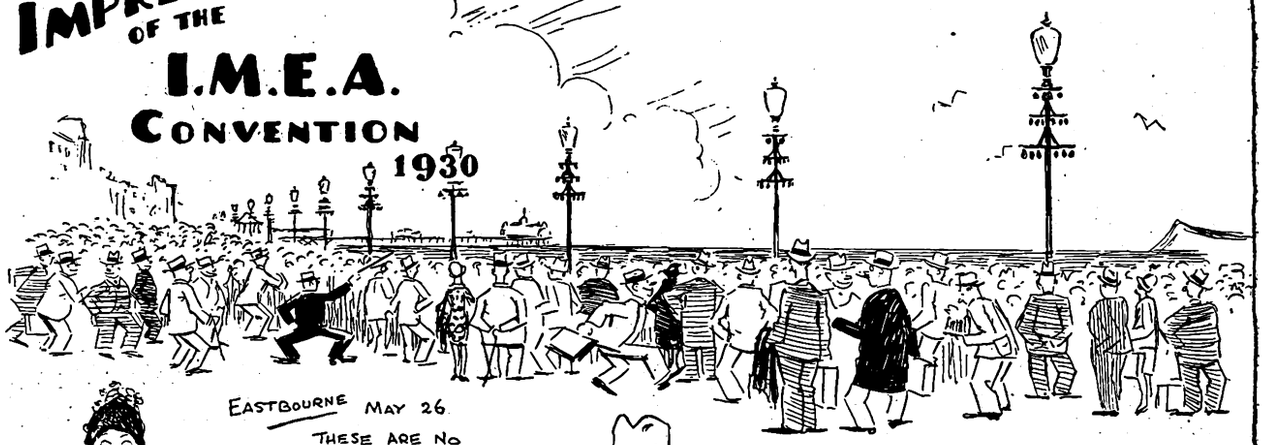
IMPRESSIONS OF THE I.M.E.A. CONVENTION 1930



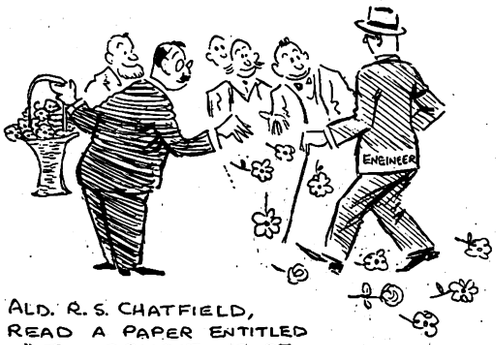
EASTBOURNE MAY 26

THESE ARE NO ORDINARY VISITORS — BUT I.M.E.A. DELEGATES.

THIS OLD LADY SAW THE LARGE NUMBER OF ARRIVALS AND SAID — "OF COURSE IT TAKES MORE WITH ALL THE RADIO SETS GOING ON THE MAINS"

PRESIDENT J. K. BRYDGES, RESPONSIBLE FOR THE PARADE LIGHTING SHOWN IN FIRST PICTURE.

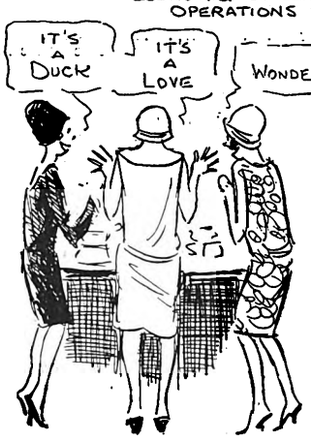
WAS THIS YOUNG MAN A B.B.C OFFICIAL LOOKING OUT FOR INTERESTING TALKS?



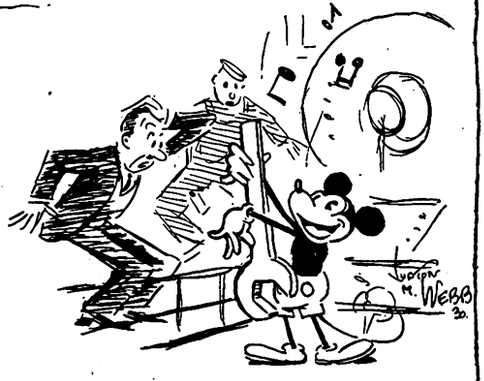
ALD. R. S. CHATFIELD, READ A PAPER ENTITLED "THE OBLIGATIONS OF ELECTRICITY COMMITTEES" — THEY MIGHT DO THIS!

MR. G. H. LAKE'S SUBJECT WAS "PULVERISED FUEL FIRING IN RELATION TO ECONOMIC BOILER OPERATIONS"

— MR. J. W. BURR'S, "ELECTRICAL HEATING OF BUILDINGS".



LADIES DAY AT THE EXHIBITION GAVE THE LADIES **THE LAST WORDS** IN APPLIANCES.



ONE PROBLEM THAT DIDN'T COME UP AT THE CONVENTION — THERE INSIDE HIS ENGINE WAS MICKY MICKY MOUSE.

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finance committee was not the final court of appeal; the finance committee's control should be limited solely to the financial side of the problem.

Alderman A. E. Gough, chairman Cardiff Electricity Committee, said that it was a very dangerous thing to have too many experts, particularly lay experts, on a committee. (Hear, hear!) It was even more dangerous to attempt to train laymen to be able to discuss technical questions. For a long time they were able to persuade electricity committees in Cardiff that extension of supply and a better tariff were not merely things that should be provided in justice to the poorer consumers, but a real commercial proposition. In practice, they had found that if there was a solitary consumer at the end of a street it was worth while to give a supply, because later they would have a whole street of consumers who would come on to the mains as a result of the example set by the one first connected. All profits should be allocated to extend supply and reduce tariffs. It was not advisable to go too fast in the matter of reducing tariffs, as it did a lot of harm if it was subsequently found necessary to raise them again. It was better to fix on a fairly reasonable tariff that could be maintained for a number of years. He did not agree that finance committees should exercise the amount of supervision over electricity committees that they did at present.

In the matter of research and other associations to which committees were asked to contribute, he suggested that these bodies should engage in more propaganda explanatory of their activities, so that committee men would be better informed as to the objects for which they were being asked to vote funds.

Alderman W. Walker said that twenty years ago the great bulk of opinion was in favour of that dishonest proceeding—the taking of profits in relief of rates. There ought to be no profits in the case of an electricity undertaking. The appearance of a profit in a balance sheet simply meant that there was a sum of money at disposal for reducing tariffs during the coming year. He suggested that the form of agenda provided for many committees could be usefully improved. In Manchester, it was the practice for every member to receive by post a day or two before the meeting a set of papers giving full particulars of all the matters which would come before the committee. This system gave committee men a real opportunity of learning what was to be discussed, and also of keeping some record of the work of the department.

In the case of supply to a small group of houses erected a mile or two outside the area, to which normal building development had extended, he thought it was fair to ask them to contribute towards the cost of connecting them.

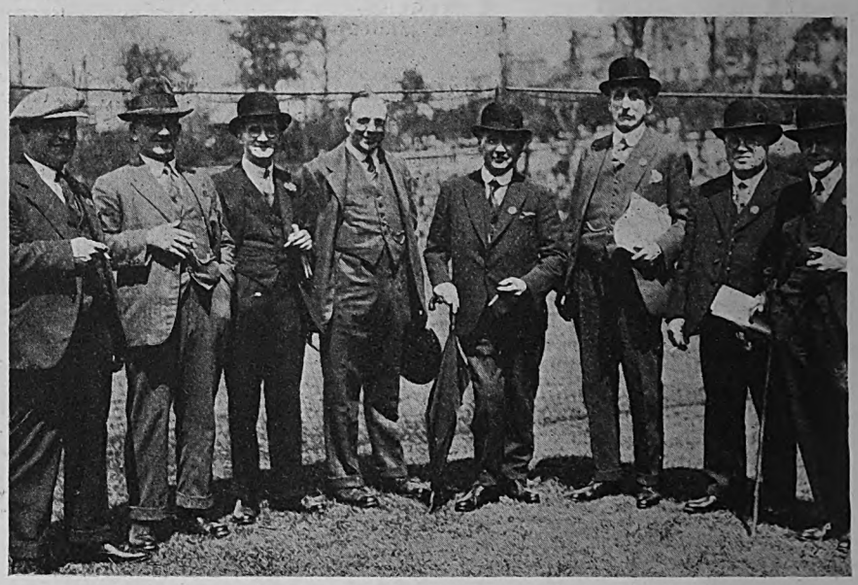
Referring to a statement made by Alderman Gough, Alderman Walker pointed out that since March 31 of this year there had been an alteration in the powers of Councils to take part of the profits, and that the $1\frac{1}{2}$% could only be taken if a reserve of one-twentieth of the capital expenditure existed.

It was a matter of great importance that electricity committees should secure the confidence of the Councils as a whole. Where this confidence existed, committees found it much easier to get what they wanted without friction.

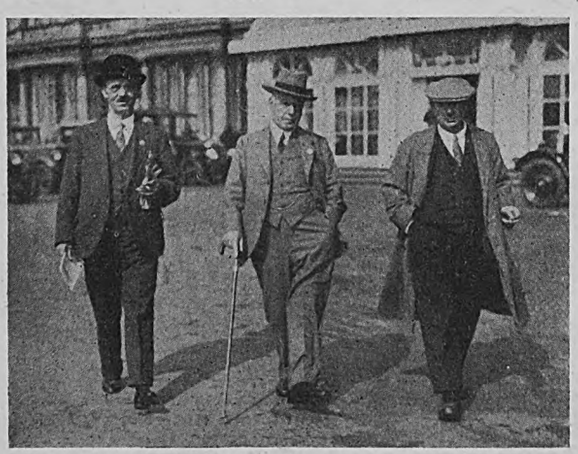
In the matter of standardisation of appliances he said that no two manufacturers had produced a single appliance with one part interchangeable. As a result of the demand, a standard form of appliance had now been devised. The I.M.E.A. had had to take a strong line on this point.

(*Continued on next page*).

The President arriving at Devonshire Park.



Messrs. H. Adam, J. H. Blackwell, J. Edgar, C. V. Weddenburn, Councillors F. Wood, G. H. Linney and others pose for "The Electrician" photographer.



Coun. Beven, Mr. J. W. Burr and Ald. M. E. Rees taking the air.

A happy group including Coun. E. Walker, Mrs. Peattie, Ald. W. Walker, Coun. J. Couston, and Mr. E. Seddon.

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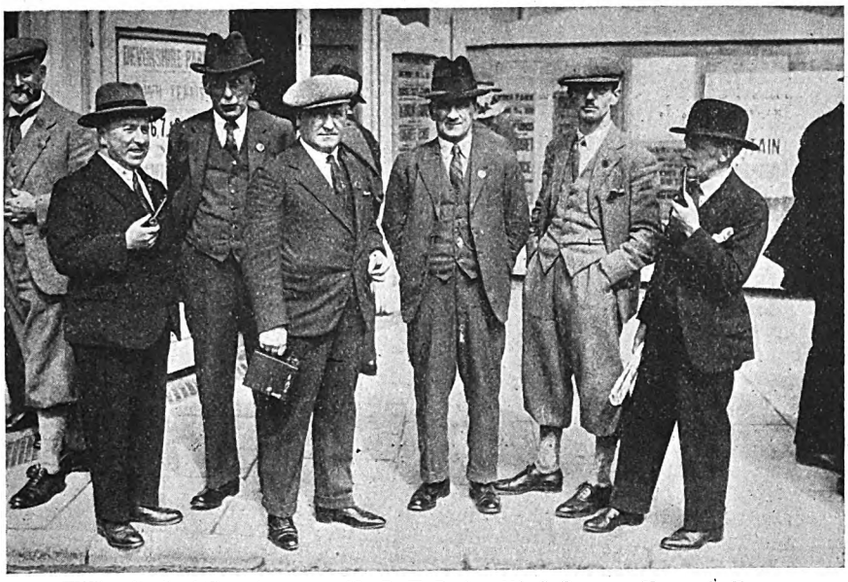
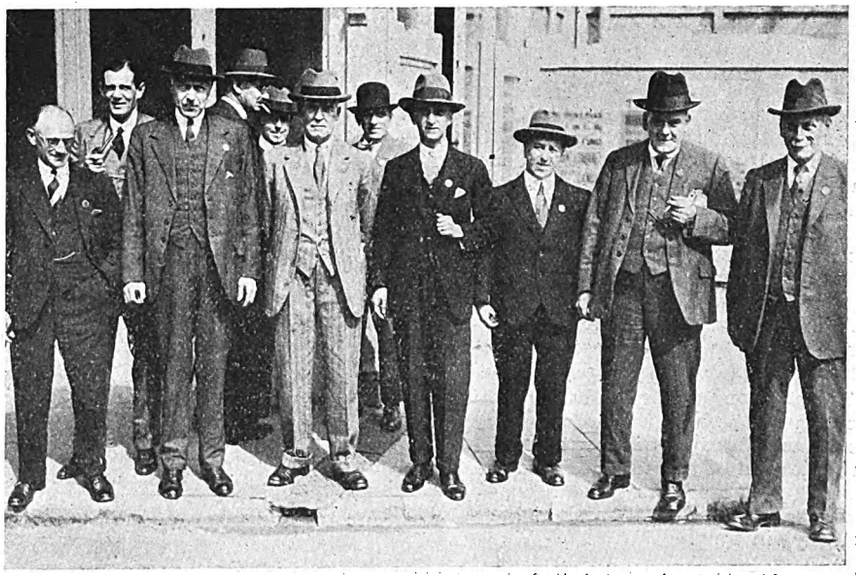


Waiting for the balloon to go up. Mr. D. H. Davies, Ald. C. Bowman, Messrs. A. Henry, J. H. Blackwell and J. S. Forster.

A gasfilled "lamp" without a filament.

Ald. W. Walker and Mrs. Peattie.



Another group, including: Coun. G. W. Parry, Messrs. R. Willis, J. A. T. Barnes, F. Swarbrick, D. H. Davies and Ald. H. Varley.

Alderman E. Huntsman, chairman of the Nottingham Electricity Committee and president of the British Electrical Development Association, deprecated taking too exclusive an electrical view of the relationship between electricity and finance committees. In dealing with problems of finance as affecting electricity, they ought to remember that the electrical department was part of a still larger body. There were cases in which it was almost treason to electrical development to take anything from the electricity undertaking, but there were occasions when it might be the duty of the undertaking to contribute something to the general trade of the city.

Recently there had been some disposition on the part of local authorities to look with suspicion at the activities of outside bodies like the Central Electricity Board and the Electricity Commissioners. He was able to deal with the situation as it existed at present, but it was necessary to educate councils as to the new state of affairs.

Inspections of foreign installations ought not to be limited to technical men only. If he had his way, he would make it incumbent on every chairman and vice-chairman, with their engineer, to spend a fortnight every year in visiting those centres in Europe where electricity had been most profitably developed. The first thing for anyone going on to an electricity committee was to take a large view and not look at matters from a narrow local standpoint.

Mr. W. C. P. Tapper, Stepney, said that with an increasing number of undertakings taking their supplies from the grid instead of continuing to generate themselves, it would become necessary for committees to concentrate their activities on the selling side. E.D.A. assisted every committee very effectively in selling electricity. Many committee men still did not realise this fact. Members of the I.M.E.A. who had not yet joined E.D.A., or who were not paying the full scale of contribution, ought to do so. We were sadly missing the late Dr. Ferranti in the matter of tariffs. He had set up a committee on tariffs shortly after becoming president of E.D.A., but since his death the work had flagged to some extent. It must be pushed forward. Much more might be done in the operation of assisted wiring schemes than was actually being done. Under the assisted wiring scheme in force in Stepney 3 500 consumers had been connected, representing 13 000 points.

Councillor H. Coates, chairman of the Watford Electricity Committee, said that large consumers' tariffs were best left entirely to the engineer. In Lancashire an excellent consumer had been lost because the committee could not appreciate the reasons for the special tariff proposed.

Alderman Chatfield, replying to the discussion, said that he felt it was a sound thing for members of committees to practice what they preached in the matter of using electricity as freely as possible. He himself was an engine driver—he mentioned the fact as an indication of the size of his income—but he had built a small house without chimneys, and his experience proved that it was a practical proposition for people of small means.

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ECONOMICS OF PULVERISED FUEL FIRING.

Influence on Cost of Steam Generation—Saving of Floor Space—Control Instruments—Feed Water Treatment—Disadvantages and Advantages of Pulverised Fuel.

By G. H. LAKE, A.M.I.E.E.

ON Wednesday morning Mr. G. H. Lake, A.M.I.E.E., Borough Electrical Engineer, Derby, provided the Convention with a very well documented examination of the economics of pulverised fuel firing, based largely on his own experience at Derby. The circulated copies of his paper, which was entitled "Pulverised Fuel Firing as Affecting Economic Boiler House Operation," contained a large amount of tabular matter illustrated with numerous graphs and diagrams.

Mr. G. H. Lake.

Mr. Lake's paper began by recalling that thirty years ago boiler capacities were necessarily small, so that large batteries of small boilers were involved, with all the attendant troubles occasioned by multiplicity. The boiler was then certainly the weakest link in the process of converting the heat value of the raw material into electricity. In 1905 there was a general move towards adoption of water tube boilers; capacities, pressures and temperatures commenced to increase with their corresponding decreases in the cost of steam generation. For some considerable period thereafter boilers of 20/25 000 lb. per hour capacity were considered as large as could be justified on either technical or economic grounds. The war and immediate post-war periods saw a gradual increase in size, yet in 1922 the author installed an extension to the boiler plant at Derby comprising six water tube boilers each having a capacity of 25 000 lb. per hour, indicating the nature of the rut into which the principles of steam generation had become stagnated. For an engineer about to purchase new equipment for his station there were to-day two alternatives—viz., stoker-fired plant or pulverised fuel equipment.

The average pressure and temperature obtaining until quite recent years was of the order of 250 lb./sq. in. with a final steam temperature of about 650° F. In the table below an indication of the advance made in this direction is clearly shown. These figures have been abstracted from a paper read by Mr. George A. Orrock at the World Power Conference at Tokyo in 1929.

INCREASE IN PRESSURE AND TEMPERATURE AND GAIN IN THERMAL EFFICIENCY.

Year.	Name.	Pressure lb. Abs.	Temp. Deg. F.	Thermal Efficiency, carnot.	Act. B.Th.U. per kWh	Overall Thermal Efficiency, per cent.
1770	Newcomen	15	212	2·7	416 000	0·82
1810	Watt	30	300	9·17	61 000	5·60
1900	Wildwood	215	400	20·8	19 200	17·75
1922	Modern	265	650	35·00	18 000	19·00
1928	Loeffler	1 700	932	61·2	11 500	29·7*
1928	Benson	2 500	1 000	63·0	10 950	31·2*

* Estimated from H.P. to vac. regenerative cycle.

Reference was made to the choice of a pressure of 800 lb./sq. in., with a final steam temperature of 846° for the Billingham plant of Synthetic Ammonia and Nitrates, Ltd., as a clear indication that the technical and commercial claims made for higher temperatures and pressures had justification. In America and other overseas countries still higher pressures and temperatures had been employed. It would be incorrect to suggest that simply to be modern one should go in for these high pressures and temperatures; there were many cases where on financial grounds alone, they could not be justified. As a rule the deciding factor was the question of capital cost, and with present construction, materials and methods, there was usually a certain pressure and temperature for any given boiler capacity that would secure the most economical results. A very important influence on the cost of steam generation was the number of boilers required to generate a given quantity of steam for equal reliability, the heating surface required for this duty and the floor space occupied.

The table below compares these factors for the conditions obtaining at Derby about 1922 and those relating to the extensions during the period 1926–1930.

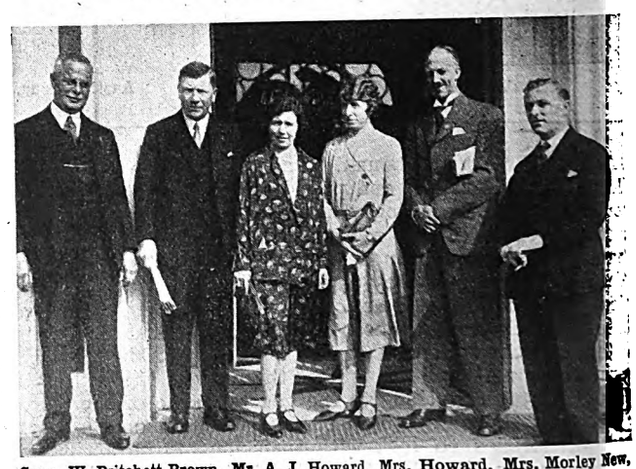
COMPARISON OF CAPACITIES, HEATING SURFACE AND FLOOR AREAS (DERBY POWER STATION).

	Lancashire Boilers. (1900).	Water Tube Boilers		Steam Generator 1930.
		Stoker Fired (1922).	P.F. Fired (1927–28.	
No. of boilers	6	6	3	2
Average capacity per boiler, lb./hr.	5 000	25 000	60/80 000	60/80 000
Total capacity, lb./hr. ..	30 000	150 000	240 000	160 000
Total heating surface, sq. ft.	—	43 690	51 470	15 880
Heating surface per 1 000 lb./hr.	—	290	214	99
Floor space, sq. ft.	2 820	7 350	8 560	
Floor space per 1 000 lb./hr.	94	49	21	

While furnace volumes had been largely responsible for the reduction in floor space, the increase in evaporation per sq. ft. of heating surface had also assisted. This increase was apparent from the practice now generally in force whereby boilers are rated at a normal capacity which corresponds to their most efficient load, a maximum continuous rating up to 25–30 per cent. above the normal rating, and finally, a peak rating generally some 50 per cent. above normal rating, at which the boiler will supply a sudden demand for a short period.

With the modern boiler, one of the primary influences on the possibility of increased rates of evaporation was the induced and forced draught fan capacities. If these were sufficiently liberal, the boiler evaporation could be pushed to unexpected rates, particularly in the case of powdered fuel installations.

Advances in design associated with control and recording instruments have had their influence on the increased efficiency now generally obtaining. This result could be ascribed to continuous research. In spite of the generally recognised and accepted benefits resulting from the careful control of the electrical side of every undertaking, many plants had still to instal modern control and recording instruments for the steam side. It was difficult to defend this position for even if such equipment and control was comparatively expensive in first cost, the savings effected would in a very short space of time more than cover the expenditure involved. The only way to attain maximum efficiency in coal consumption was to have



Coun. W. Pritchett Brown, Mr. A. J. Howard, Mrs. Howard, Mrs. Morley New, Mr. C. G. Morley New, and on the right, Mr. Penwill of the E.C.A.

the means of following the load demand as closely as possible. The more closely this was followed by the boiler plant, the higher would be the average operating efficiency over a period. Again, the installation of the proper control instruments enabled a continuous record to be maintained of the conditions obtaining throughout the day, from week to week, and from year to year. Thus the engineer was able at any time to note how the station was operating, and from past experience and facility in reading the records to be in a position to alter any undesirable feature in the method of operation for the given conditions.

(*Continued on page* 678.)

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THE OFFICIAL PHOTOGRAPH OF THE I.M.E.A. CONVENTION, 1930.

[Photo. by J. Weston & Son, Eastbourne.]

THE delegates and friends attending this year's I.M.E.A. Convention made so large a group that in order to reproduce this photograph it has been necessary to make three strips, the top showing the left-hand flank, the centre the middle of the group, and at the bottom the right flank.

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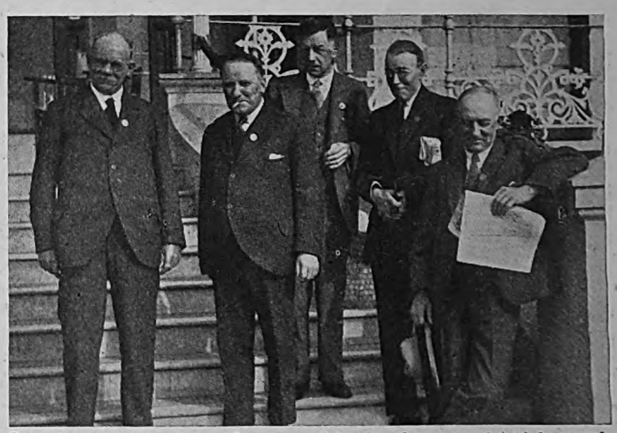
MORE I.M.E.A. SNAPSHOTS.

Another "Electrician" group, including: Mr. R. W. Grubb, the Mayor and Mayoress of Dewsbury, Mrs. H. Shaw, Mrs. J. W. Schofield, Mrs. Grubb, Miss N. Greenwood and Miss Schofield.

Waiting for the fun to begin, meanwhile enjoying the sunshine.

Left to right: Messrs. D. W. A. Roberts, H. G. W. Haslett, L. L. Robinson, Ald. W. J. Stapleton and Coun. G. Green.



Our cameraman musters a few more delegates for our pictorial record of the Convention.

Definitely associated with the developments previously referred to was the all important question of boiler feed water and its treatment. Owing to the increased capacity of the plant, the increased velocity of the water in the tubes, the necessity for keeping the boiler on the line for maximum periods, a continuous study had been made of the factors tending to reduce troubles to a minimum. Attention had naturally been focussed on the problems of providing suitable feed water for the modern boiler.

Feed water heating and steam bleeding from the turbine are established practices, and the extended use of these methods had brought about continuous advance in design. These features were recognised by all engineers responsible for generating steam efficiency, economically and with a minimum amount of trouble, and in nearly all modern boiler plants evaporated water was used for the boiler feed. With the high and positive circulation resulting from the more recent design of boilers continuous operating periods of nine months and even longer without shut-down were not only possible, but would in time become the rule.

In the early days of pulverised fuel development (only some five or six years ago) the greatest difficulties were experienced as a result of the restricted volume of the combustion chamber. In consequence of research and numerous experiments, increased attention was focussed on boiler settings. The coincident application of preheated air at once brought about trouble owing to increased furnace temperatures, irrespective of the type of plant installed.

Coming to the furnace itself, there was the question of the high maintenance of furnace walls experienced in the past, and the by no means negligible slagging troubles. Water cooling of the walls and the ash had very much reduced the incidence of this factor. The paper gave a brief description of the latest plant now in operation at Derby and other places and pointed out that we had now reached the stage when the terms "boiler" and "furnace" were practically synonymous, and the high pressure heating surface was reduced to a minimum. If the definition of a boiler as a heat reclaiming unit was borne in mind, it would be apparent that there was still a large amount of heat reclamation to be performed after the gases had left the interior of the boiler proper. It was here that the steaming economiser and air preheater played their parts. If the temperature of the leaving gases was sufficiently high, the normal economiser became a low temperature boiler, final heat extraction from the gases being performed by the air heater and returned to the furnace proper as preheated air. This heating surface was the cheapest part of the heat reclaiming unit, being subject to no steam or water pressure of any description. The most economical use had been made of the heat extracting material in the boiler, since only the most efficient portion was subject to full steam pressure and temperature. The importance of the advances made in boiler design from this development was apparent when comparing this with the settings now becoming general for stoker fired plant. In effect, the stoker designer was following in the steps of the pulverised fuel engineer.

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Additional to the features associated with pulverised fuel were the many developments in other forms of combustion equipment. Mechanical stokers and the various furnace constructions common to this form of equipment had advanced rapidly in recent years to meet the increasingly severe conditions brought about by the phenomenal rise in the size of boilers, the inevitable demand for higher combustion ratings, the tightening up of smoke regulations and the gradual rise in the temperature of the air for combustion. The travelling grate stoker in particular had been developed to combat challenges from other styles of equipment, and retained at present its position as the most widely used apparatus for water-tube land boiler firing in Europe. A few installations of retort type stokers had been made in this country recently, but it had still to be demonstrated that this type of apparatus was capable of dealing with the many grades of fuel burned on travelling grates.

A Majority Vote.

Replies from many of the foremost municipal and industrial engineers to an extensively circulated questionnaire (these are given in the form of a table and appendix to the paper) were in the majority of cases favourable to the adoption of pulverised fuel firing; the capacity of plants operated with this system represented a large volume. Every one of the replies received showed a full appreciation of the difficulties involved in the pioneering effort which had been restricted to a period, as far as these records went, of little more than five years.

On most of the early pulverised fuel installations a number of disadvantageous features were experienced, such as :

1. Preparation costs associated with the drying and pulverising of the fuel.
2. The difficulty of storage connected with central or bin and feeder systems.
3. Feeder and burner problems associated with correct combustion conditions.
4. Heavy furnace maintenance was experienced on many plants.
5. Slagging troubles associated with coals having a low fusing ash temperature.
6. Bird-nesting of boiler tubes.
7. The air vent nuisance or leakage of coal dust either internally or externally.
8. The dispoal of the ash which still remains without a market.
9. The emission of dust from the boiler stacks.
10. The human element which is generally averse to doing anything different from what his predecessors have been doing for countless years before him.

All these features had been experienced at some time or another in a greater or less form, and the experience of the pioneer had often been very unhappy, particularly when faced with the necessity of maintaining the public supply with the threat of an injunction hanging over his head for creating conditions which at times were admittedly not in the public interest.

Refinements and developments produced in the past two or three years enabled the engineer responsible for the design of a new station to instal this apparatus without the possibility of any one of these previously undesirable features being present.

Present Advantages.

Advantages which appeared to have become general in all operating experience to date are :—

1. The removal from the combustion zone of all moving parts which is a logical and progressive development.
2. Increased operating periods without interruption.
3. The unquestionable flexibility of the plant which enables the load demand to be followed accurately.
4. Greatly decreased coal costs per unit of electricity generated.
5. Effective control of combustion conditions irrespective of load on the unit or grade of coal being consumed.
6. Reduction in overall maintenance of the plant.
7. Higher daily and annual operating efficiencies.
8. The increase in evaporative ratings.
9. The reductions in the space occupied yielding valuable savings in capital costs.
10. The rapidity of raising steam to meet a sudden demand.
11. A definite advance on the labour conditions associated with operation.
12. The elimination of all banking losses.

During the whole of the period in which the pulverised fuel plant had been in service at Derby all records of costs had been most carefully followed and a number of interesting figures had been published from time to time. Taking the amount of coal pulverised and burned each year the maintenance costs on the pulverising plant, conveying plant, feeding and burning equipment, boiler and furnace maintenance, had resulted as follows :—

	Coal Pulverised.	Maintenance, including Labour.
1926/1927	25 000 tons	8·02d. per ton
1927/1928	24 800 ,,	9·20d. ,, ,,
1928/1929	30 077 ,,	7·65d. ,, ,,
1929/1930	30 844 ,,	7·04d. ,, ,,

This gives an average over the whole period of 7·97d. per ton.

Similarly with operation, and quoting from records over an extended period, it was found that these averaged out as follows :—

LABOUR.	
Preparation of coal from receiving hopper to pulveriser, pulverising and conveying to pulverised fuel bin	6·1d. per ton
To cost of boiler operation	3·6d. ,, ,,
To cost of ash removal and general cleaning	3·08d. ,, ,,
POWER.	
For operating elevators, dryers, pulverisers, conveyors and feeders. An average of 23 units per ton at 0·25d. per unit	5·75d. ,, ,,
	18·53d. ,, ,,
Add for maintenance costs	7·97d.
	26·50d. ,, ,,

Or 2s. 2½d. per ton.

These figures had resulted in a steady reduction in the costs of generation as illustrated by the returns for the past five years :—

Year.	Coal cost per unit sold.
1926	0·19d.
1927	0·45d. (affected by colliery supplies)
1928	0·15d.
1929	0·13d.
1930	0·12d.

The position reached to-day was such as to necessitate more than ordinary consideration being given to the choice of combustion equipment for any new plant, for the reliability factor was now so pronounced as to permit of stating that stability in design, space occupied, and costs per 1 000 lb. of steam were definite factors, not varying as formerly.

Dust Emission and Ash.

The principal problems from the operating point of view had been those connected with dust emission and the final ash. With the gas washing system now in use the early difficulties had been overcome, and once an effective use was found for the final ash deposit (there were a number of experiments for this purpose being conducted) the whole of the original list of disadvantages would have then also have been overcome.

It must be borne in mind that the coal which should be consumed as far as possible was of a type which could not possibly be utilised in any other way. When it was realised that from 83% to 88% of the available heat in this fuel was capable of being converted into potential energy and that large quantities of this fuel were available, pulverised fuel firing was sound and deserving of wider support.

The first year of operation at Derby with pulverised fuel was in the period 1926-27. During that year every power station was affected by the difficulties in the mining industry so that records for operation had not been included for comparison with those established during 1927-8.

During 1928-9 the increased number of units of electricity distributed in comparison with the previous year was 2 011 000, which at an average price of 1·45d. per unit sold gave an increased revenue of £12 149 15s.; the reduction in the annual coal bill as compared with the previous year was £2 326, yielding a grand total of £14 475 15s. This was not only a phenomenal return on the investment represented by the increased capital costs of the plant (£20 000) but an economic factor of such importance as to establish permanently the claims made for this development.

The latest designs of plant showed a very great reduction in floor area for each individual boiler. To emphasise this point, particularly in view of the importance attaching to this question of reduced capital costs, the following table gives

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the results based upon figures or firm quotations received for the establishment of a central station of modern design investigated for three alternatives.

Type of Plant.	No. of Boilers.	Capacity per blr. lb./hr.	Total evapn. lb./hr.	Total Coat of Plant £	Cost per lb. of steam per hr. £
Stoker fired	10	100 000	1 000 000	301 500	0·3015
Pulverised fuel fired ..	6	175 000	1 050 000	300 000	0·2850
Pulverised fuel fired ..	6	166 000	996 000	285 000	0·2850

These costs were based on boilers of the size considered most suitable for the type of firing involved and covered all necessary equipment from raw coal bunkers to ash sump but excluded

Mr. and Mrs. D. Blackshaw, and Mr. and Mrs. Hudson, on their way to one of the meetings.

the civil work. Hence prices were strictly comparable with the exception that no allowance had been made on account of the smaller space which the modern pulverised fuel fired boiler occupied.

The only other factor requiring consideration was that of coal costs. There existed a great diversity of opinion, but from investigations into available supplies, costs of transport and location of plant, the balance in favour of establishing pulverised fuel equipment in all large power stations appeared to be economically as well as scientifically sound.

The establishment of the largest individual boilers in the world, at the East River station, right in the centre of New York, was not without some bearing upon the economic factors associated with the pulverised fuel development. When considering the East River plant extensions, tenders were called for designs incorporating the largest boilers which could be arranged in the limited space available. In operation these boilers had produced the almost incredible figure of 1 250 000 lb. of steam per hour. Such facts clearly left very little argument available to dispute the fact that the development of pulverised fuel was of economic importance and ensured, even though the capital cost might be, in special cases, slightly higher, a most valuable source of revenue leading to reduced generating costs, in the author's opinion, irrespective of the location of the plant. It would in any event be conceded that there was no other form of combustion equipment which had permitted such rapid development, or which could have been considered for operating boilers of such gigantic capacities.

In summarising the balance which supported the case for pulverised fuel, it was proposed at once to capitalise the whole of the boiler house operating progress witnessed during the past three years. There had, unquestionably, been an all-round increase of efficiency on the part of pulverised fuel; this was inherent on account of the nearer approach to the theoretical or scientific conditions of combustion. On other forms of combustion equipment, the improvements effected, through the challenge previously referred to, had been brought about by the creative genius of the large body of engineers, many of them present at this conference, and the combined results appeared to indicate that the average all round increase in boiler house efficiency in municipal practice during the past three years was as much as 10 per cent. As the movement was not entirely confined to electrical power stations but had spread into many of our large industries, it became difficult to assess the value of the savings in costs of operation in terms of money. Even on conservative estimates the figure was colossal, and might be assessed as representing a total for the past three years of £1 000 000. When consideration was given to the reduction in tariffs which had been made to the consumer as a result of this progress, how the lower charges had attracted additional business represented by the continuous increase in the output from almost every electricity undertaking, and the improvement which was being effected in the social conditions of all modern households, then the full economic force or aspect of the latest boiler house developments became more clearly displayed. The author claimed that the whole of this improvement in boiler house practice was the result of the greater efficiencies associated with pulverised fuel firing or by the challenge which its introduction into boiler house operation had brought about.

A final balance would appear to show one or two reasons on the debit side such as :—

(1) Certain grades of very hard coal entail high maintenance costs on the preparation plant.
(2) Dust emission from the stacks is still held by many to remain incurable.
(3) Fuel transport costs, particularly fuel of a low grade character, are often held to rule out the possibilities of their utilisation.
(4) Generally accepted standard boiler designs do not permit of full advantage being obtained from pulverised fuel firing.
(5) The design of the equipment is held by many to be in its early stages of development.

On the credit side and in addition to the boldness of the claim already made for this development, were the following merits of the system which appeared to emerge naturally from a consideration of the contents of this Paper and from the extended experience with this apparatus on the Derby plant :—

(1) From the technical point of view the modern plant is unassailable.
(2) The introduction of water cooling has enabled the designer to take the fullest advantage of the new method of combustion which has led to new and revolutionary practice in steam generation.
(3) From the results of the pioneering experience carried out, it can be claimed that it is now possible to design and construct a boiler plant for any new capital station which takes full advantage of pulverised fuel, where the capital costs will be very much lower than with any other form of equipment.
(4) Pulverised fuel equipment has completely emerged from its experimental stages. Thus the importance of all the factors involved are thoroughly appreciated and the means for rational solution along well defined lined are now available.

After allowing for past troubles which, as the result of experience, would not recur, the results seemed entirely to justify this modern system of utilising potential energy of coal both on scientific and economic grounds. The direct result of its application and development indicated that the design of future plants might closely define the following :—

(a) Increased capacities of boilers.
(b) Smaller and cheaper buildings.
(c) Partial de-sulphurising of gases and dust elimination as a continuous process.
(d) Continuous operating efficiencies of 86 per cent.
(e) Utilisation of fuels of a cheap character which will keep costs of generation uniformly low.
(f) Remote, automatic and complete control under all conditions of load.

In this manner boiler house operation would completely evolve to a highly efficient process, and although the claims made might appear unreasonable to many of the present generation, it could safely be predicted that posterity would not be unreasonable in recording its appreciation of the efforts, which the past few years had witnessed, in the all round improvement made in boiler house operation and the valuable conservation of the national wealth by the increased efficiency now being secured from the basic raw product, coal.

Discussion.

The President said that Mr. Lake had presented a most interesting paper giving very useful data in regard to the latest applications of powdered fuel which would no doubt be the method employed for raising steam in the large power stations of the future, although some might endeavour to dispute it.

Mr. P. J. Robinson (Liverpool) said that Mr. Lake's paper was of absorbing interest to all engaged in the generation of electricity in this country. He did not agree with everything contained in it. He would like to suggest that we should adopt a mixture of stoker firing and pulverised fuel firing, because in other places we were dealing with fuel on a much larger scale than at Derby. One unquestionable advantage of pulverised fuel was that it permitted the benefit of a cheap fuel market to

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be reaped. Experience at Liverpool was that pulverised fuel was only cheap because there was no large demand, and directly a demand was created the price rose heavily.

It would be interesting to know whether the author was able to assess continuity and reliability of supply as an economic factor.

In Liverpool, as long ago as 1923, a number of experiments were carried out with stoker fired boilers by increasing the size of the combustion chamber, and eight boilers were bodily lifted for the purpose, eventually reaching 14½ cu. ft. per sq. ft. of grate area. Very little difference in efficiency was noted between stoker and pulverised fuel firing. In the new station being constructed at Liverpool, which would be 100% Bailey Block it was expected to obtain equally good results from the stoker fired boilers. Pulverised fuel had been imposed on these boilers in order to obtain more control of the fuel market.

Mr. Robinson wholly disagreed that the use of fine sprays for dealing with the grit and sulphurous fumes was the right way of tackling the problem. With a fine spray and a draught a small proportion of the sulphurous fumes were carried up the chimney and the advantage of spreading the fumes over a larger area was lost, a noxious mixture being brought down close to the station. In Liverpool they had devised a scheme which it was hoped would overcome the trouble. Three independent consulting chemists had told them that their method was right and it did not include the use of a spray. One of the problems which came up was the building of chimneys. In up-to-date plants it was almost essential that the chimneys should be superimposed on the boilers. They were putting in chimneys of chrome steel. It sounded very expensive, but if the chimney was properly designed he thought that a very efficient apparatus could be made at a cost of approximately 6s. 8d. to 6s. 9d. per kW.

A Bird-Nesting Experiment.

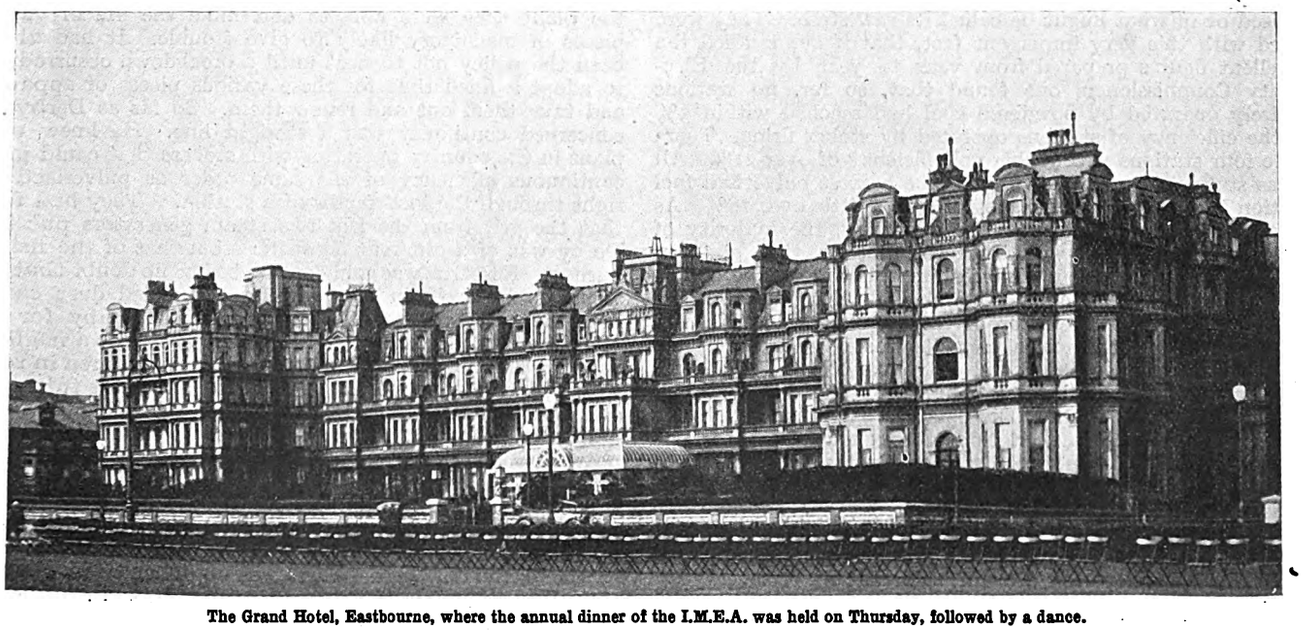
Mr. W. M. Selvey said that many of Mr. Lake's colleagues were perhaps too close to the problem to get a proper perspective which would allow them to appreciate how much he had done on the line of development which was summarised in his paper. It fell to his (Mr. Selvey's) lot to carry out a 100 hours' continuous load test on the first of these boilers. Certainly, during the course of that trial they got quite a lot of that stuff which Mr. Lake said looked like coal but looked to the speaker like anything but coal. The earlier type had an air-cooled refractory lined combustion chamber. They were getting on fairly well when the stuff in question got through. That new stuff came in when they were using a fuel with a much lower melting point. Rapid birds'-nesting started on the tubes of the boiler. The operators tried to knock it off with poles. They said they would have to put on the stoker fired boilers again. He asked to be allowed to cut off all secondary air for about 20 minutes. As he expected, the temperature at once went up very considerably and all the birds'-nesting stuff was melted off. The man in the basement came up in a great state and said: "My God, sir, they're stalagmites." The lesson was that it was necessary to get away from maintaining the temperature of combustion chambers by means of refractory material. The evolution of the all-metal combustion chamber was first mooted in a crude way by an American engineer who died during the war. The practical development of the method was due to Mr. W. R. Wood, the real inventor, who collected some commercial ability to go with his inventive powers. If our best engineers set their minds on administrative matters they would find that their technical abilities could be used in larger spheres to a very marked extent. Pulverised fuel firing was now well and truly born. When it came to this country it was only in a half-baked state. It fell to English engineers to put a little polish on it. It was not yet completely baked and would not be until the problem of grit and fumes was finally solved. That problem had several aspects to which there was certainly no conclusive answer.

Grit Emission.

Fan corrosion, or erosion, or both, was giving considerable food for thought to engineers. Was there any striking advantage in taking out the dust before it reached the fan for the sake of saving fan erosion? If one did not do that or, alternatively, washed first in order to prevent grit going to the fan at all, were we not likely to run into trouble, corrosion of fan by washing gases? No method would take out the whole 100% and that which was not taken out was very sticky stuff and was inclined to gather in any place where it lost its velocity. The chimney and the ducts leading to it were no longer to be considered as something producing draught, but passages to conduct something to the upper atmosphere, as might be most convenient. Certain cement mixtures properly applied might be quite as efficient and successful as Mr. Robinson's drastic expedient of using chrome steel. The expense of dealing with waste material represented a considerable part of the total costs. When our American friends started this pulverised fuel propaganda they said that they were putting this stuff into the air and nobody seemed to mind. Now a lot of people did seem to mind. Perfectly dry dust was not suitable for removal by the ordinary methods available. Even if a part of it was washed out, the product—slurry—was an entirely new product of power stations and could not be put into the sewer or drain. Mr. Lake was a pioneer in this field also and he had borrowed the methods of those who had to deal with metallic slimes.

Mr. F. Forrest (Birmingham) said that Mr. Lake had presented the facts very fairly and drawn his conclusions very fairly also. With most of his conclusions he concurred. For a very large modern station pulverised fuel firing gave a flexibility which was not possible with stoker firing. Although engineers could go to a lot of expense to reduce coal costs by small decimals of a penny, the gentlemen at the coal exchange could send costs up in spite of all economies in the boiler house.

(*Continued on page* 682.)



The Grand Hotel, Eastbourne, where the annual dinner of the I.M.E.A. was held on Thursday, followed by a dance.

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They had had considerable experience in Birmingham with the bin and feeder type. They did not agree as to its advantages, and were going in for the unit type. In America they had come to the same conclusion. Their reasons were lower maintenance, lower capital charges, and greater flexibility of control. Pulverised fuel was difficult to store. Even the humidity of the atmosphere was sufficient to make it cake, and it did cake. The station of the future would have at most two boilers per turbine and separately water-cooled furnace walls, automatically controlled, and with very high chimneys. American chimneys were between 250 and 300 feet high above ground level. Here we had gone too far in the other direction, and put up too low chimneys. This might have some bearing on the nuisance question. The material emitted fell into a certain area, and if one could spread one's favours over a wider area, the nuisance would be reduced. Just as we had a governor on turbines we should have an automatic governor on the boilers that supplied the steam to the turbines. It seemed very necessary that in case a grid line switch tripped and disconnected 50 000 kW of load, they should have some automatic governor on the boiler.

He did not think that spraying at the base of the chimney was the solution of the dust problem. If the particles were going through the spray at a certain rate they did not get damped down at all, and the object aimed at was not achieved. He hoped that if Mr. Lake had any figures on the question of dust and sulphurous fumes he would let us have them.

A Vexed Question.

Dr. S. L. Pearce (London Power Co.) said that he had had no experience of pulverised fuel firing. When he had to take a decision on this subject some 18 months ago in connection with the new station at Battersea he came down on the side of stoker firing. There was a great deal to be said on both sides. He thought it was quite impossible to dogmatise and say that pulverised fuel was the right thing in all cases and situations. For the large boilers now being installed in the United States he thought it might be said that only pulverised fuel could be used. In this country up to 400 000 lb. steam capacity there was no difficulty in meeting the case with stoker firing. The company with which he was associated had been doing a great deal of research work in the past 18 months. A White Paper had been published and another would be issued shortly giving further results. He would be reading a paper before the World Power Conference in Berlin next month which would give particulars of the work they had been doing.

Mr. R. E. Rycroft (Babcock and Wilcox, Ltd.) remarked that Mr. Lake's paper was really one of a series describing the experiments which he was conducting at Derby. He thought we should settle at once the point as to whether it was necessary to divide themselves into two distinct and opposing camps. He was very pleased to hear Mr. Robinson say that in his opinion there was room for both systems. Their duty as combustion engineers was to consider the particular fuel they were called upon to burn, and when they knew the class that it suited them best to buy and consume, then they should carefully weigh all the points in regard to burning fuel pulverised or in what might be called its raw state. They were faced with this very important fact, that if one studied the excellent figures prepared from year to year by the Electricity Commissioners one found that, so far, no stations entirely operated by powdered coal had reached within 3% of the efficiency of stations operated by stoker firing. There were four stations with a thermal efficiency of over 21%. All these stations were stoker fired. The nearest pulverised fuel station had an overall efficiency of only a little over 18%. As to the matter of rapidity of steam raising, the majority of experienced engineers would suggest that the time given in the paper for running up Lancashire and water tube boilers was excessive. They could certainly be run up in much less than one hour. In the recorded tests of evaporated capacity of the Derby unit the normal capacity was never once reached. The maximum recorded for the two units was 118 000 lb. The average for the whole 24 hours was rather less than half the normal evaporation. The figure of 85% mentioned was being obtained in many stations throughout the year. He thought that Mr. Lake's excellent coal figures could almost be described as a geographical accident. The Electricity Commissioners' figures for 1929 gave the average coal consumption per unit generated at Derby as 2·2 lb. The cost appeared to be 8s. 6d. per ton delivered into the Derby station.

Mr. C. G. Morley New (Cardiff) said that six or seven years ago he had a somewhat similar problem in connection with reconstruction of the boiler house. He did not take very literally the claims of manufacturers that there would be no dust or clinker problem. Their problem in South Wales was quite different. They had good fuel, but it was certainly not cheap. The cheaper fuels had low volatile contents and it was quite impossible to burn them in the Wood boiler shown on the screen by Mr. Lake. Further to the west of Cardiff anthracite dust (with a volatile content of 7 per cent.) was obtainable at 1s. 6d. to 2s. per ton, but when it reached Cardiff he might just as well burn the local coal as far as cost was concerned. There was too much talk of thermal efficiency. His station had a very low one, but the operating costs would bear comparison with those of any other station.

Mr. R. A. Chattock said that we were still doing pioneer work and this could not be done without spending money. It was not fair to take the capital costs of pulverised fuel fired stations up to the present and compare them with those of stoker fired stations which were on a permanent basis. The cost of pulverised fuel firing was being reduced and within a few years they would produce something quite as cheap and get a higher efficiency. It was necessary to simplify the arrangement for pulverising and for firing the boilers. We must also adopt automatic control. It was possible to get down labour costs very considerably. Three men could now do the work of nine men in a stoker-fired station. That saving of labour had not been sufficiently stressed in the paper and discussion and it was that saving that would tell in the cost of operating a station. In regard to feed water treatment, he thought that the steam heated evaporator interfered with the general efficiency of the station. It was better to bend the turbine in several stages and so allow the steam to do a certain amount of work before it returned to the boiler. He did not know of a large station in this country where pulverised fuel was exclusively used. They would soon have one or two, but until then it was not possible to compare thermal efficiency with stoker-fired stations. At Hams Hall they were obtaining an efficiency of 23 per cent. This was not entirely due to pulverised fuel, but also to the operation of the turbines and the saving of as many heat units as possible and getting them back into the boilers. In short it was due to the general conditions of the station. To make reliable comparisons one must know the whole cycle of operations of a station. During the coal trouble in 1926 they burnt 10 000 tons of pit mound stuff (55 per cent. ash) a week. They were able to burn it by itself and obtained full combustion of the pulverised fuel and full duty from the boiler. It saved the situation in Birmingham during that difficult period and they did not have to buy an ounce of coal from outside the country.

Mr. Lake Replies.

Mr. Lake, replying to the discussion, said that he would like to inform Mr. Robinson that there was a combination of pulverised fuel and stoker firing operating on a large scale in this country. It had now closed down the whole of the stoker-fired plant and was running entirely on pulverised fuel. During the whole of the time that the plant had been in operation at Derby they had had only one instance of a boiler shutting down. After about two years' experience of the plant they were able to determine the life of various pieces of machinery likely to give trouble. It had always been the policy not to wait until a breakdown occurred, but to adopt a fixed time for these various pieces of apparatus and take them out and renew them. So far as Derby was concerned continuity was a straight line. He knew of no plant in the country operating with stokers that could give a continuous efficiency of the same order as pulverised fuel right through the load factor of a station. They had found that the grit from the last two steam generators put in at Derby was of a different character from that of the fish-tail burners. Research was going on and he had no doubt that they would be successful in incorporating a modified dust catcher with the water sprays. When they ran at Derby for nine months with a new brick chimney there was quite a negligible quantity and no complaints from residents in the area in regard to grit. The birds' nesting experience was most interesting and instructive. They had been able to evolve from one design to another, so that in the steam generator there was no possibility of dust accumulating anywhere. They had been able to run for 350 hours without using a soot blower. Their brick chimney was lined with a special kind of cement for about 30 feet up and the water sprays were about 30 feet high. The major portion of the ash was deposited in the dust catcher or the slurry pit. There was no difficulty in operating the plant whatever kind of coal came through. They got practically a straight line of CO_2.

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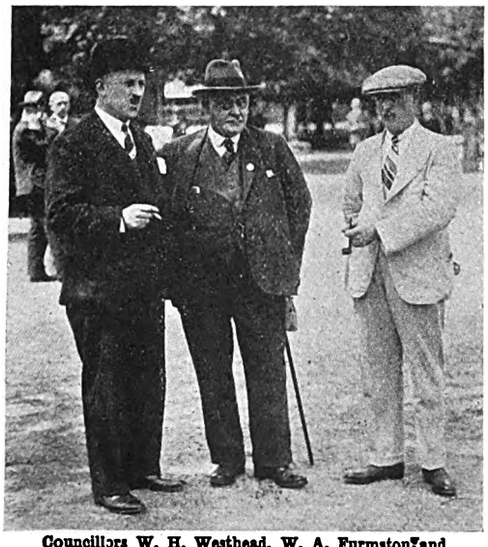
FURTHER EASTBOURNE PICTURES.

Mr. and Mrs. J. R. Goodall of Eastbourne.

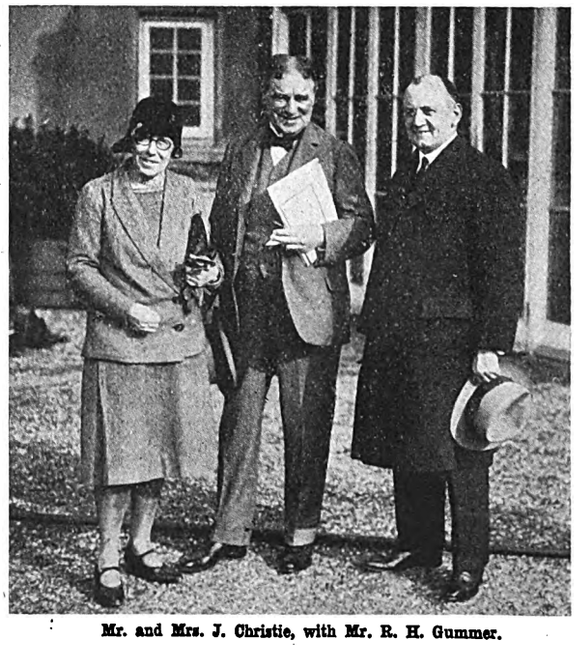
Left to right: Mrs. J. H. Johnstone, Mrs. S. C. Gibson, Miss Thomson, Mrs. C. Reader, Mrs. J. Hewitt and Mrs. W. S. Johnstone.

Group, including: Mr. R. Cox, Mr. and Mrs. E. E. Hoadley, the Mayor and Mayoress of West Ham, Councillors W. H. Martin, A. J. Fletcher, and Messrs. A. M. Mulliner and T. A. Kingham.

The E.D.A. was well supported by the supply industry at Eastbourne.



Councillors W. H. Westhead, W. A. Furmston and Mr. H. A. Tullock caught in serious mood.



Mr. and Mrs. J. Christie, with Mr. R. H. Gummer.

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ELECTRIC HEATING OF BUILDINGS.

Direct and Indirect Methods—Automatic Electrode Boiler System—Effect of Coal Price Fluctuations—Standardised Charges Impracticable—Tremendous Potential Load.

By J. W. BURR, M.I.E.E., M.I.Mech.E.

THURSDAY morning was devoted to the paper prepared by Mr. J. W. Burr, M.I.E.E., M.I.Mech.E., Borough Electrical Engineer, Swansea, on "Electric Heating of Buildings," the discussion being followed by an informal discussion on "Domestic Water Heating," introduced by Mr. A. E. McKenzie, M.I.E.E., Borough Electrical Engineer, Wimbledon.

Mr. J. W. Burr.

Mr. Burr's paper referred at the outset to the report which he had prepared for his Council on the "Engineering Requirements for a New Mental Hospital," which was the outcome of several years' investigation of the possibilities of heating public buildings. The two principal points dealt with in that report were :—

1. The supply of electricity to the hospital for lighting, power, cooking, etc.
2. The generation of heat for water and steam.

The architect's specification of works required to be done at the hospital dealt with the provision of boiler plant and reciprocating engines. The steam engines were to be used for generating electricity and the exhaust steam therefrom utilised for other purposes, such as warming the buildings and providing hot water for domestic and similar draw-off purposes.

At the outset the author was not convinced that electricity could be used economically to heat the hospital and for the other services, but after going carefully into the matter he changed his mind and has attempted to express clearly in this paper his train of thought in seeking a solution to the problem.

As an indication of the difference of opinion, the following statements which had appeared quite recently might be cited :

(1) Total electric heating costs half as much as central heating with coal-fired boilers.
(2) Since a unit of electricity contains 3 415 B.Th.U.'s, as opposed to 13 000 to 14 000 B.Th.U.'s in 1 lb. of coal, electricity must of necessity be very costly for heating purposes.

It did not require much investigation or special knowledge to realise that both these statements were equally wrong and misleading. The author realised at the outset that published statements and figures were of little or no value to him, and that it was necessary to consider the problem purely from the local point of view.

Considering first the direct electric heating method, the author pointed out that from the consumer's point of view this method had generally proved to be more or less expensive according to the local heating tariff, but had made great strides on account of its comfort, convenience and cleanliness. From the supply authority's standpoint, the load was always considered to be very desirable, and strenuous efforts were made to obtain it. It was considered that a large radiator load would materially assist in improving the load factor, but experience had shown that this was not always the case. In one particular undertaking, 4 000 kW of electric radiators were obtained, but since most of these were used in public buildings they came into commission between 9 a.m. to 12.30 p.m. and 2 p.m. to 6 p.m., and synchronised with the peak load, without any appreciable effect upon the off peak period. The valleys in the load curve consequently became deeper.

The effect of the radiator load upon his last year's peak load was still fresh in the author's mind, and, under these circumstances, the installation of electric radiators, or convectors and immersion heaters did not appeal to him. He therefore considered that an economic figure for electricity could be reasonably offered to the consumer for this class of load.

In the case of indirect heating—really a modification of the familiar central heating plant—the generation of heat in the boiler could be effected in various ways. Recently much attention had been paid to the generation of steam and/or hot water by electric boilers. The City of Basle, in Switzerland, had, by adopting this method, increased the load factor of its electrical plant from 13/14 per cent. to no less than 80/90 per cent. in a few years.

After mentioning the two practicable ways of converting the electrical energy into heat—electric water heaters or resistors and electrode boilers (which have been constructed for voltages up to 30 000 V) the paper records the inspection of the Regent Street Polytechnic installation, consisting of a 2 000 kVA electrode boiler operating at 6 600 V 3-phase 50 cycles, with three thermal storage vessels of a capacity of 26 800 gallons.

Like many other engineers, the author had serious doubts with regard to the earthing of high tension electrode boilers. Tests carried out, however, had shown that the amount of earth current was negligible.

During last year, the Electricity Commissioners were approached with a view to securing an amended form of Regulation 3 of the "Regulations for Securing the Safety of the Public," so as to admit e.h.t. supplies being given to any premises. It is understood that the Commissioners have now agreed to the words "or except for the purposes of thermal storage installations" being inserted in the paragraph in question. A further condition imposed by the Commissioners upon the supply authority is that all metalwork enclosing, supporting or associated with the consumer's installation, other than that designed to serve as a conductor must, where necessary to prevent danger, be efficiently connected to earth.

Complete automatic operation of electrode boilers was a workable proposition and the labour was reduced to the control of temperature alone. This, of course, would be done by the caretaker or handyman. Since the supply would be switched in at a predetermined hour from the generating station, automatic devices were required to ensure safety and efficient operation. These plants could be safely left unattended during the loading periods, generally 10 p.m. to 6 a.m. An alarm bell placed in the caretaker's quarters warned him of the stopping of the plant for any reason other than normal operation. The author could state definitely that the insurance company was willing to accept as an ordinary risk the insuring of electrode boilers working under the foregoing conditions.

Reading from the left : Coun. T. Crowe, Ald. H. Cassels, Mrs. Cassels and Mr. H. G. Fraser.

Another important point was the regulation of the temperature of the water supplied for domestic use. It would readily be understood that some provision must be made to prevent the temperature of this water reaching such a point as to

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endanger the inmates and domestics by scalding. This was taken care of by means of thermostats which regulated the amount of steam to the calorifiers and maintained even temperature.

A comparison of the capital costs of (1) installing coal-fired steam boilers or (2) installing electrically heated boilers, current being obtained from the public supply, showed that there was little difference between the two types of plant. The erection of a stack was a costly procedure and account must be taken of the saving in capital costs on the two buildings necessary to accommodate the alternative plants. The thermal storage vessels were usually placed below the sub-basement level and therefore occupied no useful building space.

It was reasonable to assume that the average calorific value of the coal it was proposed to use would be about 13 500 B.Th.U.'s per lb. As the load would fluctuate greatly and the banking periods be lengthy, the average boiler and economiser efficiency was not likely to exceed 50 per cent. This figure included the blow-down loss. The actual available heat per lb. of coal for conversion into steam was therefore :

$$\frac{50 \times 13\,500}{100} + 6\,750 \text{ B.Th.U's.}$$

As a pressure of 80 lb. per sq. in. was required at the calenders, the boiler pressure would be about 100 lb. per sq. in. The total heat required to produce 1 lb. of steam at 100 lb. per sq. in. pressure was approximately 1 190 B.Th.U's. As the condensate would return to the economiser at a temperature of approximately 175° Fah., the balance—i.e., 1 190—175= 1 015 B.Th.U.'s, must be taken from the coal. The corresponding evaporation was therefore :

$$\frac{6\,750}{1\,015} = 6{\cdot}65 \text{ lb. of steam per lb. of coal.}$$

As the electrical method would probably mean separating the plant into two separate sections, one for the storage of steam required in the kitchen and laundry, and the other for the storage of hot water for warming the building and for domestic supply purposes, there would be no calorifier losses. The steam and hot water plant could be placed as near the centre of distribution as possible, so that the heat losses would be reduced to a minimum. Current consumption for any given amount of steam would be :

$$\frac{\text{Lb. of steam} \times 1\,190}{3{,}415 \times {\cdot}96 \text{ (efficiency of plant)}}.$$

In practice less heat was required by the electrical method than by the less flexible coal-fired plant, due to ease of regulation and automatic temperature control. In some cases there had proved to be an actual margin in favour of electricity equal to 32 per cent. of the estimated energy consumption. A figure of 20 per cent. was regarded by the author as safe and was used by him in his calculations.

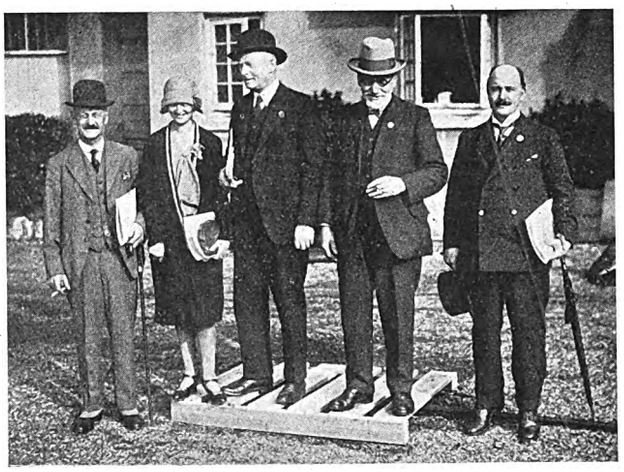
Labour charges would be heavy with the coal-fired plant. From the reference already made to the automatic operation of the electric plant, it would be seen that labour charges would be practically non-existent.

Calculations made in the manner described did not always give the true aspect of the situation as it would apply to a hospital. There were certain additional charges which should be added to the coal-fired scheme ; for instance, there would be no deterioration of stonework and buildings generally, and less cleaning and decorative renewals. There was also the cost of maintenance of private roads to be taken into consideration. After allowing for everything, however, an extremely low charge had to be made for electricity before electrode boilers could compete with the coal-fired plant.

What was an economic figure to charge for power consumed in this way ? Regard must be had to many varying factors. In the circumstances the author could not convince himself that it was possible to standardise the method of charging for electricity used for heating different types of public buildings. The question was : How cheaply could we afford to supply energy under any specific conditions ? In the case of the hospital already mentioned, assuming a thermal storage system, the installation would consist of electrode boilers which would generate heat during off-peak hours, the heat being stored in thermal storage vessels until required. Supposing the control of the supply to be in the hands of the generating staff, who would use the consumer's load to even up the valleys in the station load curve, the following points would have to be considered :—

(1) Capital expended in giving the special supply, i.e., switchgear and cables from station to consumer.
(2) Direct profit from sale of units required.
(3) Indirect profit by increase of thermal efficiencies.

The draft regulations of the Electricity Commissioners included a method of division of standby heat losses. The basis of the calculation was the assumption that the no-load



Some more well-known personalities caught by our camera.

heat loss per kW of maximum demand sent out was 989 B.Th.U.'s per hour, which on a kW maximum demand generated basis is approximately 955 B.Th.U.'s. Taking the effect of an increase of daily load factor on an undertaking having a peak load of, say, 13 000 kW, the standing loss would be :—

$$13\,000 \times 24 \times 955 = 297\,960\,000 \text{ B.Th.U.'s per day.}$$

It might be further assumed that the undertaking consumed 2·0 lb. of coal of a calorific value of 13 000 B.Th.U.'s per lb. at 15s. 6d. per ton, when working at a 30 per cent. load factor. The standing losses per unit generated decreased as the units generated increased, hence the coal cost per unit generated would also vary inversely as the units generated. The tabulated data showed that if we were able to produce 31 200 units more per day we should increase the load factor by 10 per cent.

Taking the case of a 30 per cent. load factor and presuming 31 200 units were sold at 0·2d. per unit for a controllable load such as previously mentioned, we had :—

Load factor increased to 40 per cent.
Coal cost per unit generated = 0·1 609d.
Direct profit = 31 200 × (0·2 000—0·1 609)
= 31 200 × 0·0 391d. = £5 1s. 8d.
Indirect profit would be :—
93 600 × (0·1 660—0·1609)
= 93 600 × 0·0 051d. = £1 19s. 9d.
Total gross profit = £7 1s. 5d.

It would be seen that the total gross profit would be £7 1s. 5d. for any 10 per cent. increase in load factor ; the direct profit increased as the load factor increments were added and the indirect profit became less, but the total profit was constant.

The B.Th.U.'s loss per unit generated per day depended solely upon the load factor. Hence, knowing the price and calorific value of the coal at any particular station, the loss in pence per unit generated per day might easily be calculated for various load factors, and the direct and indirect profit produced by the sale of any given number of units. In his calculations the author has only considered the coal costs ; other factors enter the question. The water consumed per unit is a direct charge but is very small, probably in most cases, say, half a lb. of water per unit, with water at sixpence per 1 000 gallons.

The question as to whether the wages of workmen would be increased was purely a local matter and depended upon factors which might vary, both with the individual undertaking and also with the particular load conditions. For instance, the night load, or off-peak load condition might be such that x boilers at full load and one boiler at half load were necessary and sufficient to carry the load. If the addition of the pro-

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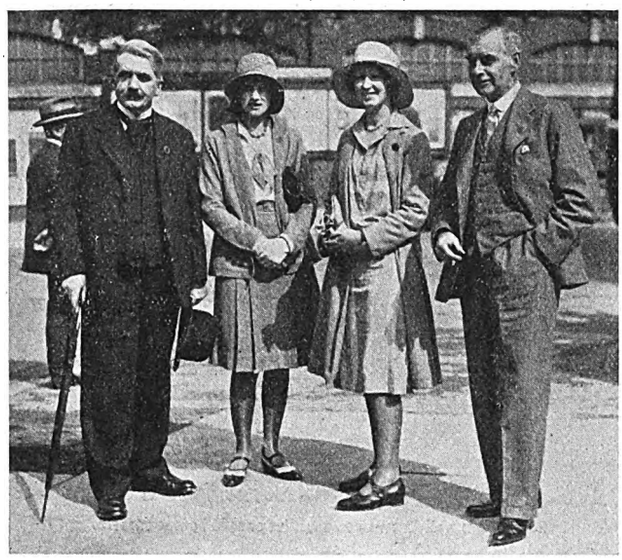
posed load meant that the one boiler at half load took the extra load and became a full load boiler, then no extra firemen were required, whereas if an extra boiler had to be run then the extra wages might have to be taken into account.

The author has only taken into account heat losses in the boiler house. Other savings also accrued from the increase of load factor. The stand-by heat losses in the engine room and also the units used on works might not vary with the



The Mayor of Shrewsbury (left) with Miss M. H. Johnston and Miss L. Woollam on the right.

increased load. The author was therefore of opinion that the actual coal cost per unit and a fairly safe basis on which to calculate for off load heating in large amounts. Having arrived at the gross profit it was only necessary to adjust for :—

(1) Units lost in transmission, etc.
(2) Capital costs on special cables, etc.
(3) Discount (if any) for prompt payment of accounts,

in order to arrive at the net profit.

One of the difficulties was the adoption of a coal clause which would be mutually satisfactory to both parties.

In order to arrive at an equitable charge for varying coal prices it was necessary to take into consideration the indirect as well as the direct profit.

The tabular matters given in the paper showed an average rate of decrease of net profit of £1 3s. 2d. for each shilling increase in the cost of coal per ton.

A capital charge of £730 per annum (i.e., £2 per day) was deducted to allow for the cost of giving the special supply from station to consumer. Hence, taking the units sold as 95% of 31 200 we had 29 640 units to bear the cost of £1 3s. 2d. per shilling increase in the price per ton of coal. This worked out at 0·00469d. per unit per sixpence increase or decrease in the price per ton of coal. The method assured that the undertaking would receive a constant profit over a wide range of coal costs, but did not necessarily meet all contingencies, such as the burning by the undertaker of cheap low grade fuel, or conversely a dear but high grade coal, such as washed steam beans. This factor could only be covered by the addition of a calorific value clause in the agreement, which provided for an adjustment in the price per unit charged corresponding to the increase or decrease in average calorific value of the coal consumed, such increase or decrease to be at least five per cent. variation in the standard or basic calorific value.

In such an event as the general strike and prolonged coal stoppage of 1926 the consumer had to pay heavily for the energy consumed, but it must be remembered that if the consumer had his own coal-fired plant then his coal cost would probably rise even higher in proportion than the cost of coal to a supply authority.

The conclusions arrived at in the paper were as follows :

Supply authorities were placed between two limiting conditions :

(1) The price the consumer could afford to pay ; and
(2) The price at which the undertaker could afford to supply.

It was not possible to offer a tariff to prospective consumers which would bear direct comparison with the cost of alternative systems unless all the advantages and economies mentioned in the paper were taken into account. Little difficulty should be experienced, however, in justifying rates of from 0·2d. to 0·3d. per unit.

It was not feasible to standardise methods of charging for electricity used for heating large public buildings. Each case must be considered on its own merits and under its own local conditions.

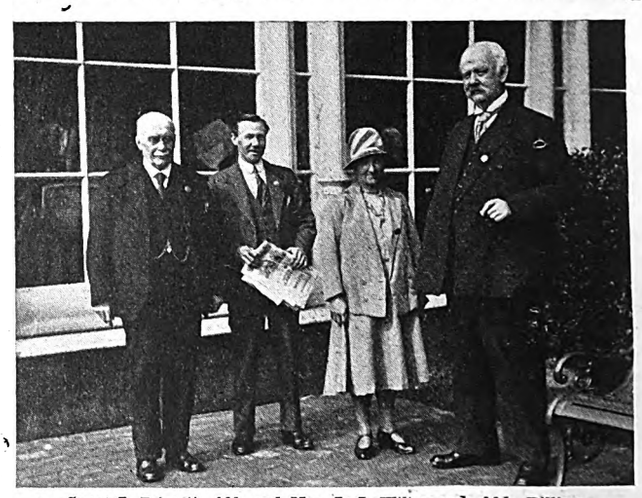
There was no question that the matter should be undertaken seriously and with vigour. Consumers should be approached before building operations or even plans had been commenced.

The question of tariffs really resolved itself into the consideration of how cheaply could they, as public supply authorities, afford to sell energy for this particular purpose. Due regard must be given to all aspects such as direct profit, indirect profit and the general advancement of the undertaking.

The potential load from this class of heating was tremendous. Some idea of the consumption which might be expected from a public building was afforded by the fact that the hospital already mentioned was estimated to consume about ten million units per annum. The other figures mentioned in the paper had no particular reference to the hospital in question. The author expressed his appreciation to his personal assistant, Mr. H. A. Haines, B.Sc., for assistance in the preparation of the paper.

Discussion.

Discussion of Mr. Burr's paper was combined with the discussion on domestic water heating which was opened by Mr. A. E. McKenzie, borough electrical engineer, Wimbledon, who said that electric water heating was a branch of business that deserved attention of every supply engineer. He hoped that the report of the special E.D.A. Committee on the use of hot water in the home on which he was serving would shortly be available. In most districts the popularity of electric cookers was already well-established, and as every electric cooker was a potential advertisement he suggested they should devote attention to electric water heating as some other countries had done. It offered unique opportunities for improving load factor, more, he suggested, than any other type of load. Improvement of load factor was of utmost importance, particularly as so many undertakings would shortly be taking supplies from the grid on a two-part tariff. Unfortunately, the average householder had no idea of the quantity of hot water used daily. It would pay most undertakings to employ a special assistant for the development of this class of business with the following qualifications. Good address and education, good knowledge of electricity and of various types of water heaters, and most important of all, ability to trace out existing piping arrangements and make suggestions for their improvement where



Coun. J. Priscott Ald. and Mrs. J. J. Wilton and Ald. Billing.

desirable. He should be able to advise consumers as to which type of heater would best suit their requirements. In Wimbledon they employed such a man who was able to give a complete price for carrying out work. The consumer appreciated this as he only had one firm to deal with and knew exactly what the cost of installation would be. They had to adopt this practice because they found that the order frequently fell through when the consumer received a plumber's estimate for the cost of the alterations. It was important that supply

(*Continued on page* 688.)

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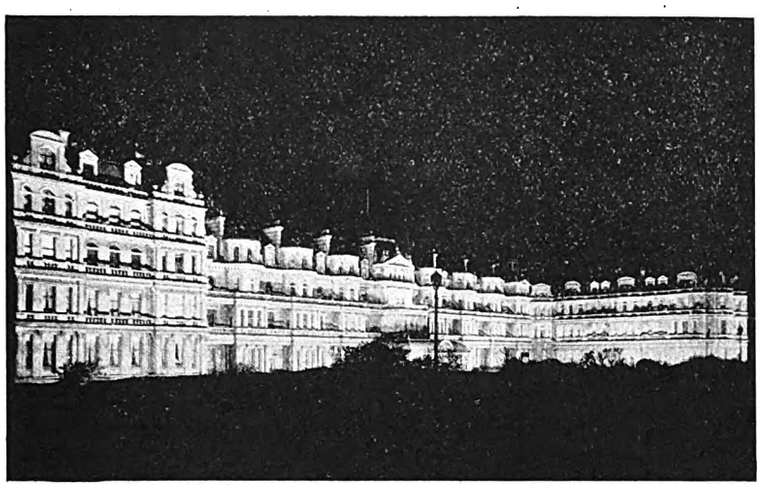
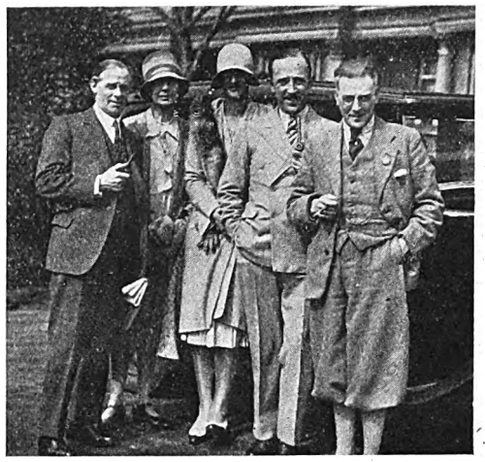
FURTHER CAMERA SNAPS FROM EASTBOURNE.

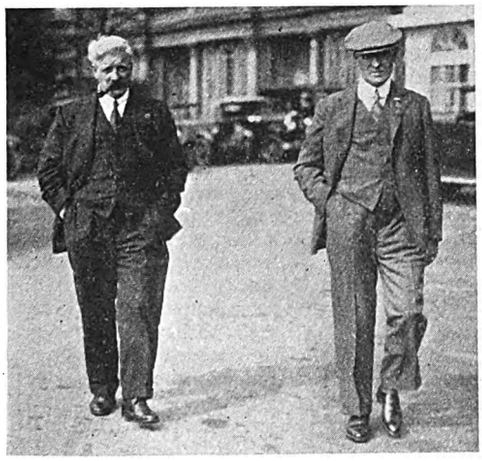


The Grand Hotel, at Eastbourne, bathed in "Mazda" light during the period of the Convention.

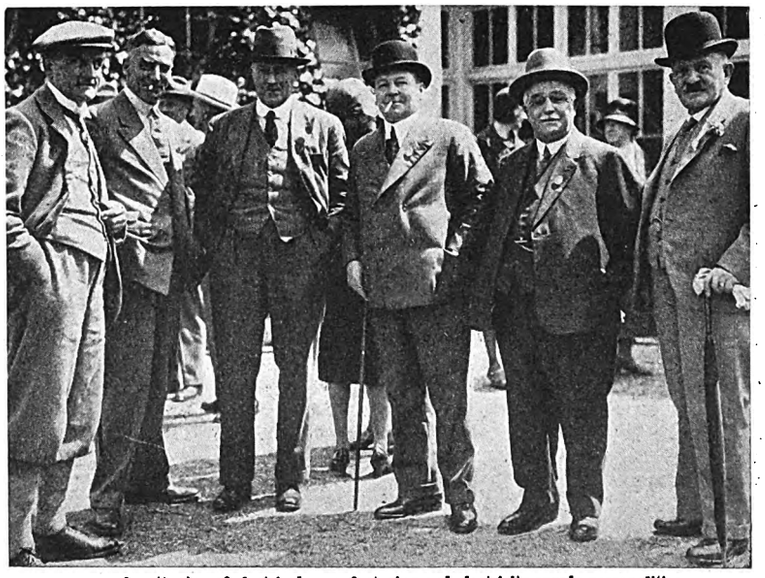
This night view may be compared with the picture on page 681.



Councillors A. H. Swain and J. Minto, Mrs. Swain, Mrs. Usher and Mr. G. C. Usher.



Councillor J. Lewis and Mr. W. C. P. Tapper leaving the hotel.



A gathering of electrical manufacturing and electricity supply personalities outside the Winter Gardens.

Before the tennis courts: Mrs. F. Forrest, Mrs. Ferguson, Mr. and Mrs. S. T. Allen, Mr. and Mrs. T. A. G. Margary, Mr. and Mrs. E. J. Jennings, Miss C. Haslett and Mrs. H. A. Howie.

Miss G. F. Sharp, Mrs. W. Raudell, and Mrs. V. W. Dale with a friend.

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engineers should co-operate with builders so that water heaters should form part of the heating arrangements. In his district builders came to inquire as to what type of tank should be put in so that immersion heaters could be inserted later, if required. To every applicant for electricity supply in Wimbledon literature was mailed about water heating, with a request that the department should be allowed to submit the estimate. They supplied heaters made by any reputable firm, preferably British. They had early formed the opinion that it was useless setting out one tariff and forcing everybody to take that.

Immersion Heaters Preferred.

Their policy was to get the water-heating load by one means or another. It had been generally found that immersion heaters of 2 kW loading were sufficient to provide all the hot water required in the average household. To date they had installed 1 300 heaters in Wimbledon, mostly of the fixed loading type. As a result of a special push in the last four weeks 200 applications had been received and a large proportion were going forward. Speaking of hand and electrically wound time switches Mr. McKenzie said that the former usually required winding monthly and electrically wound switches were better for that reason. British types of time switches were renowned throughout the world but they were too expensive for water heating with current at 3 units a penny. Synchronous motor switches could be thoroughly recommended. At Amsterdam, by April 3 last, 8 825 night tariff water heaters had been installed and the night load was increased more than 8 000 kW. Water heaters were being put in at the rate of 200 weekly, all control being by synchronous motor switches. The tariff was two-fifths penny from 11 p.m. to 7.30 a.m., and from noon to 2.30 p.m., and four-fifths penny at other times. At The Hague 7 776 water heaters had been installed, with a night load of 5 000 kW. Maintenance costs were less than with time switches and the synchronous switches had proved absolutely reliable. Fixed rentals were charged according to size of heaters. No difficulty occurred in maintaining accurate frequency so that there was no cumulative error. The use of instantaneous electric heaters comparable with gas geysers should be discouraged. It was far better to argue on the basis of value for money and better service by the electric method than by comparison of costs. They should be wary of converting existing systems and not assume that it could be done in every case, particularly in large houses with long runs of piping. Water heaters should preferably be cut off over the station peak load now that apparatus for achieving this end could be obtained at a reasonable price. Until the prices of water heaters were reduced electric water heating would not make the headway that we all desired.

Mr. H. C. Lamb, Manchester, said he thought it rather dangerous to say that electricity could compete with coal for the heating of large buildings on a pure cost basis. If they attempted to do anything like that the price would be so low that there would be no margin left to make it worth while. For the heating of these large buildings on the thermal storage principle they could not compete with coal at a satisfactory price to themselves unless other important factors were taken into account by the consumer. If they were to secure that class of business there must be present factors such as space valuable to the consumer and a desire to avoid dust and dirt by banishing coal and ashes from his premises. In such cases there was a chance of securing such business on reasonable terms. When water was required in large quantities for washing it was much more difficult to make a satisfactory contract for a heating supply on the thermal storage system in competition with coal or oil and they had a far better chance when it was purely a case of heating a building. The essential condition was that the supply should be given without any capital cost to the undertaking in order to avoid misunderstandings with other consumers. The Manchester Corporation had arranged a contract for a large building at a price well above Mr. Burr's lower limit of 0·2d. There were special advantages because the authorities concerned were determined not to have a chimney or dust and dirt.

Mr. L. Romero, Salford, said he had also found the synchronous time switch an excellent device. He hoped that as a result of the E.D.A. Committee's activities we should get a scheme that we could all adopt. If water heaters with thermostatic control with sufficiently low loading were used, the load factor was extremely good. In his own house the figure was 80%. For the class of consumer that predominated in Salford it was essential that water heaters should be let out on simple hire and that the charge should include cost of fixing. They had adopted a rather special type of heater, similar to the lagged storage system thermostatically controlled and designed to be fitted in place of the existing hot water cylinder with connections behind the kitchen boiler. This enabled consumers to feel their way and use the fire or electricity as best suited them.

Mr. C. H. Smith (Electric Fires, Ltd.) said that the night tariff system was bound up very closely with large storage capacity. He suggested wiring the heater past the cooker with a pilot lamp to remind the consumer to switch over when the change was necessary. A central heating load would not fill up the valleys of the load curve in summer but a water heating load would improve the load factor throughout the year.

Alderman Mrs. S. E. Hammer, Hackney, said that women did not care much about load curve valleys but they did want their current as cheaply as possible. Experience had taught them that if they had to give up all their electric appliances except one they would keep the water heater. Electric water heating in the home would be an enormous success if they once got it introduced, and for this they needed the right men and women to talk to householders about it. Women found it difficult to understand tariffs and to realise why charges could not be standardised throughout the country.

Mr. E. Seddon, Edinburgh, said that only half the story had been told in Mr. Burr's paper. He asked whether any comparative costs had been prepared between coal-fired plant and electric supply. He had been asked to prepare a statement to show if electricity could be used for wash-houses. He found that at one farthing per unit the cost of supplying the 3 000 lb. of steam required per hour for ten hours daily would cost £4 472 per annum, including capital charges, whereas the charge for a coal steam-raising plant would be £857. At that price per unit he did not believe that electric heating by thermal storage could be done at a profit to the seller.

Conditions in New Zealand.

Mr. E. E. Sharp (Venner Time Switches, Ltd.) said that the figures given by Mr. McKenzie for Amsterdam were supplied by the designers of the switch mentioned. The Hague had ordered 1 000 English time switches and were negotiating for another two or three thousand, so there was something to be said on the other side. It ought not to be a question of whether to buy time switches in England or synchronous motor switches from Germany or America. Users in this country had recently been circularised as to what they wanted, but very few of them had answered. He hoped that when they went after water heating they would not put out such confusing printed matter as Wimbledon had done. They had suffered from too many tariffs in the past and they did not want to lose business by confusing the consumer. So far they had heard only of Continental practice. In New Zealand, habits and customs of the people were more in conformity with ours. In New Zealand they began water heating as an aid to electric cooking, but water heating was proving so much more popular in Auckland that there was one water heater to every two consumers against one cooker to five consumers. Over 10 000 water heaters were at present operated under time-switch control there and the rest of New Zealand was following suit. Conditions in New Zealand were very similar to what they would be here shortly. The Government generated current and supplied it to the power boards on a kW basis, so it was very important to have the water heaters kept off the peak load.

Mrs. H. A. Howie, Walsall, mentioned the need for a system which would allow houses to use their kitchen fires for water heating in the winter and change over to electric heating from May to October.

Mr. E. E. Hoadley, Maidstone, said that in Maidstone they had found that at a halfpenny per unit there was quite a lot of business to be done in water heating. Water heating was going to be one of the biggest things the electricity supply industry had ever embarked upon.

Mr. C. G. Nobbs (Geo. Nobbs, Ltd.) and Councillor Mrs. Gregory, London, also spoke, the latter emphasising the need of cheaper electrical appliances.

I.M.E.A. PHOTOGRAPHS.

The group photographs of delegates at the Convention were specially taken for THE ELECTRICIAN by the "Gazette and Herald," Eastbourne.

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THE I.M.E.A. EXHIBITION.

Interesting Display of Domestic and Power Equipment at the Winter Garden, Eastbourne—Brief Description of Some Outstanding Items.

THE electrical exhibition held in connection with the I.M.E.A. Convention is this year staged in the Winter Garden, Eastbourne, and was visited by the delegates on Tuesday afternoon.

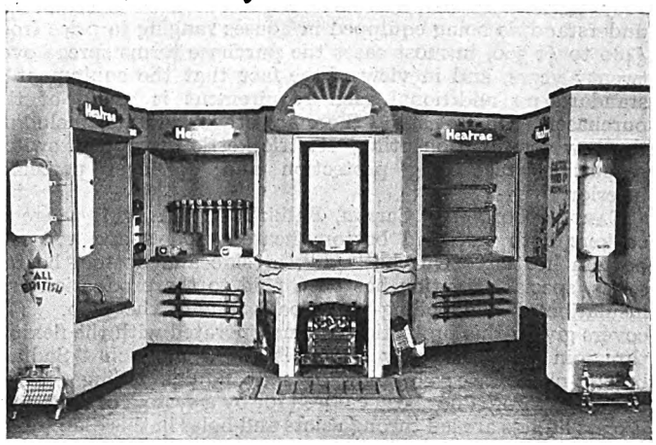
J. H. TUCKER AND CO., LTD., Tyseley, Birmingham, are making a special exhibit of a new heater type switch, the chief features of which may be summarised as follows: The switch is of the quick make-and-break type, is of skeleton construction, the contact clips, mechanism, etc., being mounted on a steel frame, no porcelain being employed. The contact clips and contact are insulated from non-conducting metal with mica and all switches are subjected to a flash test of 1 100 V a.c. The mechanism embodies a complete positive drive both when making and breaking the circuit. The moving contact arm is a separate part from the rocker, and initially at the commencement of the stroke is directly operated and slightly displaced by the operating dolly prior to the dolly actuating the rocker. This results in the positive drive being effective throughout the stroke of the operating dolly. The conducting parts of the switch are robust and amply proportioned, the stationary clips being of phosphor bronze to provide maximum flexibility. The steel frame, rocker, cradle and bridge are galvanised as rust preventative. The spring is of the compression type in steel, copper-plated to prevent rusting. The operating dolly incorporates a long straight shank designed for foot operation, particular consideration having been given to avoid the possibility of "tipping" the fire when operating the switch. Full rated load test of 15 A 250 V d.c. has been carried out, completing 32 270 operations (on and off) without electrical or mechanical damage.

The BASTIAN METER CO., LTD., Farnham Road, Trading Estate, Slough, in addition to their standard water heaters and boilers, are showing typical component parts of a thermal storage electric heating system. Of special interest are the samples and data shown on various heat insulation materials, automatic temperature control valves and the electro-steam boiler and hot water calorifier.

DRAKE AND GORHAM WHOLESALE, LTD., 67, Long Acre, London, W.C.2, are making a special display of water heating equipment, including heaters with time switch or relay control, gravity feed type cisterns with capacities ranging from 4½ to 55 gallons, domestic cisterns of 1½ gallons capacity and barbers' cisterns. The switchgear exhibited includes the "Metesco" oil switch fuse. A further useful unit is an e.h.t. ring main controller, which condenses in a minimum space the maximum amount of control for heavy current ring mains up to 12 000 V. The firm claims to have further developed what is known as the type I.E.P. automatic oil switch fuse which is useful under certain circumstances. A fuse blowing in any phase brings out the whole switch. Whilst the "Metesco" switch fuse is said to be the simplest piece of apparatus, this rather more elaborate automatic oil switch fuse is suitable under certain conditions. Another exhibit is the "Busy Bee" refrigerator, two self-contained models of which are to be seen. The rotary compressor with its three moving parts is practically silent in running.

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1. The exhibits here cover a representative range of cookers including the models hired by the Eastbourne Electricity Department, but owing to the small space available, the full range of cookers made by the company cannot be shown. Special attention is drawn to the Nos. 50J and 51J table models, the latter model in "de luxe" finish, including the well-known marblon all-enamelled mottled interior. The exhibit also includes the well-known "Quick-service" water heaters for sinks, surgeries, etc. (capacity two to three gallons), also one of the new series "Jackson" storage water heaters which have now been slightly modified and fitted with elements which can be removed without breaking any water joints. A range of fires in fabric finish is also shown, while the new competition type washboiler and the new automatic kettle, the body of which is made without any soldered joints, completes the company's comprehensive exhibit.

BULPITT AND SONS, LTD., Swansea Works, Birmingham, are displaying a wide range of water heaters of the storage type. The consumption of the 10-gallon size heater is only 0·75 kW, while the loading of the 15-gallon tank is 1 kW. Temperature is adjustable by the thermostat setting, and can be varied between 120 deg. F. and 200 deg. F. An immersion heater of an improved and robust type is employed, worked at a relatively low heat to ensure long life. The renewal of the element can be effected by turning a cap with a bayonet



The stand of Electric Fires, Ltd., as erected at the company's works before taking up its official position in the Winter Garden.

joint, which allows the porcelain former and heater to come away bodily without breaking any water joints. The thermostat is of a type which operates the mercurial switch by means of a bi-metallic spiral strip. When set up, a covering cap encloses all the controls and preserves a clean outline to the tank with no pockets to trap dust. In one type of tank, adapted for pressure service, the cold water feed is from the usual ball cistern at the top of the building, or from the mains, the hot water being led off from either top or bottom of the heater to the required site and controlled by stop-cocks on the outlets. In another type of tank, there is a free outlet for the hot water, and it is operated on the "push-through" system, with a stop-cock on the cold inlet only. Another feature of considerable utility is the means adopted for obtaining a small quantity of hot water almost immediately the heater is switched on. The pocket containing the heating element is surrounded by a somewhat larger cylinder, the top of which is open and immediately under the hot water outlet syphon. The bottom of this cylinder is perforated and the small volume of water which enters it is immediately raised to a high temperature by the immersion heater and rises to the top of the tank where it collects in a hot layer ready for use.

ELECTRIC FIRES, LTD., Heatrae Works, Norwich, are also specialising in water heating, their exhibit consisting of several types of thermal storage systems shown in such a way that the construction can be examined, and all the latest improvements are brought clearly forward. There is a cistern type tank containing its own ball valve chamber and working on the principle of constant temperature and variable volume. This is a complete hot water system in itself, and is suitable for direct connection to the cold water main; it will supply hot water to several points such as the bath, wash basin and kitchen. An example of a 10-gallon thermal storage water heater, that can be operated either as a displacement type heater or be connected to a ball valve tank and piped to several points according to the job for which it is intended, is shown. A new type 1½ gallon thermostatically controlled heater is another item, and this has been designed specially for sinks and wash basins. The apparatus is of particularly simple construction, and all parts are readily accessible. Other "Heatrae" exhibits include hot pipes or tubular heaters, low temperature air warmers, towel rails, warming plates, immersion heaters and electric fires.

SANTON, LTD., 149/150, Dock Street, Newport, Mon., are exhibiting, in addition to their well-known electric geysers, circulators and tank belts, the new "Santon" multi-plug which allows of a number of appliances being connected to a common point.

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L. G. HAWKINS AND CO., LTD., 30/35, Drury Lane, London, W.C.2, have a special exhibit of their new family size "Hera" electric washing machine. Originally this was introduced as a portable electric washer, but many builders of large estates have decided to instal this equipment as standard in their new houses. It is an interesting fact that each one of these builders is advertising in the Press the inclusion of a "Hera" electric washing machine. In some instances these electric washers are being equipped with 3 kW heating elements, thus giving an efficient wash boiler in addition to the electric washing machine. It will be appreciated that any one electrical appliance that is put out in such large quantities will give valuable additional revenue to lighting companies with a very materially reduced sales expense. The "Hera," we understand, is being equipped in houses ranging in price from £480 to £1 500, in most cases the purchase terms spread over twenty years, and in view of the fact that the equipment is standard no additional cash requirement is asked of the purchaser. On this stand there are other exhibits, including the new combination utility electric kettle fitted with switch regulation, fuse plug protection and porringer porcelain interior.

CARRON COMPANY, Carron, Falkirk, show a wide range of cookers both side and bottom heated models and top and bottom heating. On the "M", or side and bottom heated series, special attention has been paid to the production and insulation of the boiling-plate leads under the hob. The covers giving this protection are incorporated with the flexible three-pin plug assembly which is fitted to each "Sadia" boiling-plate. The draining of spilt liquids falling on the under diaphragm has been catered for by a system of channels. Excess liquids are led through slots and holes in this diaphragm to the white enamelled plate which extends half way across the top of the grill chamber or warming cupboard. A tray can be drawn out on runners for cleaning purposes.

Turning to the top and bottom heated "P" type cooker, the key-note of the design is accessibility from the maintenance engineer's point of view. All component parts, i.e., boiling plates, grill and oven elements, are all of the plug-in type. The exhibit also includes thermal automatic switch kettles and vitreous enamelled irons and fires.

The "Dolphin" Range.

DOMESTIC ELECTRIFICATION, LTD., Townsend House, Greycoat Place, London, S.W.1, are showing a range of "Dolphin" heating and cooking appliances, including three cooker models. The standard cooker embodies mottled enamelled hob, all mottled enamelled interior and shelves for the oven; this has rounded corners of wide radius for easy cleaning. Ample space has been provided round both oven and door for lagging, and a new design of latch with heat resisting handle ensures a perfectly tight-fitting door. Elements are of plug-in type for ease in replacement. The boiling plates are solid type circular pattern. The oven elements in the smaller model are at the top and bottom; a solid shelf is provided to allow the oven to be sub-divided, so that when only one dish is being cooked, only one element need be used. For compactness and convenience the grill has been placed at the top of the oven, permitting ample space for plate warming in the bottom. The No. 616 cooker also shown, has been designed for the family of from 6–10. It has ample oven space, two large circular boiling plates and a grill. A let-down door provides a hot cupboard for plates under the hob. This hot-cupboard is vitreous enamelled and has rounded corners. The oven elements can either be fitted at the top and bottom or at the sides. All elements are controlled by a three-heat switch and care has been taken throughout the cooker to protect all connections from overflow of liquids. The "Dolphin" fires are of pleasing design; some models having the elements placed vertically with chromium plated reflectors. The company's automatic safety iron with "Klixon" thermostat, is being shown for the first time. A working model of this thermostat on the stand is interesting to watch and at the same time shows the action and construction.

CREDENDA CONDUITS CO., LTD., Oldbury, Birmingham. On this stand is staged examples of the latest types of "Creda" electric cookers as hired by Eastbourne Corporation and elsewhere. Special interest is centred on two new models shown for the first time. Plug-in elements are fitted throughout and the design includes many novel features. In addition there is also shown the new "British Standard" electric cooker, arrangements having been made for the manufacture of these in conjunction with several other leading cooker manufacturing concerns. Other items of special interest on the stand are samples of the new "Creda" tubular heating system. It will be recalled that "Creda" cooking apparatus was installed on the airship R.100.

The MANOR ELECTRIC OVEN AND FIRE CO. (E. ELLWOOD), 303, High Street, Chiswick, London, W.4, is showing the standard range of "Manor" products including a new 4–6 person cooker, a new design water heater, and table cooker.

CHESTERTON JONES AND CO., LTD., David Works, Rushey Lane, Tyseley, Birmingham, are showing among other appliances their No. D. 705 and D. 702 cookers, descriptions of which have already been given in these pages.

Another Water Heater.

BERRY'S ELECTRIC (1928), LTD., Touchbutton House, 85/86, Newman Street, London, W.1. In addition to new Magicoal fires, this company is showing for the first time the "Canvary" electric water heaters, in which the inner cylinder is suspended within highly efficient insulating material, and is in no way metallically connected with the outer case. The heaters are automatic, being controlled by a thermostat, designed to operate without the use of springs. The element is of solid construction with a large heating surface. There is a non-drip device. The element and thermostat are removable without emptying the tank. The outer case is finished in cellulose enamel, with coloured bands to tone with surroundings. The heaters are made in sizes from 1½ to 22 gallons.

ARCHIBALD LOW AND SONS, LTD., Merkland Works, Partick, Glasgow, W.1, show a comprehensive range of domestic apparatus and appliances, together with a 6 kW baking oven and 6kW bakeplate for scones, pancakes, etc. Electric continuous supply water boilers for tea making, tramcar tubular heaters, etc. are also included.

The BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION includes in its exhibit a typical window display, a poster display, a display of all the papers and journals in which the association advertises, a display of E.D.A. literature and reports, a 1930 refrigeration display window cut-out, and other examples illustrating the E.D.A. services to the industry.

SADIA, LTD., 22, Newman Street, London, W.1, are featuring automatic electric water heaters of the pressure type, self-contained heaters, with ball tank, heaters with a novel anti-drip device, new type table stoves, thermostats and time switches, immersion heaters and heating pipes, etc.

The HORSTMANN GEAR CO., LTD., Newbridge Works, Bath, are exhibiting a complete range of Newbridge automatic electric time-switches suitable both for public lighting and for shop window lighting control, and other indoor uses.

FERRANTI, LTD., Hollinwood, Lancs. In addition to a stand at the official exhibition this company has taken showroom premises at No. 2, Carlisle Buildings, in Carlisle Road. At both these two centres there is displayed and demonstrated an extensive range of fires and water heaters, together with thermostats and relays of various type for off peak control of thermal storage equipment. In addition, bell-ringing transformers and certain other similar small appliances of domestic interest are also shown. Visitors to the firm's showroom will also have facilities of hearing various all-mains wireless receiving sets and moving coil loud speakers. Ferranti water heaters are now supplied in all sizes from two gallons upwards, all thermostatically controlled. The smaller heaters are of the wall pattern, intended primarily for connection direct to the pressure main for operation on the displacement principle, to deliver hot water to one point only. They can be used in connection with ball valve feed tanks to give a supply of hot water at several taps. The larger heaters, of capacities from 20 gallons upwards, are arranged for floor mounting, and are intended generally for central storage supplies of hot water for all household needs. Heaters of this type can, of course, be installed to work on true thermal storage principles, the electricity supply being controlled by means of a load levelling relay, time switch or other device to restrict its consumption to off peak conditions of the supply system. With heaters of suitable size this restriction of electricity supply does not, of course, in any way restrict the hot water service. Particular interest will no doubt centre upon a new construction of a fire which when built into an ordinary flue still delivers into the room 96% of the heat generated in the elements, and utilises the remaining 4% for the purpose of ventilation sufficient to provide two changes of air per hour in a room measuring 15 ft. by 15 ft. by 8 ft.

(*To be continued.*)

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LINE CORROSION.

The Problem of Protection against Atmosphere, Salt and Fog.

AT a meeting of the Overhead Lines Association on May 21, Mr. G. W. Molle read a paper entitled "Corrosion with Special Reference to Overhead Lines." It was known that there were two chief types of corrosion—chemical and electro-chemical—and that the presence of impurities or difference of stress in metals or change in molecular structure or the lodging of foreign bodies on the surface of a metal, or the occurrence of cracks, could start corrosion. In this connection the vibration of overhead conductors, due to wind—might cause such molecular changes as to initiate corrosion. Atmospheric corrosion depended on the presence of moisture and acid gases or on the deposition of water and salts on a metal surface. In practice there were two chief types of corrosion: (*a*) general, caused by acids and (*b*) local or pitting, caused by salt and water.

The paper then outlined the views held by workers who have carried out researches into the theory of corrosion. Coming to some of the more practical details dealt with, it was pointed out that steel containing 0·2 per cent. of copper has such resistance to atmospheric corrosion that it loses only 4 per cent. of its thickness under conditions where ordinary steel loses 70 to 90 per cent., and that copper-steel is being used for transmission towers on the Central England Electricity scheme. The life of galvanised steel towers and poles, it was pointed out, is generally reckoned as from 14 to 50 years, according to local conditions. In a bad industrial atmosphere it had been found that galvanising is not so efficacious as painting. Some difference of opinion existed as to the best method of protecting steel supports. Reference was then made to research work carried out on deterioration of reinforced concrete poles and the precautions necessary when dealing with zinc, copper and aluminium were outlined by way of references to previous publications. It was also pointed out that in the presence of moisture, corona causes the formation of nitric acid with possible deterioration of conductors on high voltage lines, but it was added, troubles at one time attributed to this were now attributed to vibration.

Discussing forms of protection other than galvanising and painting, metal spraying was mentioned, as was the fact that chromium plating has been used for outdoor overhead switchgear. An interesting application was the spraying of porcelain insulators inside and outside as a preventative of corona; zinc, tin or copper being used. Cable clamp jaws have also been coated with copper to overcome the inconvenience of losing loose copper linings in the field. The estimated life of sprayed steel frameworks is 15 years, and it is also claimed that as there is no necessity to provide for corrosion losses, comparatively light steel can be used, the saving in steel paying for the coating process. There are other methods of protecting metal but in Mr. Molle's opinion the only one of importance from the overhead line point of view is sherardising. Stainless steel and cadmium plating were coming into use in connection with open air switchgear. It had been found in America that aluminium wire was the best for hornbreak fuses in situations where corrosion is likely to occur. If carbon tetrachloride fuses were used, the bursting of a glass tube may release the corrosive fluid and damage surrounding ironwork.

Discussion.

Mr. C. H. E. RIDPATH (British Aluminium Co.) said the liability of aluminium to corrosion depended on its purity and on the actual conditions of wire drawing. Against cases of corrosion with aluminium there were innumerable instances in which highly satisfactory results had been obtained over long periods.

Mr. F. SWARBRICK (Basingstoke) said as regards aluminium conductors, some 15 years ago he erected a line on the west coast and when he saw the line 12 months ago the corrosion was negligible.

Mr. J. H. C. BROOKING said the Navy, which probably had the greatest difficulty of all in regard to corrosion, depended on ordinary paint.

Mr. F. CHRISTY (Chelmsford) said he had experienced trouble with electrolysis at Bude on the north coast of Cornwall.

Mr. W. FENNELL drew attention to the fact that various metals were attacked in different ways in different parts of the country and suggested that the Central Electricity Board should expose samples of the metal it proposed to use for its towers and cables in various parts of the country and see the effect of the atmosphere before erecting such gear.

RESEARCH AND WIRELESS.

Presidential Address to Institute of Physics—Contributions to Science.

By DR. W. H. ECCLES, F.R.S.

THE stability which the Institute had attained after a life of ten years showed that its founding was justifiable, and the subject of wireless telegraphy and telephony had been chosen for the address as an illustration of the constructive work of the physicists in a typical modern enterprise. In preparing an account of the contributions of physicists to wireless Dr. Eccles omitted all reference to the engineers who had adorned the industry, as otherwise his address would be a complete history. With this intention of making a case for the physicist, he began by pointing out that Hertz's experimental demonstration in 1888 of the physical existence of electric waves was the foundation of wireless. But Hertz's apparatus was insensitive, and therefore the detectors discovered by Lodge, Branly and Minchin in 1889 and 1890 were an essential apparatus to any prospective practical application.

After these purely scientific investigations had provided the means and materials, wireless telegraphy was born at the British Association meeting at Oxford in 1894, when Lodge sent Morse signals from a spark apparatus worked by a telegraph key and recorded them on a moving paper tape by receiving apparatus at a distance. Later, in 1897, Lodge's laboratory produced the method of tuning aerials by inductance coils, thus enabling each transmitting station to correspond with a selected receiving station tuned to it. Another laboratory product was the arc generator of continuous waves (due to Duddell and Poulsen). It led the way to wireless telephony, which was developed rapidly by Fessenden, a professor of physics, until in 1907 the human voice was heard across the Atlantic. This ranked as the greatest achievement of wireless up to that date, for telephony was then impossible on long cables.

The Thermionic Valve.

In 1913 the amplifying valve came to maturity; it was purely the work of physicists, the use of a grid being traceable to the experiments of a German physicist in 1902. The coming of the valve brought two consequences, firstly the scrapping of the spark stations which had been laboriously developed during 15 years of pioneer engineering work, and, secondly, after the war, the popularisation of wireless telephony in the form known as broadcasting.

At the present moment the industrialists of this country were indulging in profound self-examination and there was much discussion of the process called rationalisation, which was brought into prominence in 1927 by the World Economic Conference at Geneva. The main object of rationalisation was to reduce the costs of production and operation in important industries, and its aspects were multitudinous. But keeping to the technological side, an important instrument of rationalisation was standardisation, and another was the modernisation of plant and products by the introduction of the latest invention and knowledge. Now there was a certain amount of contradiction here, for standardisation was opposed to modification; and the conflict had, so far as he knew, not yet been thoroughly discussed. To put the matter another way, it was not economic to standardise machinery or products too soon, that was before the latest improvements had been incorporated, and, on the other hand, it was not economic to modify a standardised form until the costs of adopting it had been recovered. This conflict was well illustrated in the history of wireless, and unceasingly appeared in many industries, such as the electrical industry, and therefore the physicist was deeply concerned in it. To those responsible for making decisions it was no easy task to settle when to introduce improvements and when to stop improving in order to standardise. They probably regarded the physicist as the villain of the piece, for he had been, in certain industries, the cause of many a sudden change of direction, the source of many a revolutionary idea. But the better view of the position of the physicist in this matter was that he possessed potentialities for helping as well as for disturbing the stability desirable even in progressive motion; being intimately connected with the laboratories whence sprang the sort of invention that shattered the established technique, he was better equipped than others to forecast in some degree the direction of forthcoming change and to materially assist in deciding the instant and mode for standardising and for modifying.

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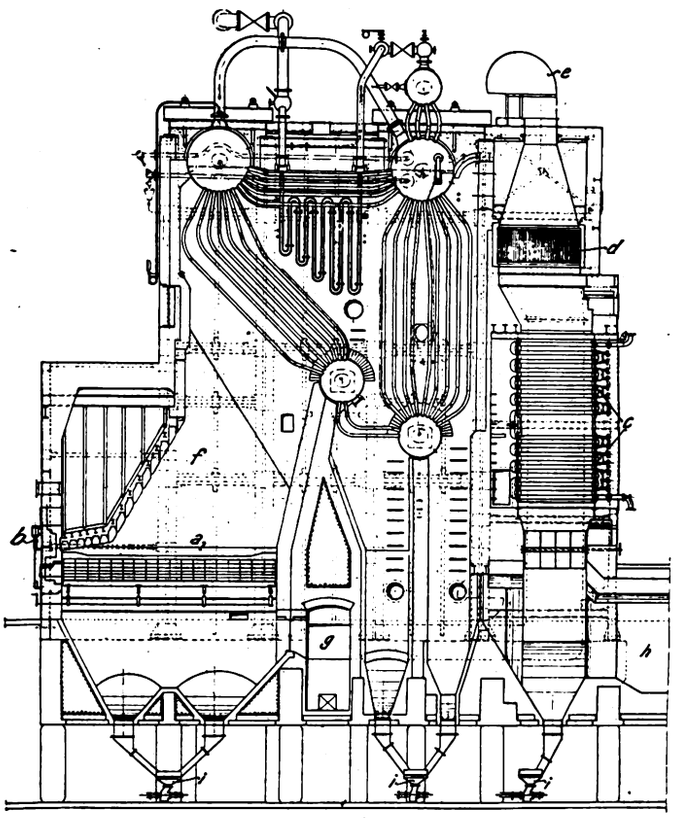
POWER STATION DEVELOPMENT OF THE ELEKTROWERKE COMPANY.

Special Features of the New Plant at Golpa-Zschornewitz Power Station—730 000 kW Installation—Turbo Generators of 100 000 kVA—Lignite-fired Boilers.

By DR. A. PEUCKER *

THE Elektrowerke Company has a share capital of 90 million marks (about 4½ millions sterling) which is entirely held in Germany, but has also received loan capital from the United States to the extent of $12 500 000 (about £2 570 000). The company generates power in three brown coal (lignite) power stations and delivers it by means of an 110 kV network to cities, provinces, distribution companies and chemical industries over the whole of Central Germany. The lignite is obtained primarily from open workings, which yielded 4 803 678 metric tons in 1928. A small part of this output was sold. The lignite has a moisture content of 54 to 56 per cent., 6 per cent. ash, a heat value of 2 000 to 2 250 calories per kg. of fuel (3 600 to 4 050 B.Th.U. per pound), and an ash melting point of 1 150° C. (2 100° F.). In the three power stations of the



(a) Grate. (b) Oil Drive for Stoker. (c) Economiser. (d) Air Preheater. (e) Ventilator. (f) Firebox. (g) Hot Air Duct. (h) Flue. (i) Feed Water Inlets.

One of the new boilers of 1 000 sq. m. heating surface at the Golpa-Zschornewitz power station of the Elektrowerke Company.

company, plant of a total installed capacity of 460 000 kW was available during 1928, and it produced a combined output of 2 009 915 700 kWh. During 1929, the plant capacity was increased to 730 000 kW, equivalent to 868 490 kVA. The new machines were put into operation at the end of that year, the output being 2 332 million kWh ; they include two units of 100 000 kVA each, together with boiler-plant of a remarkable character. For these extensions, the existing boiler pressure of 16 atmospheres (235 lb. per sq. in.) was retained, because high pressure boilers and plant for at least 100 atmospheres (1 470 lb. per sq. in.) had not been sufficiently tested for large central stations, and with a cheap fuel like lignite such plant would not prove an economic proposition. An intermediary pressure was not to be recommended, as the ultimate adoption of at least 100 atmospheres with a step-down arrangement was foreshadowed, and the necessary intermediary superheating would be more advantageous at 16 atmospheres (235 lb.) than at an intermediate pressure. The new boiler houses of the Elektrowerke Company have boiler units of 1 000 sq. m. (10 764 sq. ft.) heating surface each, with cast iron gilled pipe economisers, plate air-pre-heaters and super-heaters. The boilers are fired with raw lignite, which is delivered in large capacity wagons which carry the fuel direct from the land-dredger excavators to the boiler house conveying plant. Despite the low heating value of the fuel, a duty of 60 tons of lignite per hour has been successfully accomplished for one boiler. It is hoped, with further improvements during the next few years, to reach 70 tons per hour per boiler.

The boilers have drums which are bent round and rivetted, a system in contrast to that used in the United States, which system has given satisfaction for a number of years to the Elektrowerke Co. The boilers are fitted with automatic underfeed stokers, operated by oil-pressure rams. The feed water is heated by the regenerative method to 110° C (230° F.) before it reaches the economiser, the remaining utilisation of the hot flue gases takes place in the air heater up to a temperature of 170° C (338° F.). The low melting point of the ash forbids a higher degree of the air heating. The boiler feed-water is de-gassed to a degree of less than 0·1 milligramme of oxygen per litre, and it is passed through the economiser at a speed of at least 0·5 metres (about 20 inches) per second; by these means, corrosion has been completely eliminated. The boiler house has a fuel bunker capacity equivalent to 0·536 cubic metres (18·9 cubic ft.) per kW.

Capacity of the Plant Installed.

The turbines, each of 100 000 kVA capacity, take steam at 360 to 385° C. (680 to 725 ° F.). One of these machines is of the two cylinder type, the other has three cylinders ; both, however, are of single-shaft construction.

The three cylinder machine has a purely hydraulically operated control gear for starting, regulation, and stopping. Both machines are bled twice to heat the feed-water to 110° C. (230° F.) and to distill a 3 per cent. make up feed. Quick acting double shut off gear is placed in the main steam supply pipes, consisting of a valve and a controlling arrangement with two separate independent safety regulators. Each turbine unit has a condenser with 6 000 sq. metres (64 644 sq. ft.) of cooling surface, operated by steam pumps of 1 000 kW. The generators are wound for 13 000 V. The stator weighs 210 metric tons, and the rotor 120 tons, the turbine operates at 1 500 revs. per minute. The cooling air for each generator is circulated by means of a fan placed near the exciter generator on the main turbine shaft. The construction of the whole turbine unit is such that with an over-speed of 25 per cent., there is still for every part a factor of safety of two. The turbine house is fitted with two 110 tons overhead travelling cranes ; it requires, including all auxiliary plant space, a building capacity of only 0·3 cubic metres (10 cubic ft.) per installed kilowatt. The main transformers are placed near the respective turbo-generators and step up to 115 kV. The connection between each step up transformer and the main switchboard is made by means of 115 kV cables ; for each turbo-set there are 3 single-core cables, each of 525 sq. mm. conductor area, with a fourth as a spare. The copper conductor is not of the hollow oil-filled type, but is of the normal type with the usual cable-form ; the paper dielectric is 18 mm. One of the two sets of cables has a protecting sheath of non-magnetic steel wire over the lead, the other is without such an arrangement. The length of each cable is about 700 metres and all cables are made in two sections to enable the joint construction to be tested. A patented combined concrete and tile system of construction for the cooling towers was adopted.

As the plant has only been in operation a short time, the author cannot give the operating efficiency data, but the heat input of the turbine, including auxiliaries, is about 3 250 kg. calories (12 900 B.Th.U.) per kWh, and with a 60 tons of fuel evaporative duty per hour the boiler efficiency will be about 86 ; a favourable figure when taking into account the low steam pressure, the use of raw lignite and of artificially cooled condensing water.

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PNEUMATIC PLANT IN POWER STATIONS.

Installation at Deptford—Methods of Pneumatic Conveyance—Handling Riddlings and Soot—Grit Emission and the Remedy.

THE extension of electric power stations in connection with the grid scheme is giving increased prominence in the minds of engineers to two significant problems. The first and perhaps less important of these is the question of conveying and making use of riddlings and disposing of soot. The second is the vital subject of preventing grit emission. Our attention was recently called to the work being done to solve these problems by Pneumatic Conveyance and Extraction (1929), Ltd., of Broadway Buildings, Broadway, Westminster, S.W.1. The Deptford East station affords a good example of the methods used by the firm for achieving efficient pneumatic conveyance, while the other side of its activities—grit extraction,—is illustrated at the Croydon power house.

Before describing in detail the apparatus employed at Deptford it is proposed to give a general outline of the "Pneuconex" system as used in power stations. The first necessity is a system of tubing extending the length of the boiler section of the station and from bottom to top. Through parts of this tubing the riddlings are induced by vacuum action, while it is the function of other parts to dispose of the soot. Arrangements have to be made for the collection and discharge of the material to be dealt with, for creating the suction, for eliminating the difficulties caused by bends in the tubing, and for separating fine gauge grit from the air stream before it can pass into the exhausting machinery and so injure it. In this connection it must be made clear that the system of pneumatic conveyance here described does not operate on the principle of a pump, but arranges for the introduction of air to the collection end of the system at a velocity sufficient to accelerate and float the material to be conveyed. The material is carried in suspension to the discharging point, where—owing to a considerable decrease in the air velocity—it is deposited in bunkers, thence to be remixed with fuel and passed to the stokers, as in

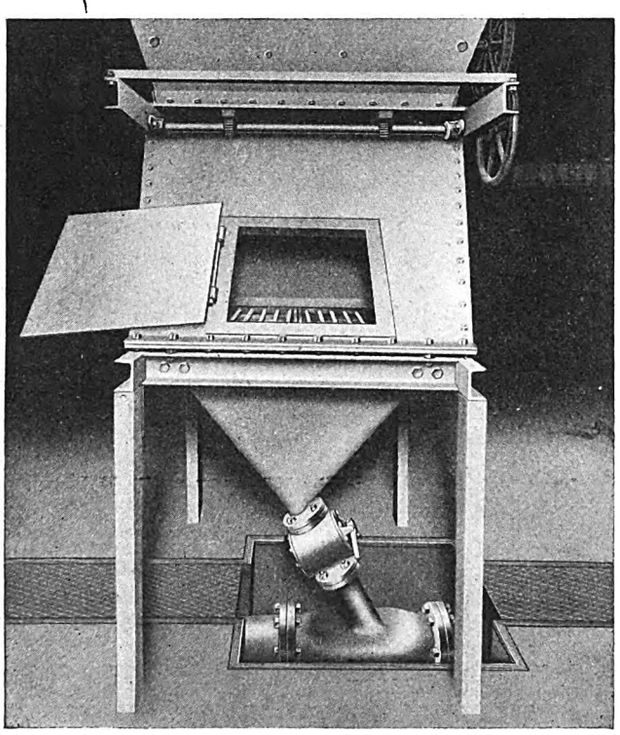

Fig. 1.—Close-up view of loading unit at Deptford power station.

the instance of riddlings, or to be delivered to wagons or barges, as in the instance of soot.

Fig. 1 is a close-up view of one of the patented loading units of the pneumatic installation at Deptford—handling riddlings from chain-grate stoker fired Babcock and Wilcox boilers. It will be noticed that the feeding pipe enters the horizontal main at a particular angle, this being one of the features of the firm's tangential method of introducing material. The pipes are so arranged that only a certain fraction of the cross sectional area can be occupied by the material, which gravitates through the openings in the horizontal plate (seen through the open door in Fig. 1), the limit of occupation being determined by the frictional coefficient of the particular substance to be conveyed. After passing through the openings the material forms a series of pyramidal piles inside the piping, and conveyance is effected by opening the isolation valve. Air is admitted from the basement in which the equipment is installed; the high velocity air steam passes the loading orifices at right-angles, and the induction takes place on simple ejector

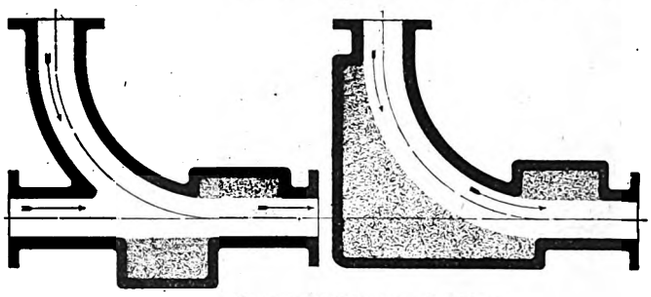

Fig. 2.—Sections of "Pneuconex" fittings.

principles—the direction of flow in the main pipe being from left to right.

When they have passed the collection point the riddlings enter into the next stage of their journey—the mains—which are ordinarily of mild steel. Large diameter systems such as this have flanged joints throughout, but smaller installations are provided with flanges for connection to cast-iron fittings—or, where initial economy is essential, screwed muff couplings are utilised. The joint rings are of an asbestos and rubber composition. Independent of the conveying mains are the air mains, which transfer—in effect—the partial vacuum produced at the exhauster to the various points in the station where it is to be applied. It may be compared with other potential sources of energy, such as a compressed air system or an electric circuit, as it may be tapped wherever desired and its uses are not necessarily confined to the particular purposes for which it is primarily installed. Thus at Deptford the system is also employed for vacuum cleaning; brass capped nozzles are provided at several points, and by screwing on lengths of flexible steel house, the exteriors and interiors of the boilers and other parts of the machinery may be readily cleaned.

One of the inherent difficulties encountered in the design of pneumatic conveyance systems is the necessity for changes in direction. Such abrasive substances as riddlings, where constantly driven against the angular portion of a fitting, tend to destroy it in a comparatively short time. This trouble is overcome by the use of patented fittings, which are recessed in the manner shown in Fig. 2. The two special cavities are thus filled with the passing material, which forms a shield against the bombardment of fresh divisions of its kind—while at the same time it facilitates the travel of the substance through the fitting, by damping the blows of the riddlings both at the point where the two lines of direction meet and at the point that normally receives the ricochet. The recessed portions of the fittings are, in addition, made detachable, so that when they do become worn they can be simply replaced by unscrewing a few nuts.

The riddlings are raised by the conveying mains a vertical height of 130 ft., after which they are discharged into one of a pair of bunkers. When one of these two bunkers becomes full, the flow of riddlings is diverted into the other by the manual operation of a valve. The riddlings can then be mixed with the graded coal, in the desired proportion, and re-supplied to the mechanical stokers. Although automatic discharges are available for use with the "Pneuconex" system, none are employed at Deptford, where the section of the system dealing with soot discharges into a large bunker in the power station basement; from this bunker the soot can be disposed of, when convenient, by means of the hydraulic sluice.

Having arranged for delivering the riddlings at the requisite point the next necessity is to separate the residue of solids from the air stream—before the latter passes through the exhauster and into the open. At Deptford this is accomplished by a machine known as a rotary separator, which operates by combined centrifugal force, reduction of air velocity and the

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provision of a winding path for the air stream. The circular element of the rotary separator is illustrated in Fig. 3. The shaft is driven by an electric motor, and to it are secured perforated discs, of which the peripheries rotate in an annular chamber. To the faces of the discs are fixed runners, which create the necessary centrifugal action and counter-flow.

The separator is claimed to remove from the air stream some 98% of the solid particles, which are chiefly in the form of very fine dust. The balance is in turn extracted by the air washing plant. A section of the "Pneuconex" patent air washer is shown in Fig. 4. Air is admitted through the chamber A, of which the lower end is bell-shaped to facilitate the exit of the air and to direct it in the desired direction. Chambers B and C are fitted with baffles D, one overlapping the other, and disposed slightly below the horizontal to enable them to be easily flushed. For the more complete breaking up of the air stream louvred baffles E are provided; space does not permit us to mention the various ingenious features of the detailed design. Nozzles F, for flushing and filling, are shown in the two top corners of the central rectangle.

Beyond the air washer is the rotary exhauster which supplies power to the whole system. At Deptford the exhauster is situated in one corner of the main basement, where it takes up a pleasantly small amount of space. Its 500 V motor, manufactured by the Lancashire Dynamo and Motor Co., is rated at 60 B.H.P., but the average output is in the neighbourhood of 40 H.P. Hoffman ball or roller bearings are used throughout and the design agrees with the special recommendations of the Hoffman Manufacturing Co. The machine consists essentially of a carcase, rotor, hinged vanes, connecting rods and crankpin. The drive is transmitted by chain to the rotor, which is mounted eccentrically in the carcase. The crankpin is at all times stationary, the function of the connecting rods being to limit the movement of the vanes, so as to prevent them coming in contact with the carcase. The carcase and rotor are of cast iron, and the vanes of aluminium, while crankpin and connecting rods are forgings.

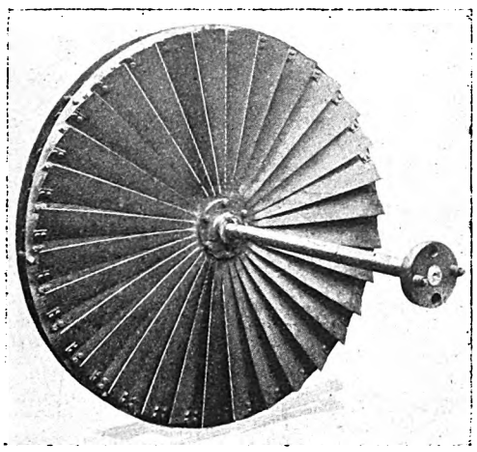

Fig. 3.—"Pneuconex" rotary separator.

The cleansed air is discharged to the atmosphere through a large silencing chamber built of brick.

Grit Extraction.

The grit catching equipment at the County Borough of Croydon Electricity Works is of particular interest, in view of the extensive troubles caused by grit emission at Croydon before its installation. The cyclonic method of separation is employed, and the design is such that centrifugal force and gravity combine to eliminate the dust from the flue gases. The grit catchers are not standardised, but have to be specially adapted to circumstances—and where they are installed in previously erected power stations, many difficulties have to be overcome. At Croydon, the grit catchers have had to be designed to fit in under the sloping glass roof of the station, at the top of which there was little enough space to spare, as shown in Fig. 5.

The grit catchers operate by providing a relatively long and circular path for the flue gases, in such a way that the solids—carried at high velocity—are flung towards the periphery of a conduit of triangular section. The solids pass through an orifice in the periphery or inverted apex into a bunker, from which they are discharged by way of a vertical pipe and are removed to dump by trucks on the ground level of the station. Though the sides of the cones and inlet bends are normally manufactured from hardened steel having a Brinell figure of 270 to 275, at Croydon these are of ordinary mild steel plate, ¼ in. thickness. The four equipments have been in operation for some considerable time but no undue wear has taken place. The reason for introducing the hardened plate is in anticipation of the abrasive wear of the grit during the process of extraction. Cones normally operate in parallel; the outlet slot of each being usually about 20 ft. in length; a breeches piece is fitted at the inlets, connecting the supply duct to each cone in a manner ensuring the equal division of gases at this point. The increase of velocity essential to efficient extraction is only operative across the inlet bends and cones, the consequent resistance normally being overcome by the induced draught plant, which is, of course, an integral auxiliary of up-to-date steam raising plant.

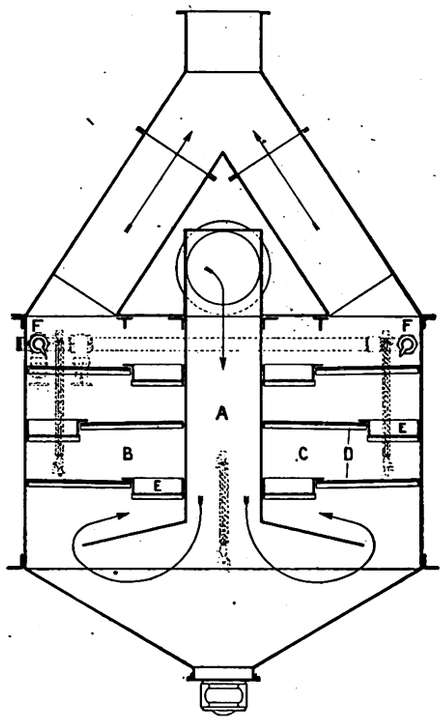

Fig. 4.—Section through "Pneuconex" airwasher.

Though only a very small percentage of the gases escapes through the slot, a certain amount of such escape is inevitable, and adequate steps are taken to return the gases to the cones. The return is effected by allowing sufficient area between the cones and bunker sides, to ensure that the escaping gases rise slowly through this space to the "pressure relief ports," which

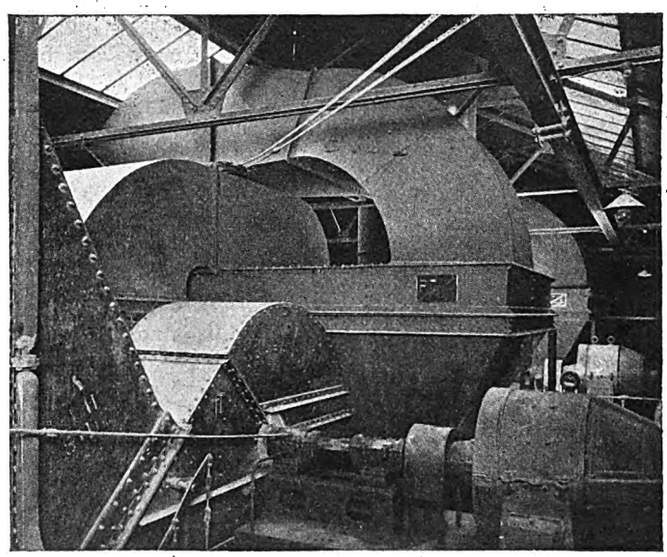

Fig. 5.—Grit catchers at Croydon power station.

are placed at the inlet ends of the cones. The gases thus re-enter the system, and are again treated before passing from the unit.

An analysis of the grit extracted at Croydon has shown that 55·5 per cent. will pass through a 200-mesh sieve.

Bangor Electricity Committee is in favour of laying distributing mains where there is a potential use of electricity, irrespective of whether there is an immediate demand for supply or not. The Electrical Engineer has been instructed to submit a programme of cables which might be laid in the future.

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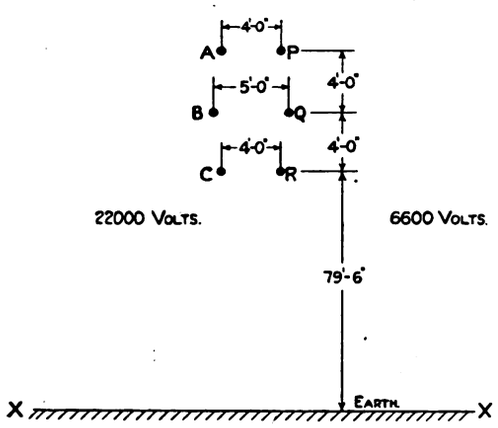
INTERFERENCE BETWEEN POWER LINES.

Case of 22 000 V and 6 600 V 3-phase Overhead Lines on the Same Poles when the 6 600 V Line is Entirely Disconnected.

By S. AUSTEN STIGANT, M.I.E.E., F.Am.I.E.E., and H. MORGAN LACEY, B.Sc., A.K.C., A.M.I.E.E.

THE effect of electrostatic and electromagnetic induction between adjacent parallel circuits is usually of importance only when telephone circuits are in close proximity to overhead power lines. A case recently came to the authors' notice, however, where there was a likelihood of interference between two separate power circuits where it was proposed to utilise the same set of poles for two 3-phase overhead power lines, the pressures being 22 000 V and 6 600 V respectively, and the frequency 50 cycles. While it was not thought that any serious effects would follow this procedure, it was still considered advisable to calculate the magnitude of the various inductive effects before putting the proposed scheme into operation.

The particular case considered is when the 22 000 V line is in use and the 6 600 V line is entirely disconnected from all other apparatus, both at the sending and the receiving ends of the line. This case is chosen because the inductive effects are likely to be worst under these conditions. If the 6 600 V lines are connected through machines, or other apparatus, having a low impedance, it is probable that the various induced pressures will be neutralised by the flow of equalising capacitance currents, the latter being, in all probability of very small magnitude. This aspect of the case is dealt with in greater detail at a later stage.



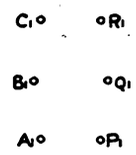


Fig. 1.—Line spacings.

In setting out the calculations involved, it is not proposed to attempt anything in the nature of proof of the various formulæ employed, the object of the article being merely to indicate the method of arriving at the desired results.

In Fig. 1 the 22 000 V conductors are indicated by the letters *A*, *B* and *C*, while the 6 600 V conductors are marked *P*, *Q* and *R*. The ground is indicated by the line *XX*, and the images of the various conductors by corresponding letters with dashes. In order to calculate the various capacitances, it is necessary to know all the distances between conductors and their images. All the distances required in the calculations are set out in Table 1. The distance between any two points (*i.e.* any one line and any other line or image) is given in this table by the figure common to the line and column marked with the letters corresponding to the points in question. The only other dimensions required are the radii of the various conductors, and it so happens in this example that these are all equal.

Radius of each conductor = 0·2075″
= 0·0173′

Electrostatic Effects.

Let e_a be the pressure at any instant on line *A*.
e_b ,, ,, ,, ,, ,, *B*.
e_c ,, ,, ,, ,, ,, *C*.

Then if e_{pa} be the pressure induced in line *P* by the pressure e_a, it can be proved that

$$e_{pa} = e_a \times \frac{M_p}{M_a + C_p}$$

where M_p is the mutual capacitance of *P*, and *A* with its image *A′*
M_a ,, ,, ,, ,, *A*, ,, *P* ,, ,, *P′*
C_p is the capacitance of *P* to earth.

It can also be shown that—

$$M_p = \frac{b_1}{b_1 b_2 - a_1 a_2}$$

$$M_a = \frac{b_2}{a_1 a_2 - b_1 b_2}$$

$$C_p = \frac{a_1}{b_1 b_2 - a_1 a_2}$$

where—

$$a_1 = 2 \log_e \frac{AA^1}{r}$$

(NOTE.—$\frac{1}{a_1}$ is the capacitance per unit length of line *A* to earth).

$$a_2 = 2 \log_e \frac{PP^1}{r}$$

$$b_1 = 2 \log_e \frac{PA^1}{PA}$$

$$b_2 = 2 \log_e \frac{AP^1}{AP}$$

Thus the total pressure e_p induced on line *P* by lines *A*, *B* and *C*, at any instant is given by—

$$e_p = e_a k_a + e_b k_b + e_c k_c$$

where

$$k_a = \frac{M_p}{M_a + C_p}$$

$$k_b = \frac{M_p}{M_b + C_p}$$

$$k_c = \frac{M_p}{M_c + C_p}$$

If the particular instant be chosen when e_a is at its maximum value, say *E*,
Then

$$e_b = E\left(-\tfrac{1}{2} + j\frac{\sqrt{3}}{2}\right)$$

$$e_c = E\left(-\tfrac{1}{2} - j\frac{\sqrt{3}}{2}\right)$$

Line P.

1. With respect to *A* :—

$$a_1 = 2 \log_e \frac{AA^1}{r} = 2 \log_e \frac{175}{0{\cdot}0173} = 2 \log_e 10120 = 18{\cdot}44$$

$$a_2 = 2 \log_e \frac{PP^1}{r} = 2 \log_e \frac{175}{0{\cdot}0173} = 18{\cdot}44$$

$$b_1 = b_2 = 2 \log_e \frac{PA^1}{PA} = 2 \log_e \frac{175{\cdot}1}{4{\cdot}0} = 2 \times 3{\cdot}781 = 7{\cdot}562$$

$$M_p = \frac{b_1}{b_1 b_2 - a_1 a_2} = \frac{7{\cdot}562}{(7{\cdot}562)^2 - (18{\cdot}44)^2} = -\frac{7{\cdot}562}{26{\cdot}0 \times 10{\cdot}878} = -0{\cdot}02674$$

$$M_a = \frac{b_2}{a_1 a_2 - b_1 b_2} = 0{\cdot}02674$$

$$C_p = \frac{a_1}{b_1 b_2 - a_1 a_2} = -\frac{18{\cdot}44}{26{\cdot}0 \times 10{\cdot}88} = -0{\cdot}0652$$

TABLE I.

DISTANCES IN FEET.

	P	Q	R	A′	B′	C′	P′	Q′	R′
A	4·0	6·02	8·94	175	171	167	175·1	171·1	167·1
B	6·02	5·0	6·02	171	167	163	171·1	167·1	163·1
C	8·94	6·02	4·0	167	163	159	167·1	163·1	159·1
P	0	4·03	8·0	175·1	171·1	167·1	175	171	167
Q	4·03	0	4·03	171·1	167·1	163·1	171	167	163
R	8·0	4·03	0	167·1	163·1	159·1	167	163	159

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$$k = \frac{M_p}{M_a + C_p} = \frac{-0.02674}{-0.03846} = 0.6955$$

2. With respect to B :—

$$a_1 = 2 \log_e \frac{BB^1}{r} = 2 \log_e \frac{167}{0.0173} = 18.37$$

$$a_2 = 2 \log_e \frac{PP^1}{r} = 18.44$$

$$b_1 = b_2 = 2 \log_e \frac{PB^1}{PB} = 2 \log_e \frac{171.1}{6.02} = 6.7$$

$$M_p = \frac{b_1}{b_1 b_2 - a_1 a_2} = \frac{6.7}{(6.7)^2 - 18.37 \times 18.44} = -0.0228$$

$$M_b = \frac{b_1}{a_1 a_2 - b_1 b_2} = 0.0228$$

$$C_p = \frac{a_1}{b_1 b_2 - a_1 a_2} = -0.06252$$

$$k_b = \frac{M_p}{M_b + C_p} = \frac{-0.0228}{-0.03972} = 0.574$$

3. With respect to C :—

$$a_1 = 2 \log_e \frac{CC^1}{r} = 2 \log_e \frac{159}{0.0173} = 18.27$$

$$a_2 = 2 \log_e \frac{PP^1}{r} = 18.44$$

$$b_1 = b_2 = 2 \log_e \frac{PC_1}{PC} = 2 \log_e \frac{167.1}{8.94} = 5.86$$

$$M_p = \frac{b_1}{b_1 b_2 - a_1 a_2} = \frac{5.86}{(5.86)^2 - 18.27 \times 18.44} = \frac{5.86}{-302.7} = -0.01937$$

$$M_c = \frac{b_1}{a_1 a_2 - b_1 b_2} = 0.01937$$

$$C_p = \frac{a_1}{b_1 b_2 - a_1 a_2} = -0.06037$$

$$k_c = \frac{M_p}{M_c + C_p} = \frac{-0.01937}{-0.04100} = 0.4724$$

Total Effect on Line P.

At the instant when line A has its maximum pressure to earth—

$$e_a = E = 22\,000 \times \frac{\sqrt{2}}{\sqrt{3}} = 17970$$

then, $e_b = -8985 + j\,15\,570$

$e_c = -8985 - j\,15\,570$

and $e_{ps} = (17\,970 \times 0.6955) - (8985 \times 0.574) + (j\,15\,570 \times 0.574)$.
$- (8985 \times 0.4724) - (j\,15\,570 \times 0.4724)$

$= 12\,500 - 9400 \times j\,1582$

$= 3100 + j\,1582$

$= 3475/27^\circ\,5'$ volts.*

Line Q.

1. With respect to A :—

$$a_1 = 2 \log_e \frac{AA^1}{r} = 18.44$$

$$a_2 = 2 \log_e \frac{QQ^1}{r} = 2 \log_e \frac{167}{0.0173} = 18.37$$

$$b_1 = b_2 = 2 \log_e \frac{QA^1}{QA} = 2 \log_e \frac{171.1}{6.02} = 6.7$$

$$M_q = \frac{b_1}{b_1 b_2 - a_1 a_2} = \frac{6.7}{(6.7)^2 - 18.44 \times 18.37} = -0.0228$$

$$M = \frac{b_1}{a_1 a_2 - b_1 b_2} = 0.0228$$

$$C_q = \frac{a_1}{b_1 b_2 - a_1 a_2} = \frac{18.44}{(6.7)^2 - 18.44 \times 18.37} = -0.06275$$

$$k_a = \frac{M_q}{M_a + C_q} = \frac{-0.0228}{0.0228 - 0.06275} = \frac{-0.0228}{-0.03995} = 0.5707$$

2. With respect to B :—

$$a_1 = 2 \log_e \frac{BB^1}{r} = 18.37$$

$$a_2 = 2 \log_e \frac{QQ^1}{r} = 18.37$$

$$b_1 = b_2 = 2 \log_e \frac{QB^1}{QB} = 2 \log_e \frac{167.1}{5.0} = 7.02$$

$$M_q = \frac{b_1}{b_1 b_2 - a_1 a_2} = \frac{7.02}{(7.02)^2 - (18.37)^2} = -\frac{7.02}{25.39 \times 11.35} = -0.02436$$

$$M_b = \frac{b_1}{a_1 a_2 - b_1 b_2} = 0.02436$$

$$C_q = \frac{a_1}{b_1 b_2 - a_1 a_2} = -\frac{18.37}{25.39 \times 11.35} = -0.06375$$

$$k_a = \frac{M_q}{M_b + C_q} = \frac{-0.02436}{-0.03939} = 0.6183$$

3. With respect to C :—

$$a_1 = 2 \log_e \frac{CC^1}{r_a} = 18.27$$

$$a_2 = 2 \log_e \frac{QQ^1}{r_q} = 18.37$$

$$b_1 = b_2 = 2 \log_e \frac{QC^1}{QC} = 2 \log_e \frac{163.1}{6.02} = 6.6$$

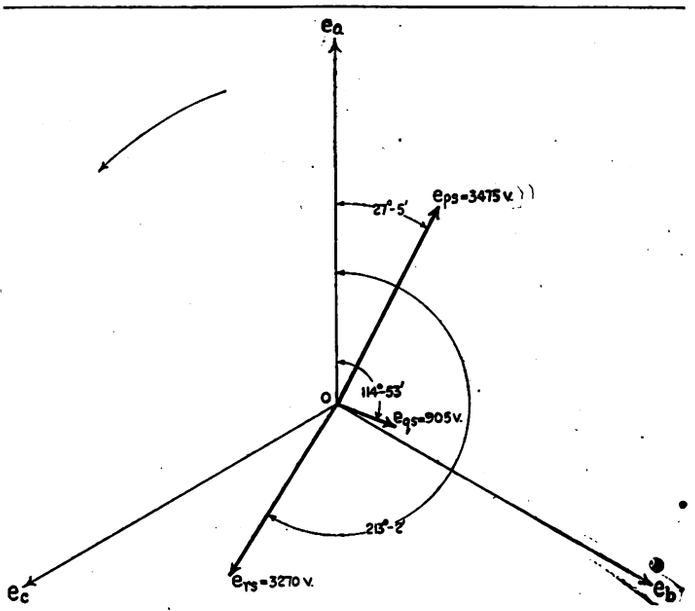

Fig. 2.—Vector representation of electrostatically induced pressures on lines P, Q and R.

$$M_q = \frac{b_1}{b_1 b_2 - a_1 a_2} = \frac{6.6}{(6.6)^2 - 18.27 \times 18.37} = -0.0226$$

$$M_c = \frac{b_1}{a_1 a_2 - b_1 b_2} = 0.0226$$

$$C_q = \frac{a_1}{b_1 b_2 - a_1 a_2} = -0.06254$$

$$k_c = \frac{M_q}{M_c + C_q} = \frac{-0.0226}{-0.03994} = 0.5656$$

Total Effect on Line Q.

$e_{qs} = (17970 \times 0.5707) - (8985 \times 0.6183) + (j\,15570 \times 0.6183)$
$- (8985 \times 0.5656) - (j\,15570 \times 0.5656)$

$= 10260 - 10640 + j\,820$

$= -380 \times j\,820$

$= 905/114^\circ\,53'$, volts. (See Fig. 2.)

Line R.

1. With respect to A :—

$$a_1 = 2 \log_e \frac{AA^1}{r} = 18.44$$

$$a_2 = 2 \log_e \frac{RR^1}{r} = 2 \log_e \frac{159}{0.0173} = 18.27$$

$$b_1 = b_2 = 2 \log_e \frac{RA^1}{RA} = 2 \log_e \frac{167.1}{8.94} = 5.86$$

$$M_r = \frac{b_1}{b_1 b_2 - a_1 a_2} = -0.01937$$

$$M_a = \frac{b_1}{a_1 a_2 - b_1 b_2} = 0.01937$$

$$C_r = \frac{a_1}{b_1 b_2 - a_1 a_2} = -0.06092$$

$$k_a = \frac{M_r}{M_a + C_r} = \frac{-0.01937}{-0.04155} = 0.4662$$

2. With respect to B :—

$$a_1 = 2 \log_e \frac{BB^1}{r} = 18.37$$

$$a_2 = 2 \log_e \frac{RR^1}{r} = 18.27$$

* This result means that the total pressure e_{ps} induced electrostatically on line P by lines A, B and C, has a maximum (peak) value of 3475 V and its vector lags 27° 5′ behind the pressure vector representing e_a (see Fig. 2).

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$$b_1=b_2=2\log_e\frac{RB^1}{RB}=2\log_e\frac{163\cdot1}{6\cdot02}=6\cdot6$$

$$M_r=\frac{b_1}{b_1b_2-a_1a_2}=-0\cdot0226$$

$$M_b=\frac{b_1}{a_1a_2-b_1b_2}=0\cdot0226$$

$$C_r=\frac{a_1}{b_1b_2-a_1a_2}=-0\cdot06288$$

$$k_b=\frac{M_r}{M_b+C_r}=\frac{-0\cdot0226}{-0\cdot04028}=0\cdot561$$

3. With respect to C:—

$$a_1=2\log_e\frac{CC^1}{r}=18\cdot27$$

$$a_2=2\log_e\frac{RR^1}{r}=18\cdot27$$

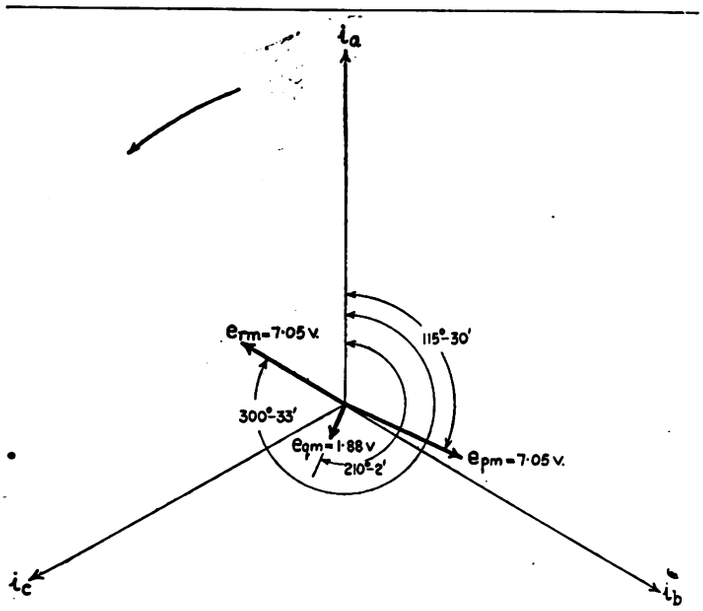

Fig. 3.—Vector representation of electromagnetically induced pressures on lines P, Q and R.

$$b_1=b_2=2\log_e\frac{RC^1}{RC}=2\log_e\frac{159\cdot1}{4\cdot0}=7\cdot366$$

$$M_r=\frac{b_1}{b_1b_2-a_1a_2}=\frac{7\cdot366}{(7\cdot366)^2-(18\cdot27)^2}=-\frac{7\cdot366}{25\cdot64\times10\cdot9}=-0\cdot02635$$

$$M_e=\frac{b_1}{a_1a_2-b_1b_2}=0\cdot02635$$

$$C_r=\frac{a_1}{b_1b_2-a_1a_2}=-\frac{18\cdot27}{25\cdot64\times10\cdot9}=-0\cdot06536$$

$$k_e=\frac{M_r}{M_e+C_r}=\frac{-0\cdot02635}{-0\cdot03901}=0\cdot6754$$

TOTAL EFFECT ON LINE R.

$$e_{rs}=(17970\times0\cdot4662)-(8985\times0\cdot561)+(j\ 15570\times0\cdot561)$$
$$-(8985\times0\cdot6754)-(j\ 15570\times0\cdot6754)$$
$$=8380-11120-j\ 1780$$
$$=-2740-j\ 1780$$
$$=3270/213°\ 2',\ \text{volts. (See Fig. 2.)}$$

With the lines P, Q and R disconnected, there is therefore no statically induced pressure in excess of that for which the lines are designed. The results of the electrostatic effects of the 22 kV line upon the 6·6 kV line are summarised in Table II. If apparatus having a sufficiently low impedance is connected to the 6 600 V lines, equalising capacitance currents will flow. The remaining pressure due to electrostatic induction from lines A, B and C on lines P, Q and R will then be the vectorial sum of e_{ps}, e_{qs} and e_{rs}. Thus, if e_s be the resultant electrostatically induced pressure—

$$e_s=e_{ps}+e_{qs}+e_{rs}$$
$$=(3100+j\ 1582)+(-380+j\ 820)+(-2740-j\ 1780)$$
$$=-20+j\ 622$$
$$=622/90\ \text{deg. volts.}$$

NOTE.—This resultant induced pressure vector lags 90 deg. behind the pressure vector representing e_a.

ELECTROMAGNETIC EFFECTS.

These effects are based upon the assumption of 100 amperes (peak) i_a, i_b, i_c, in lines A, B and C respectively.

LINE P.

Inductance of line P with respect to lines A, B and C.

$$=\left(\log_e\frac{BP\times CP}{AP^2}+j\sqrt{3}\log_e\frac{CP}{BP}\right)\times10^{-9}\times160934\ \text{henrys per mile.}$$

$$=\left(\log_e\frac{6\cdot02\times8\cdot94}{4\cdot0\times4\cdot0}+j\sqrt{3}\log_e\frac{8\cdot94}{6\cdot02}\right)\times10^{-9}\times160934$$
$$=(1\cdot215+j\sqrt{3}\,0\cdot3963)\times10^{-4}\times1\cdot60934$$
$$=(1\cdot955+j\ 1\cdot104)\times10^{-4}\ \text{henrys per mile}$$

If e_{pm} be the maximum (peak) value of the pressure induced electromagnetically on line P by lines A, B and C.

$$e_{pm}=j\,I\,\omega\,L\ \text{where}\ \omega=2\pi n=314\cdot16$$
$$e_{pm}=j\times100\times314\cdot16\ (1\cdot955+j\ 1\cdot104)\times10^{-4}$$
$$=-3\cdot468+j\ 6\cdot14$$
$$=7\cdot05/115\ \text{deg. }30',\ \text{volts per mile.}*$$

*This result means that the total pressure e_{pm} induced electromagnetically on line P by lines A, B and C has a maximum (peak) value of 7·05 V and its vector lags 115°–30′ behind the current vector representing i_a (see Fig. 3).

LINE Q.

$$\text{Inductance}=\left(\log_e\frac{BQ\times CQ}{AQ^2}+j\sqrt{3}\log_e\frac{CQ}{BQ}\right)\times10^{-9}\times160934\ \text{henrys per mile.}$$

$$=\left(\log_e\frac{5\cdot0\times6\cdot02}{6\cdot02\times6\cdot02}+j\sqrt{3}\log_e\frac{6\cdot02}{5\cdot0}\right)\times10^{-9}\times160934$$
$$=(-0\cdot1855+j\sqrt{3}\,0\cdot1855)\times10^{-9}\times160934\ \text{henrys per mile}$$
$$e_{qm}=j\times100\times314\cdot16\ (-0\cdot2985+j\sqrt{3}\,0\cdot2985)\times10^{-4}$$
$$=-1\cdot625-j\ 0\cdot9374$$
$$=1\cdot88/210\ \text{deg. }2',\ \text{volts per mile. (See Fig. 3.)}$$

LINE R.

$$\text{Inductance}=\left(\log_e\frac{BR\times CR}{AR^2}+j\sqrt{3}\log_e\frac{CR}{BR}\right)\times10^{-9}\times160934\ \text{henrys per mile}$$

$$=\left(\log_e\frac{6\cdot02\times4\cdot0}{8\cdot94\times8\cdot94}+j\sqrt{3}\log_e\frac{4\cdot0}{6\cdot02}\right)\times10^{-4}\times1\cdot60934$$
$$=(-1\cdot932-j\ 1\cdot139)\times10^{-4}\ \text{henrys per mile}$$
$$e_{rm}=j\times100\times314\cdot2\ (-1\cdot932-j\ 1\cdot139)\times10^{-4}$$
$$=3\cdot58-j\ 6\cdot07$$
$$=7\cdot05/300\ \text{deg. }33',\ \text{volts per mile. (See Fig. 3.)}$$

The results of the electromagnetic effects of the 22 kV line upon the 6·6 kV line are summarised in Table III. It will be seen that the electromagnetically induced pressures are very small, and as their vector sum is negligible, the resultant pressure when circulating currents flow through connected apparatus may be disregarded.

TABLE II.

ELECTROSTATICALLY INDUCED PRESSURES, VOLTS, WHEN $e_a=E$.

Lines A, B, C, induce on line P 3475 peak V (2460 RMS V) at an angle of 27°–5′ with e_a=E
" " " " " Q 905 " " (640 " ") " " " " 114°–53′ " " "
" " " " " R 3270 " " (2310 " ") " " " " 213°–2′ " " "

TABLE III.

ELECTROMAGNETICALLY INDUCED PRESSURES IN VOLTS PER MILE, WHEN 100 AMPERES, PEAK VALUE, FLOW IN LINES A, B AND C.

Lines A, B, C. induce on line P 7·05 peak V (5· RMS V) at an angle of 115°–30′ with i_a=I
" " " " " Q 1·88 " " (1·33 " ") " " " " 210°–2′ " " "
" " " " " R 7·05 " " (5· " ") " " " " 300°–33′ " " "

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VOLTAGE CONTROL OF LARGE ALTERNATORS.*

Problem of Maintaining Constant Voltage—Stability and Speed of Response—Grading of Rheostats—Alternator Instability—Trend of Alternator Design.

By H. W. TAYLOR, M.I.E.E.

THE problem of maintaining constant voltage on a generator, when large loads are frequently thrown on and off, is still met with in some mills and factories which still generate their own power.

With power supply from capital stations, incidental variations in legitimate load have become relatively small. But system faults constitute changes of load which require adjustment of the machine excitation.

When a severe fault occurs close to the generating machinery in one section, it is usually impracticable to maintain full

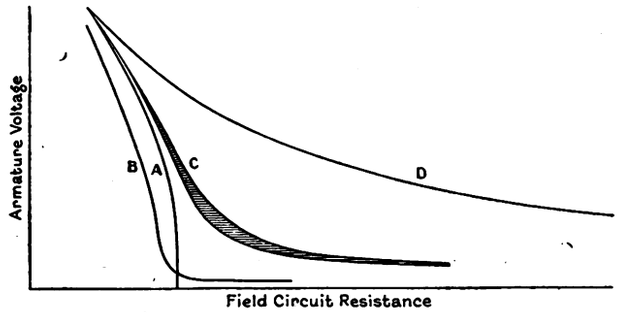

Fig. 1.—Curves illustrating grading of rheostats for different types of exciter.

voltage. When, however, a fault occurs at a distant point, or in an adjacent section, it is usually desired that the excitation on the generators be increased quickly to the limit of the exciter capacity, so as to maintain the supply voltage as near to normal as possible. Side by side with increase in size of system, there is a tendency to increase sizes of generating units. The magnet systems require larger stores of electro-

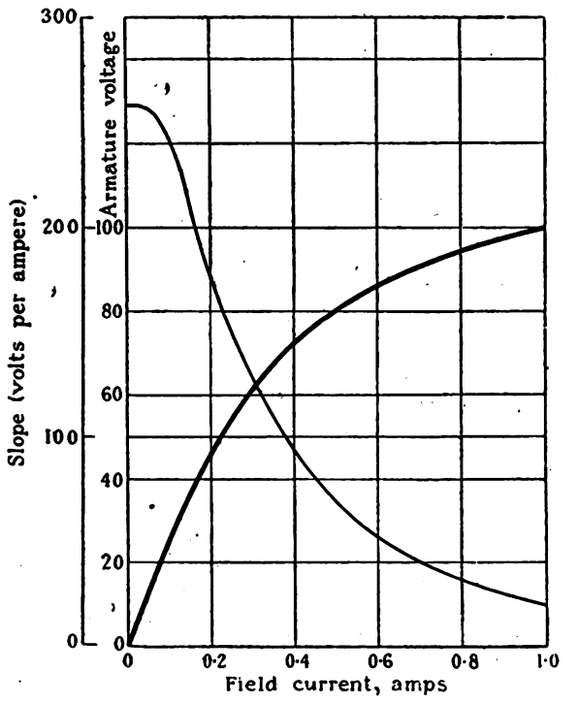

Fig. 2.—Typical exciter saturation curve.

magnetic energy, which tends to a longer time in responding to changes in the excitation.

The study of the machine voltage control requires consideration of " stability " and " speed of response," both separately and in combination. Stability determines whether the drop or rise in voltage becomes cumulative after certain load changes. Response determines the quickness with which voltage can be restored.

Voltage control is nowadays required to be automatic within a few per cent. of normal value. As direct manipulation of the alternator field circuit is not practicable, the control of the generator voltage is effected by changes in the exciter field circuit. It is convenient to consider firstly, the exciter alone, secondly, the generator alone, and finally the two in combination as a generating unit.

The author then proceeds to review in turn exciter stability, exciter response, alternator stability, alternator response, and the combined response of alternator and exciter.

Exciter load instability is caused by the load current in the armature overpowering the field excitation. In general, the exciter load current and voltage increase together, except for increases in resistance due to the temperature of the alternator field coils, which may attain 33 per cent. This feature, and the saturation, help to make the exciter stable at heavy loads. But the air gap should be such that at low exciter voltage the field ampere turns are greater than the corresponding armature reaction ; also equalising connections should be provided on the armatures where lap windings are used. Separate excitation of the exciter field is a preventive against complete reversal. By the aid of several diagrams, illustrating the relation between armature voltage and field current and the grading of rheostats (Fig. 1), the author next discusses the inherent instability of exciters. Various attempts to stabilise the shunt machine at lower voltages are mentioned, such as premature saturation in short lengths of the magnetic

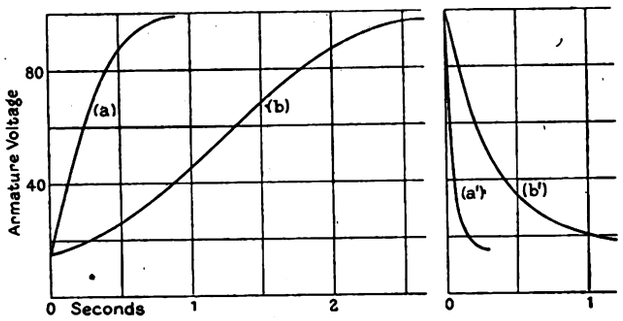

Fig. 3.—Growth and decay of voltage with shunt and separately excited exciters (exciter time constant = 1 sec.)

circuit, or the provision of an initial voltage independent of the shunt field circuit. Various methods of carrying out these two ideas are illustrated in the original paper. Exciter response, which is next discussed, may be defined as the rate at which its voltage increases per second when the resistance of its field circuit is changed. The response figure at any voltage is calculated by dividing the ultimate increase in exciter voltage by the time-constant of the exciter. The author presents a typical saturation curve, giving a maximum voltage of 100 with an excitation of one ampere (Fig. 2). The time-constant of a typical exciter when separately excited and unsaturated is taken at one second, and the growth of voltage of such a machine is illustrated in the original paper. Response curves for a separately excited exciter and of the same machine when shunt excited are compared (Fig. 3). The maximum available exciter voltage should be at least 15 per cent. greater than that required for maximum excitation of the generator. The use of curves for a particular exciter is next illustrated, and the effect of solid poles, etc., upon exciter time-constants is briefly discussed. A reference is also made to " super-excitation " by some special process other than conversion to separate excitation with the 15 per cent. margin in voltage mentioned above. The procedure may involve using a larger number section of conductor with a corresponding smaller number of turns for the field spools or the provision of a higher voltage for separate excitation. The time-constant of the exciter is not altered, but the possible voltage change is increased.

The next point considered is the inherent instability of the alternator. If an alternator is connected to a circuit which consists largely of capacity (e.g., unloaded long overhead lines or underground cables), it may be self-exciting owing to leading current in the stator windings acting as a magnetising current upon the magnetic circuit. The alternator will then be inherently unstable, and the voltage may rise to a

* Abstract of a paper read before the Institution of Electrical Engineers.

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value limited only by saturation. The condition may arise in high potential testing when a smaller alternator is used to provide current for testing a large stator, and it has been noticed on some commercial circuits abroad. It is unlikely to arise in this country, but it is suggested that, in specifying power factors for machines, the capacity current required in distribution should be included, and that manufacturers should base the stator dimensions upon kW rather than kVA rating, longer air gaps being used when high-power factors are specified. It is possible to say at what value for the external capacitance the alternator will build up, and the author illustrates this process by the aid of diagrams, one of which is reproduced (Fig. 4).

When the capacity is absent or negligible, and with a constant excitation, load conditions may produce a drop in voltage and the alternator may become unstable. If there is a corresponding drop on load current (e.g., with a purely lighting load), a steady, but reduced voltage will result. But if the kVA demand remains the same with falling voltage (as with an induction-motor load), an additional load may not be sustained, and the alternator voltage may fall to zero unless the excitation is adjusted, preferably by automatic means. The usual condition of service is probably intermediate between these two conditions.

The foregoing considerations affect the trend of alternator design. The tendency in turbo-alternator design has been to design with higher armature reactions than those con-

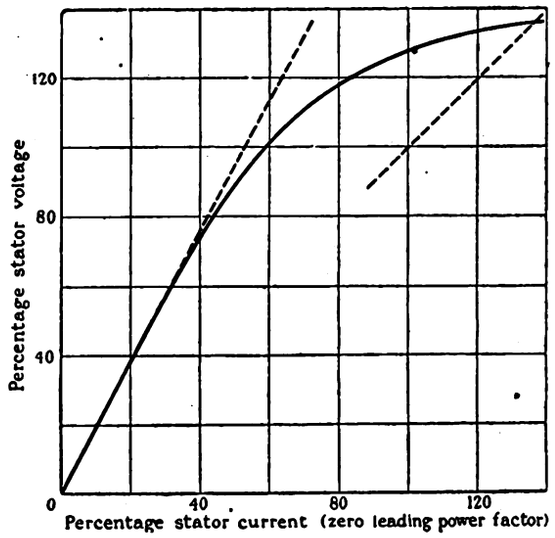

Fig. 4.—Building up of stator voltage with capacity load.

templated when turbines came into use about 25 years ago. Typical figures for modern machines are: reactance, 16 per cent.; armature reaction, 160 per cent., giving a synchronous reactance of 176 per cent. These characteristics apply to machines designed to work at 0·8 power factor. In American designs the armature reaction percentage is less, but even higher values have been adopted with success on large systems in England. The evolution is the result partly of the search for a design which will be cheaper per unit of rating and partly of keeping pace with turbine design. The turbo-alternator has become more of a "copper" machine and less of an "iron" machine. Performances of a typical modern turbo-alternator are illustrated (Fig. 5). In a case mentioned, the maximum load at 0·8 power factor requires 2·63 times the excitation for open circuit normal voltage, and assuming a temperature rise of 90 deg. C. on the rotor-winding copper, as measured by resistance between no load and full load, the exciter will need to be stable over a range of 1:3·5. With a margin of 15 per cent. between the maximum excitation voltage and the maximum exciter voltage available a shunt exciter must be stable at 24 per cent. of its maximum voltage. With the older type of machine the inherent voltage regulation of an alternator (i.e., the voltage rise when full load is thrown off, excitation remaining constant at full load value) was usually guaranteed not to exceed 22 per cent. with 0·8 power factor. With present day machines, the value may be about 45 per cent. The corresponding figures for voltage drop, when the full load circuit is suddenly connected to the alternator terminals, may be put at 30 per cent. for the older machines, and 60 per cent. for those of the present day. In the original paper, a family of load saturation curves at 0·8 lagging power factor for ¼c, ½, ¾ and ⅘, and full load at normal voltage are presented. From these corresponding volt-ampere curves may be derived. Such characteristic curves are useful in determining the change in voltage arising from a change in load, and illustrations of this procedure are given.

In the next section, devoted to alternator response, it is remarked that the voltage drop in the alternator voltage

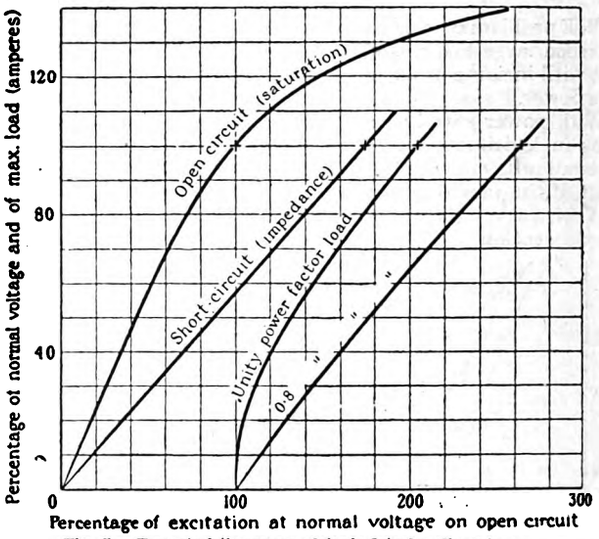

Fig. 5.—Characteristic curves of typical turbo-alternators.

when load is thrown on is calculated in two steps. The first involves the reactance of the stator winding, assuming that constant voltage is available, and the percentage voltage absorbed in the stator reactance before and after the load change is determined. A diagram is presented showing the reactance voltage change for changes of 0·8 power factor load for a machine with 16 per cent. reactance is shown. When a full load is thrown off, the voltage rise is 11 per cent., or if full load is thrown on when the machine is on open circuit, 9·8 per cent. In general the change in load current and voltage at the alternator terminals occur almost simultaneously with the change in the load circuit conditions. The second part of the calculation takes account of the magnetising effects of the opposing stator and rotor currents. Each change in load produces a change in the main flux and therefore in

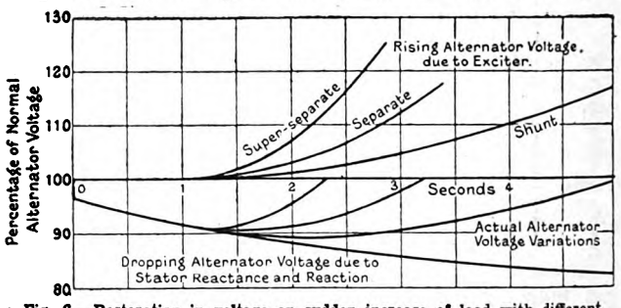

Fig. 6.—Restoration in voltage on sudden increase of load with different methods of exciter excitation.

the machine voltage. The time-constants of alternators on open circuit are briefly discussed. It is suggested that for large 50-cycle turbo-alternators the time-constant may be taken as 7·2 seconds for 3 000 r.p.m. machines and 8·4 seconds for 1 500 r.p.m. machines of the plate-rotor construction, and 8·4 seconds for 1 500 r.p.m. machines of the solid rotor-construction. Time-constants on load for various types of machines, working on 0·8 power factor, are also illustrated. In order to illustrate alternator response the author presents a curve showing the restoration in voltage after increasing the load suddenly from 40 to 80 per cent. (power factor 0·8) with different methods of exciter excitation (Fig. 6).

The final section explains how, by the aid of curves previously presented, it is possible to calculate (1) the drop in voltage due to armature reaction when the exciter does not respond, and (2) the rise in armature voltage due to the exciter if armature reaction were not effective. Average curves are drawn to show that a maximum drop of voltage-drop of 8 per cent., and a time of 3·8 seconds to restore the voltage completely to normal in the case of the shunt exciter, may be expected. For separate excitation, the corresponding figures are 5·5 per cent. voltage drop and 1·8 second for restoration, and for super-excitation, 4·5 per cent. drop and 1·0 second.

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UNEMPLOYMENT AND WORK—V.

Official Unassistance.

By SIR ERNEST J. P. BENN.

"SOMETHING must be done." There is a satisfaction about this phrase which explains our habit of using it on all occasions, as a study of political speeches and newspaper articles will show. Whatever the subject of the speech, the regular method is to enlarge upon the troubles and the difficulties and then the whole audience applauds when the table is thumped and the orator declares that we will no longer brook delay and that "Something must be done." The next step is to set official machinery in motion, and years later we discover to our cost that the "doing" has been more in the nature of talk than action.

Those who have no practical experience of business methods find it hard to understand that official action is the slowest, most expensive, and generally most inefficient of all forms of action. This is necessarily so, even when the official method is obviously the best. For instance, education is accepted as a proper sphere for government activity, but that does not alter the fact that it costs a great deal more to educate a child in a government school than by the use of any other agency. This is as it should be and is quite proper. Public money must be spent with due delay and strict regard to forms and rules which have no bearing upon private disbursements. When, however, public opinion forces government action in the field of commerce or industry, a double damage is always done. The first effect is to drive off the field all the private individuals who would ordinarily be at work upon it. They can proceed with their activities so long as they are dealing with other private individuals, all subject to the same limitations and all possessing the same prospects. When, however, the government or the local authority enters the field and begins to make bargains without the healthy influence of the risk of personal loss, others who are subject to that influence have no alternative but to leave things alone.

The first effect, therefore, of deciding that "Something must be done" officially, is always to stop somebody else doing anything. Unemployment is created from the moment that officials first put in an appearance in any market. Then, if and when that appearance is followed by real action, the pace is slower, the price is higher and the loss almost inevitable. The question is too big to discuss in this connection, but it should be remembered that official action, if wise, is always a last resource; that the public authority method is the worst and not the best way of satisfying a practical economic need. Public action half empties the private purse and closes up the other half.

In the matter of unemployment, we know that discharges are made with far less compunction since insurance was introduced than before. An employing company, having paid perhaps thousands of pounds to the insurance funds, thinks itself fully justiffed in relying on the fund to relieve it of obligations which had previously been regarded as its own. The dole is commonly supposed to encourage the spirit of idleness among the workers. I doubt very much whether that aspect is nearly so serious as the tendency, inherent in its very nature, to encourage employers to leave to the State obligations which the State in its folly has been vain enough to assume.

The American Attitude.

America helps us to understand this very difficult dilemma. She resolutely declines to take any official notice of unemployment, and deliberately leaves the distress created by bad trade to the care of private charity. A talk between an average American citizen and an average Englishman on this matter always discloses very wide differences in outlook. The American does not think himself a hard-hearted materialist, but he regards us as innocent fools. I have had the advantage of long and earnest conversations with unemployed in America and have talked with the lowest of the down-and-outs in East Side New York, Pittsburg, Chicago and elsewhere. From the very bottom upwards, these men regard their difficulties as mere stepping stones to fortune. There is in America a total absence of that reliance on superior authority which is the characteristic and the curse of the post-war Englishmen. It is hard to blame the victims of our way of looking at things. The fault is with the public opinion, which seems to delight in creating and fostering a spirit of helplessness and hopelessness. But wherever the blame, the effect is the same—millions of people who desire to be up and doing are discouraged by the suggestion that the real responsibility is with others.

The Labour Exchange is a dangerous drug, undermining the vitality of both employers and employed. It has failed to promote employment; the theory of mobility upon which it was founded has disappeared; the principle of insurance has ceased to be regarded as serious; and it is rapidly assuming the character of a more expensive form of Poor Law relief. But the mere shutting up of the Ministry of Labour, desirable as I believe that course to be, would not of itself remove our difficulties. We have surrounded the individual man with obstacles to work. We not only tell him that it is somebody else's job to find him a job, but we add, in order to strengthen that unnatural proposition, all sorts of prohibitions and restraints which bar the way of the enterprising fellow who desires to be without official assistance.

Obstacles to Self-Help.

Nobody knows of the numerous hardships of this kind better than the genuine unemployed himself. If he tries to do a little natural buying and selling he may find himself in conflict with the police over a hawker's licence or, failing that, he will be up against some trade ring. To give only one example: if he thinks he might sell a few books, no publishers will give him supplies until the Federated Booksellers or Associated Publishers have decided that he is qualified to receive trade terms, a decision which they are not very likely to take. The same sort of difficulties crop up in almost any trade he may choose. If his inclinations are of a more simple character, and he approaches a building job or a printing office, he will find his prospects blocked by the absence of a ticket which some labour monopoly declines to issue to him. If he tries to emigrate he will find so many official organisations to help and examine and qualify him, that he will give up the attempt in despair. Whatever he decides to try, he is absolutely forbidden by popular modern economic heresy from getting into any job or market by the natural process of cutting the price. A trade board will get on his heels if he attempts any homework, and, above all, unless when he goes to draw his weekly dole he can swear that he has been completely idle, he loses the pittance on which he now relies. It is rather difficult in these circumstances to blame the unemployed; they are the product of our own plans for improving the condition of the world. They are part of the price we pay for social reform, and the more reforming we do, the greater will be the number of those who rank as unemployed.

If arrangements made by the State provide for the payment of benefits in given circumstances, it is natural, and even in some circumstances right and proper, for the citizen to arrange his affairs in such a way as to qualify for those benefits. Who, for instance, can quarrel with the girl who, on leaving her employment to get married, requests her employer to go through the formality of a dismissal in order that unemployment pay may be added to the new family budget? The thing is natural and inevitable. As time goes on, increasing numbers are always finding ways to get themselves within the range of these benefits, and they have every bit as much right to adopt this course as has the tradesman, who, faced with two ways of doing the same transaction, selects the one which will involve the lower taxation. If a motor manufacturer can regulate the length of the piston and the size of the bore to reduce the tax, the labourer is equally entitled to plan his work with a view to advantages offered and given by a badly run State.

These aspects of a difficult and complicated problem come into better perspective when we consider that practically none of all the talk and writing about employment makes any direct appeal to the employed or unemployed themselves. It appears to be agreed on all hands that they are the helpless victims of circumstances beyond their control and hardly a word is said of their own responsibility, or still less of their own potentialities. Human nature being what it is (a dangerous and forbidden phrase) the vast majority of the workers ignore our official folly and look after themselves, a simple little natural fact that saves us from complete disaster. But nobody seems to imagine that among the million-and-three quarter

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recipients of State allowances there would be even a minority who would respond to any form of encouragement to self-endeavour. Our public policy is clear and definite; we appear to be determined to cultivate the spirit of dependence and to multiply the numbers of those whose conception of citizenship is the right to an income.

This abuse spreads far beyond the limits of the working class, as every day we add to the number and variety of the doles available for people who do not care to stand on their own. Indeed, nobody stands "on his own" in this rationalised world if he can help it. When a local authority makes a road, the cost is covered up in a Treasury grant and most of the things which we do in our corporate capacities are apparently paid for by somebody else. We have fooled ourselves into a condition of complete irresponsibility; the Chairman of the Finance Committee of a County Council boasted recently that 73 per cent. of the county budget was outside the jurisdiction of the Committee, the Council or the county. Wherever one turns, the fashionable tendency to depend upon the State is apparent. I would like to see a return showing the number of young people from the universities and secondary schools who are leading a life of irresponsible security in obedience to the new obsession for organised research. They are all on the dole. As we go on increasing the numbers of those whose conception of the State is as a payer of wages and decreasing the numbers of those who realise that the State can only derive its support from the citizens, so our position must get weaker.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Electrical Progress.

[To the Editor.]

Sir,—It is unfortunate that Colonel Crompton should have prefaced his interesting account of the progress of electricity supply with a disparagement of the knowledge of telegraph engineers at the beginning of the period of which he wrote, circa 1880.

Before that date the Committee of the British Association had formulated the definitions in C.G.S. dimensions of the ohm, the volt, the ampere, and the farad, and had provided material standards for practical use. That work was largely instigated for telegraphic purposes and was shared in by eminent telegraph engineers. The names of some of them—William Thomson, William Siemens, Latimer Clark, Fleeming Jenkin, Ayrton—should suffice to clear the profession of the aspersion of ignorance.

To my own knowledge, from at latest 1874, all P.O. telegraph instruments, rheostats, and condensers, had their resistances and capacities marked in ohms and micro-farads; received currents in line tests were measured in milli-amperes (an older name for the ampere was the weber), and battery values denominated in volts.

References to contemporary technical literature will confirm these statements. Some books in my possession which afford confirmation are:—

* "Culley's Handbook of Telegraphy, 1874, 6th edition.

"Fleeming Jenkin's Magnetism and Electricity, 1880. 5th edition.

Preece and Sievewright's "Telegraphy," 1884. 3rd edition.

Kempes "Handbook of Electrical Testing." 1884. 3rd edition.

The fact is that heavy electrical engineering came into a rich heritage from the telegraph engineers. A contemporary authority said with truth that there was more scientific knowledge and practice of electricity in the cable test rooms than in all the University classes. The heritage included:—a system of units on a scientific basis; material standards of the more important units of respectable accuracy; methods of electrical measurement for practical use in great variety and of high accuracy; instruments suitable for those measurements; knowledge of the electrical properties of some important materials (e.g., the importance of a high degree of purity in copper); all of which were, and are still, of incalculable value to the new art.

As to the views of those consulted by Colonel Crompton upon the relation between the resistances and voltages of dynamos, it is permissible to conjecture that there was a misunderstanding between questioner and questioned. The design of dynamos was as much a new problem for telegraph engineers as it was for Colonel Crompton himself.

I may add that I wrote a little note on the debt of heavy electrical engineering to telegraph engineering for the Jubliee number of the Journal of the I.E.E. which I hoped had laid to rest Colonel Crompton's imputation to telegraphic ignorance.—Yours faithfully,

Henry M. Sayers.

Streatham, S.W.16.
May 24.

* R. S. Culley, first Chief Engineer of P.O. Telegraphs.

Kaplan Turbines.

[To the Editor.]

Sir,—In your issue of May 16 last, Mr. J. J. C. Berkeley mentions the Kaplan turbines at Passau on the Danube, rated for 9 200 H.P. max. A similar station will be ready for use this year near Rheinfelden in Germany, containing two aggregates with Kaplan turbines, each for about 33 000 H.P. at 75 r.p.m. These two turbines are said to be the largest of their kind at present, but it is interesting to note that in 1925, i.e., five years earlier, an installation was erected for the Swedish Government at Lilla Edet on Göta älv, with turbines for a continuous output of 10 000 H.P. at 62·5 r.p.m., working on a head of only 6·5 metres and a water consumption of 150 cubic metres per second. One of these turbines was of the Kaplan type while the other two were of the Lawaczeck type. The efficiency of the Kaplan turbine reached the high values of 90 to 92% at test for loads from 4 800 to 10 000 H.P. and the same full load value was measured for the other turbines. The direct connected three-phase generators, rated for 10 000 kVA at 25 cycles, 10 000–11 000 volts and 7 p.f. were all of Asca manufacture and at this time the largest vertical generators in Europe.—Yours faithfully,

H. Wahlberg,
Civil Ingeniör.

Västeras, Sweden.
May 23.

I.E.E. Wiring Regulations.

[To the Editor.]

Sir,—I should be glad if you would draw attention to the revised Supplement to the Ninth Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings. This supplement relates to radio receiving and valve amplifying apparatus connected to the supply mains, and is in substitution for the corresponding supplement issued in June, 1928, which is now withdrawn. Copies can be obtained, free of charge, on application to the Secretary of the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.—Yours faithfully,

P. F. Rowell,
Secretary.

The Institution of Electrical Engineers,
Savoy Place, W.C.2.
May 23.

Benn Brothers' Jubilee.

[To the Editor.]

Sir,—May I congratulate you on your Publishers' Jubilee History, which is very interesting. I think the nation owes a great deal to Benn Brothers.—Yours faithfully,

C. Turnbull,
Borough Electrical Engineer.

North Shields,
May 23.

RAILWAY SIGNAL ENGINEERS.

The seventeenth annual report of the Institution of Railway Signal Engineers, contained in Part II of the Proceedings, 1929–30, just issued (price to non-members 7s. 6d.), gives the membership on January 1, 1930, as 756, an increase of 25 during the year.

The Council is considering the best means of administering the legacy of £1 000 bequeathed to the Institution by the late Mr. W. J. Thorrowgood, a Past President, for the purpose of founding a Thorrowgood Scholarship.

Increased use is being made of the Appointments Register by those having vacancies to fill in the signalling world.

The financial position of the Institution continues to improve.

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BOOK REVIEWS.

The Practice of Electrical Wiring. (Third and revised edition.) By D. S. MUNRO, M.I.E.E. (London: Electrical Review. Pp. xi+293. 4s. 6d. net.)

Here is a book which will become the "Bible" of the electrical contractor. In it the author sorts out, classifies, explains and comments upon the details of the practice of electrical wiring. Every system of wiring, whether the author approves of it or not, is given its fair share of notice in an entirely unprejudiced manner.

What an excellent thing it would be if all architects could read this book; they might not care for the references to their own work, but they could not well take offence since the strength of the author's arguments can scarcely be contradicted. For one thing, the architect who reads this book will, perhaps, realise what an enormous responsibility he takes upon his shoulders if he relies on no outside expert opinion in designing the electrical installation. Some architects, it is true, are capable of taking this responsibility, but very, very few. The I.E.E. Regulations by no means cover the subject adequately, although they are the best which such a body can produce in view of the fact that they have no parliamentary authorisation to insist on such rules. It is good to hear Mr. Munro's views on craftsmanship, for this point is too often overlooked. Electrical installation work being a comparatively new science, one is apt to forget that science is not everything, and that it must be backed up with handicraft. There is also an impression among many laymen that public supply undertakings, where they carry out wiring work, are more to be trusted than electrical contractors. Listen to what Mr. Munro has to say on this subject:—

"Indoor wiring executed by the workman of a public supply company or corporation (so far as the experience of the writer goes) is commonly worse than that of the average contractor."

Dealing with the question of competitive tenders put out with no regard for anything but price, the author says:—

"The most desirable results are got, as a rule, by employing only skilled labour under the control of a responsible contractor working to the specification of an experienced consulting engineer. The proper registration of these various classes is necessary for their own protection and that of the public."

Hard on the heels of this particular evil of the "lowest tender" comes the evil of customers buying their own fittings and handing these to the contractor to erect. The author points out how absurd it is for a contractor to be expected to be held responsible for the electrical condition of an installation which he has put up where the fittings have been handed to him without consultation.

Architecture forms a chapter to itself, and shows, among other things, that electrical installation work is not the only craft of which the author is master. This chapter, which is, in some respects, the most important in the book from the point of view of propaganda, shows also the vitally important part which the electrical installation plays in any building, and it shows, too, the deplorable neglect of which it is the object at the hands of architects. Let me conclude with a quotation on this subject:—

The author is speaking of the installation in a certain hotel where the space occupied by piping of all kinds actually took up three feet of the basement corridor height, and the steel channel supports were fixed at short intervals right across the passage to form a framework for the pipes. "This particular corridor," says Mr. Munro, "was primarily designed for waiters to convey trays of food to numerous sumptuous dining-rooms, and it was not pleasant to think of the dust-laden upper recesses of the corridor where all the germs were comfortably breeding on the warm piping till destiny or an electric fan decided that they should fall into the soup. Such an important pipe run should have been provided for from the beginning."

D. W. T.

Electric System Handbook. By C. H. SANDERSON. (London: McGraw-Hill Publishing Co.) Pp. 1067. 25s. net.

This book, written in twelve sections, is by a number of American authors, each of whom is an expert at his own particular job. Mr. Sanderson is a capable editor-in-chief, and is responsible for some of the sections. The work may be described as a treatise on the generation and transmission of electrical energy for all purposes. The first section deals with electrical energy and its transmission in a general way: elementary principles of generation are given. Other sections deal with auxiliary electrical equipment and factors influencing choice of equipment. The section on switchboards is valuable, since it deals extensively with the selection of instruments and control and instrument wiring. Generating stations come in for adequate treatment; an interesting portion of this section discusses power station auxiliaries, an important subject from a central station engineer's point of view. The section on the transmission system is well written and deals with the subject from all angles, including the electrical characteristics of transmission. Sub-stations occupy a large proportion of the work; this is necessary since it deals with a.c. and d.c. sub-stations; railway sub-stations have a separate section, in which the characteristics of mercury arc rectifiers are discussed. The section on distribution includes all distribution methods, including street lighting, and installation practice in distribution systems. Details are given of the protection of electrical apparatus, circuits and systems, and inspection and maintenance. The work is well indexed, and as a general work is to be commended.

CYRIL SYLVESTER.

Outline of Costing. By WM. A. SMITH, A.C.W.A. (London: Moore's Modern Methods.) Pp. 110. 5s. net.

Manufacturers desiring to institute a simple and effective system of job costing will find in this book much useful data, both in connection with the allocation of the various charges and the general control of the accounts. Numerous examples and specimen rulings for the different books and forms have been included, and a separate chapter has been devoted to the need for reconciling the costing figures with those recorded in the books of account. The methods to be adopted when materials and stores are requisitioned and issued are dealt with in a manner that will enable the small manufacturer to appreciate the principles involved, while the entries necessary at the termination of the financial year or other accounting period are sufficiently illustrated for all practical purposes. It is true that many points of a more or less controversial nature have been disregarded, but by so doing, the practical daily requirements, as enunciated in the fifteen chapters, can be more readily grasped by the preoccupied employer established in a small way.

S. H. W.

Kraftverstärker. By DR. EUGEN NESPER. Pp. 96. (Leipzig: Hachmeister and Thal.) 4·80 rm.

This book is a reprint of a series of articles on radio amplifiers which appeared early this year in "Radio-Helios," a German export and trade journal. In consequence, the semi-technical, semi-descriptive vein to be expected from such a source is found in the book. A few simple notes on amplification theory are followed by a statement of the desiderata of a good amplifying valve, and the methods of coupling. The remainder of the book deals with details such as supply, assembly, parts, valves, etc., with a data sheet of certain thermionic valves for amplification purposes manufactured by various German firms. The book closes with descriptive notes on large industrial amplifiers and methods of measurement (e.g., of losses, distortion, etc.). The majority of the diagrams are of the line type, a few half-tones being included to illustrate apparatus, and the typography is good.

S. PARKER SMITH.

The Theory of Electrical Artificial Lines and Filters. By A. C. BARTLETT, B.A. (London: Chapman and Hall. Pp. 155. 13s. 6d. net.)

Mr. Bartlett, who is a member of the Research staff of the General Electric Company, has written a general introduction to the theory of artificial transmission lines, line balances, filters and phase shifters, a subject which is of increasing importance in modern telegraphy and telephony, both wired and wireless. Chapters 1, 2 and 3 deal with the general theory of artificial lines and repeated networks, and the remaining chapters, which are concerned with extensions or applications, include treatment of filters and phase shifters, terminal impedance circles and other geometrical aspects of the Homographic transformation, artificial lines related to the uniform line, thermionic valves and the general theory of the multi-stage amplifier. The book will be of considerable service to telegraph, telephone and radio engineers.

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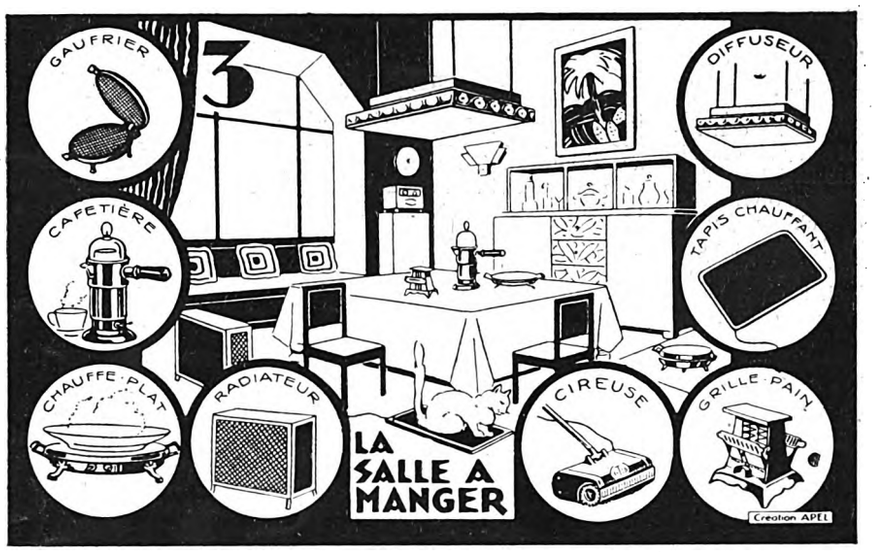
ELECTRICAL LOTTO.

Useful French Publicity Device for Children—A Suggestion for E.D.A.

IMPRESSIONS gained during childhood often have lasting effect, as many political and other propagandists realise. In France there is an organisation, the Société pour le Developpement des Applications de l'Electricité (known generally as the Société Ap-El), of 14, Rue de la Victorie, Paris, IX; it supplies pamphlets, films and utilisation data, and recently developed the ingenious idea of devising a game for children to show the uses of electricity in the home, the office and the farm.



Typical illustrations included in the Electrical Lotto of the Société Ap-El.

The game is in the form of picture Lotto. A number of large cards, 16 in all, are dealt round, each card having a general view showing appliances in place. The cards include the drawing-room, dining-room, kitchen, bedroom and bathroom, the office of "papa" and the laundry. Four cards cover the farm—the dairy with churns, and so on; the machinery shed with a thresher, winnowing machine and cyder press, farm tools, circular saw and grindstone; the cow shed, with milker, sheep shearer, and hen house with electric brooder and electric light, and what is humorously termed the kitchen for the animals, with chaff cutter, root cutter, and so forth. Each piece of apparatus, besides being shown in the main picture, is also shown in a circle which has to be covered by a cardboard counter with the name of the appliance on it. The cards are dealt round, the counters taken out of the bag, one by one, and called out. The sharp player spots the right picture, and the one who fills up all the circles first wins the game. The card illustrated shows the dining-room with coffee pot, plate warmer, radiator, floor polisher, toaster, diffuser and foot warmer.

The Ap-El society supplies these to power authorities which send them to school teachers for use in class or as prizes. Experience shows that the parents take quite an interest in the game.

Printed in a folder, giving the rules of the game, is a list of articles illustrated with a description of the appliance or its virtues in a few words; for example, of the "aspirateur" (suction cleaner) it is stated "the broom only displaces the dust, the suction cleaner puts it in a bag." The electric iron is "always ready for work and is clean," and so on. After playing the game two or three times a child will know the names of a score of electrical objects and will point them out with pride to parents and others when seen in a shop window.

It might be a happy idea for the E.D.A. to get out something of the same kind, but the game in French, as it stands, might become popular in high schools and private families as a valuable method of learning French, on the one hand, and useful to British supply authorities at the same time as an introduction to electricity in the home. Enterprising supply undertakings in this country might obtain some sets from the introducers and send them to secondary and high schools for use as an amusing form of French lesson.

MICA SUPPLIES.

Canadian and Madagascar Amber—The Largest Mica Firm in Europe.

IN connection with the article on "Varieties and Uses of Mica," by Mr. A. R. Dunton and Mr. A. W. Muir, which appeared in THE ELECTRICIAN of May 9, Messrs. Attwater and Sons, of Preston, ask us to state that over thirty years ago they were importing mica and supplying to the Brush Co. They add:—

"When the English Electric Co. started in Preston some thirty years ago we supplied all their mica for many years and the same with the British Westinghouse Co., from the moment they started, and the British Thomson Houston Co.; for many years we could truthfully say that one could not sit down in an electrically propelled vehicle in the United Kingdom that was not driven by a motor the copper bars of which were not insulated with Canadian Amber mica which we imported direct from Canada in the cob form or in thumb trimmed slab and trimmed—split and cut in our factory. The London County Council's first tramways, the Manchester, Birmingham, Liverpool, and Glasgow Tramways, the first L. and Y. electric train, the first North Eastern trains, were all insulated with such Canadian Amber mica. When the building of the Westinghouse works was begun Mr. Crumpton, the first purchase agent, gave us a three years' contract for Canadian Amber mica splittings and this was continued until Mr. Shroeder took charge, when, on the score of economy, he substituted India mica splittings.

"From 1902 up to 1914 we imported direct from Canada into Liverpool over 90% of the total sea-borne mica mined in Canada. We have also been importing mica direct from Madras and Calcutta for over 25 years, and we think that we can safely say that over 50% of the mica used by the Westinghouse Co., the British Thomson-Houston Co., The English Electric Co., during the past 25 or more years was imported direct and supplied direct to these firms by ourselves.

"We were, during the war, the only house in the United Kingdom with a permit to import mica, other than the Government agents. Further, we exported over 50% of the total of mica exported during 1914–1918. We were shipping on blank orders all the mica we could spare to France and to the United States. We were shipping five tons per month to the Italian Government aeroplane works alone. For three years we took the whole production of the Madagascar mines and we have at all times in our warehouses at Preston more Madagascar Amber mica than exists in the whole of the public and private warehouses in London

"We have one very choice and large supply of Madagascar Amber that gives a breakdown test nearly equal to the best Ruby. Tests made at the English Electric Co.'s works recently for the Russian Government on this mica supplied by us gave an average puncture test as follows:—

Film	·005" average breakdown	11 500 V.
	·007" " "	16 000 V.

"As we carry a stock at Preston at all times of £50 000 to £60 000 value of mica, we can claim to be the largest mica house in Europe."

WOMEN IN BUSINESS.

In the charming book "Good Manners and Bad," Mr. Hugh Scott refers to the "numerous class of women engaged nowadays in business and professions who, because they have found an intelligent occupation, or have been given a position of some small authority, apparently feel it necessary to put off all the most engaging attributes of their sex and to make themselves as hard, and generally unattractive as possible."

Mr. Scott seems to have been somewhat unfortunate in his experience of business women. He goes on to say that "women of this class are distinguished in a peculiar degree by that particular kind of bad manners which I am at present discussing. I refer to that kind of rudeness and incivility which proceeds, not from carelessness or ignorance or obliviousness, but is perpetuated deliberately, and has its roots in downright ugliness of disposition and lack of amiability."

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NEWS IN BRIEF.

Electric Houses at Liverpool—Tasmanian Views of Australian Tariff—Foreign Cable for Dundee—Automatic Signals on Tramcars—Appointments Vacant.

BIRMINGHAM Corporation requires an assistant to the district mains engineer in the Corporation's rural electricity supply area.

It is stated that 3 000 telephones will be installed in Thames House, Westminster, on its completion in 1931. The building is to be equipped with public call boxes.

Liverpool Electric Power and Lighting Committee is having exhibition model houses in Church Road, Litherland, and at 292, Menlove Avenue, Liverpool, equipped with electrical apparatus.

A chief assistant electrical engineer is wanted in the Birmingham electricity supply department.

The position of power station superintendent at the Scarborough Municipal electricity works is vacant.

A limited wireless telephone service between Great Britain and Java, via Amsterdam, was commenced on May 23.

The number of hired electric cookers connected to the Manchester mains during March last was 95, making 6 114 on circuit.

The 57th meeting of the American Electrochemical Society is being held at St. Louis, Miss., from May 29 to 31, inclusive.

Warwickshire County Council is to obtain tenders for an electric light and power installation in the new county offices, Warwick.

On May 21 the Prince of Wales opened the new physics and chemistry laboratories of the University College of South Wales and Monmouthshire, Cardiff.

The Swansea and Merthyr Joint Mental Hospital Committee has decided that the hospital be heated and lighted by electricity obtained from Swansea Corporation.

The summer programme of the Electrical Association for Women includes a visit to Wimbledon electricity works and showroom on June 4, when Mr. A. E. McKenzie, engineer and manager, will deliver an address on "What Wimbledon is Doing to Introduce Electricity into the Home"; and a motor coach trip to the works of Electrolux, Ltd., at Luton, where Mr. A. H. Hunter will talk on "The Manufacture of Modern Household Electric Appliances," on July 3.

Mr. H. A. Curtis, chairman of the Tasmanian Government Hydro-Electric Commission, recently expressed his views to the Commonwealth Public Accounts Committee on the Australian Government's recent additions to the tariff imposts on electrical appliances. He said if Australian industries followed these tariffs, the remaining Tasmanian areas would never be reticulated, as they could not pay the charges. The capital expenditure on the hydro-electric scheme was £3 592 535, and hundreds of thousands of pounds had been added to the cost by the Customs duties on machinery which had to be obtained from Great Britain and America.

The International Illumination Congress will begin on September 2 and end on September 19, 1931. The Congress is held under the auspices of the International Commission on Illumination, of which Mr. Clifford C. Paterson is chairman, and is being organised by the National Illumination Committee of Great Britain and the Illuminating Engineering Society, London. During the period of the Congress the delegates will visit places of interest in London and afterwards proceed on a tour to Glasgow, Edinburgh, Sheffield, Birmingham and Cambridge, the last week of the Congress being spent at the last mentioned town. The papers and discussions will cover illumination for every purpose.

It is understood that negotiations are proceeding between the Indian Radio Co. and the Indian Government with a view to establishing a wireless telephony service between India and the United Kingdom.

Dundee Electricity Committee decided last week to accept the offer of a foreign firm for the supply of cable, and thus effect a saving of 23%. It is stated that the amount of the lowest British tender was about £500 in excess of the accepted tender.

The Council of the Overhead Lines Association has selected Friday, October 31, 1930, as the date for the Association's annual conversazione. In connection with this function there will be a supper-dance and a display of exhibits relating to the activities of the Association.

An illuminated tramcar was run over various routes during Newcastle-upon-Tyne's Cancer Campaign carnival last week.

A lady cooking demonstrator and showroom assistant is required in the showrooms of Harrogate electricity department.

There is a vacancy for a graduate assistant in electrical engineering in the Wolverhampton and Staffordshire Technical College.

An agreement for establishing a special wireless station for the use of the League of Nations in times of emergency has been signed. The station will be run in normal times by the Radio Suisse Co.

It is understood that Birmingham tramways department is considering the question of adopting automatic light signals to give warning to the drivers of following vehicles when tramcars are about to stop.

The wireless telephone service, which was opened between London and Sydney (N.S.W.) at the beginning of May, has now been extended, at the Australian end, to most parts of New South Wales, Victoria and Queensland and, at the European end, to the Irish Free State, Northern Ireland, France, Switzerland, Belgium, Holland, Germany and Denmark.

It is announced by the Imperial and International Communications Co., that savings to cable telegraph users to the approximate amount of £85 000 per annum are the results of reductions in cable and wireless telegraph rates effected by the company since its inception in April, 1928, as a joint cable and wireless organisation, incorporating all the British privately owned overseas telegraph services operated from Great Britain. In some instances charges have been reduced by as much as 50%.

The London Students' Section of the Institution of Electrical Engineers will hold a summer meeting in the Ruhr area and Switzerland during August of this year. The places to be visited will include Cologne, Essen, Basle, Zurich, and Interlaken. The tour will commence on August 2 and finish in London on August 13 and the cost will not exceed £15 per person. Further particulars can be obtained from the hon. secretary, Mr. L. S. Crutch, 15, Mundania Road, East Dulwich, London, S.E.22.

The last of the series of five lectures on electricity to teachers of domestic science, students of housecraft and others, by Mr. C. F. Partridge at the Girls' Central Secondary School, Sheffield, took place on Monday, the talk being on controlling and protective devices. Some essays were handed in for a competition in which electrical apparatus was offered as prizes. The lectures were organised by Captain A. W. Brown, of Leeds, in co-operation with the Sheffield educational and electricity departments.

LOOKING BACKWARD.

FIFTY years ago, THE ELECTRICIAN *of May* 29, 1880, *recorded what was described as the inauguration of the electric light in the City of London, when the new installation supplied by the Brush Electric Light Co. in the vaults of the Royal Exchange was set to work.*

At that time Chicago had 3 000 *telephones, St. Louis* 1 000 *and Milwaukee* 550. *The charge was £12 per annum in Milwaukee and £20 at Chicago and St. Louis.*

The s.s. "Columbia," just completed at the works of John Roach, Chester, Pennsylvania, for the Oregon Railway and Navigation Co., was fitted throughout with the Edison electric light, this vessel being the pioneer in this respect. The current was supplied by four Edison dynamos installed in the engine room.

Experiments with electric ploughing and threshing and with sugar machinery driven by electricity had just been carried out at Bar le Duc and elsewhere in France.

* * *

TWENTY-FIVE years ago, in THE ELECTRICIAN *of May* 26, 1905, *correspondence was continuing on the subject of the desirability of larger generating units.*

The L.C.C. Bill for the construction of electric tramways across Blackfriars and Westminster bridges and along the Thames Embankment was before a House of Commons Committee.

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PERSONAL.

CARLISLE Town Council has adopted a recommendation by the Electricity Committee to pay to the city electrical engineer, Mr. C. W. Salt, £1 075 for services rendered in connection with extensions at the new works.

Mr. H. G. W. Haslett who has joined Chesterton, Jones and Co.

Mr. H. G. W. Haslett has been appointed sales manager (electrical products) to Chesterton, Jones and Co., Ltd. Mr. Haslett has, for many years, been London sales engineer (heating and cooking section), for the Credenda Conduits Co., Ltd.

The happy and interested relationships which have existed between the Association of Supervising Electrical Engineers and its presidents are reflected in the statement that Mr. S. B. Donkin has accepted the invitation of the Board of Control of the A.S.E.E. to continue as president for a further year. It is expected that Mr. Donkin will deliver his presidential address at the opening meeting of the 1930–31 session, on October 21.

Falkirk T.C. has granted an increase of £100 a year in the salary of Mr. Thos. Climie, burgh electrical engineer.

Bedford Town Council has fixed the salary of Mr. R. W. L. Phillips, borough electrical engineer, at £1 195 per annum as from April 1 last.

Mr. G. C. Hadfield, manager of the showroom of the Southport electricity undertaking, has resigned on securing a similar appointment with Nottingham Corporation.

Sir William Henry Bragg received on May 22, the Franklin gold medal, the highest award of the Franklin Institute, Philadelphia. The gold medal is awarded for an outstanding career in physical science.

Mr. Lachlan Mackinnon, manager of Glasgow Corporation Tramways, has been elected president of the Scottish Tramways and Transport Association. Mr. F. A. Fitzpayne, Edinburgh, has been elected vice-president.

Mr. Walter Binns, who was general manager of the Reading Corporation Tramways 18 years ago and left to go to South America, visited Reading last week and addressed the local Rotary Club on the subject of Brazil.

Mr. M. I. Lipman, engineer representative for A.E.G. Insulation Materials Department, has relinquished his position to take a post with E. K. Cole, Ltd., as production engineer. His place is being taken by Mr. F. E. Chilton.

At the meeting of the Overhead Lines Association on May 21, the president, Mr. Theodore Stevens, announced that the Council had nominated Mr. W. C. Bexon, chief engineer and manager of the Ayrshire Electricity Board, as president for next year, and that this would come before the members next October.

Mr. John Christie, borough electrical engineer, Brighton, is relinquishing his appointment within the next few months, but his services will continue to be at the disposal of the corporation undertaking in a consultative capacity. He is being succeeded as borough electrical engineer by Mr. W. N. C. Clinch, operating engineer, North Metropolitan Electric Power Supply Co., and resident engineer Brimsdown power station.

Sir Ernest Benn, Bart., chairman of Benn Brothers, Ltd., and Lady Benn will be entertained at a luncheon at the Criterion Restaurant, London, on Tuesday, June 3, by the Trade, Technical and Scientific Branch of the London District of the Institute of Journalists, to mark the occasion of the jubilee of Benn Brothers, Ltd., proprietors and publishers of THE ELECTRICIAN and numerous other technical and trade journals.

Obituary.

MR. DAVID BAILLIE, for many years superintendent at Pinkston power station.

MR. ALEXANDER FAIRBAIRN DODDS, chief draughtsman of Edinburgh Electricity Department. Mr. Dodds has been in the department for 47 years, and was closely connected with the work of the Portobello power station extension.

IN PARLIAMENT.

House of Lords Select Committee Approves Tube Extension.

THE Bill promoted by the London Underground Railways Group for authority to extend the Piccadilly line northwards from Finsbury Park to Cockfosters, etc., has been under consideration by a House of Lords Select Committee during the past week. Sir Lynden Macassey, for the promoters, gave particulars of the scheme, and said the total expenditure under the Bill would be £12 385 000. Mr. Frank Pick, managing director of the London Electric Railway Co. and the London General Omnibus Co. and other witnesses gave evidence in support of the scheme. Sir Ralph Wedgwood, general manager of the L. & N.E. Railway Co., gave details of an alternative electrification and extension scheme which his company were prepared to carry out and which, he said, would cover a greater distance and cost £1 000 000 less than the proposed tube. The Committee decided that the preamble of the Underground Railways' Bill was proved, and also authorised proposed improvements at certain stations in Central London. The Bill had previously been passed by the House of Commons.

Manx Electricity Bill.

The Manx House of Keys on May 20 postponed the third reading of the Electricity Bill until October. The scheme, which was to cost £100 000, was being promoted by the Electric Securities Trust, a subsidiary company of the General Electric Co., Ltd. The Legislative Council passed the bill, but in the House of Keys some members expressed dissatisfaction at the financial proposals, which enabled the promoters to charge 8% on loan capital. This proposal was also objected to by the Electricity Commissioners of England, to whom the question was referred, and the House adjourned consideration of the Bill until further information is obtained.

Barnsley Tramways Abandonment.

The Bill promoted by the Yorkshire Traction Co. seeking powers to remove tramway rails and substitute motor omnibus services for the tramways in Barnsley and district came before the Unopposed Bills Committee of the House of Commons on May 15. The Bill, which had already passed through the other House, was passed for third reading.

Sidmouth Electricity Undertaking.

The Bill to authorise the transfer of the electricity undertaking of Sidmouth U.D.C. to the East Devon Electricity Co. came before the Unopposed Bills Committee of the House of Lords last week. The Bill, which was passed for third reading, authorises the company to supply electricity in the urban district of Sidmouth and parts of the parishes of Salcombe Regis and Sidbury, in the rural district of Honiton.

Fife Electric Power Co.'s Bill.

The Unopposed Bills Committee of the House of Lords last week passed for third reading the Bill promoted by the Fife Electric Power Co., seeking powers to increase the capital from £600 000 to £1 000 000, to increase the borrowing powers from £200 000 to £500 000, to sanction the raising of additional loans, etc.

Nottingham Trolley Omnibus Bill.

A Select Committee of the House of Commons decided on May 16 to grant authority to Nottingham Corporation to adopt trackless trolley traction on all its existing tramway routes, but refused power for extensions outside the city. Trolley vehicles are not to go into Beeston urban district, nor on certain Carlton routes.

Progress of Unopposed Bills.

The Unopposed Bill Committee of the House of Lords has passed the Bill promoted by the Metropolitan Railway Co. for power to construct a new railway from Wembley to Little Stanmore, and to raise money not exceeding £500 000.

The Committee has also passed the Bill promoted by the Brixham Gas Co. to change the name of the company to the Brixham and District Gas and Electricity Supply Co., to consolidate and convert existing capital, to raise additional capital, to increase company's area of electricity supply to include Broad Sands, the urban district of Paignton, etc.

The Hastings Tramways Co.'s Bill, seeking powers for additional trolley-car routes and the prevention of indiscriminate competition, has also been approved by the Committee.

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LEGAL INTELLIGENCE.

Marconi Company's Action with Respect to Broadcast Receiver Royalties.

IN the King's Bench Division, on May 22, Mr. Justice Branson gave judgment in an action which had been brought by Marconi's Wireless Telegraph Company, Ltd., to recover £3 261 for royalties under a licence of May 6, 1928, from a number of defendants. These were Mr. E. H. Newman and Mr. Maudslay Baynes, a firm of Regent Street, W.; Mr. Wm. Henry Cork, an accountant of Eastcheap, E.C.; Mr. H. F. Gidden, 105, New Oxford Street; Mr. W. G. Adie, White Street, E.C.; Mr. A. W. White, Essex Street, W.C.; Mr. H. Bowyer, of Bailey Mews; Mr. P. S. Booth, Kimberley House, Holborn; Mr. W. A. J. Osbourne, Magnet House, Kingsway; and Mr. L. O. Terrett, Charing Cross Road. All the defendants denied liability.

Sir Walter Schwabe, K.C., for the plaintiff company, said the defendants were the inspector (Mr. Cork) and the inspection committee appointed under a deed of arrangement by the two other defendants, Newman and Baynes, who were in business together in the manufacture and sale of wireless sets and other apparatus under the style of the Langham Radio. Messrs. Newman and Baynes got into financial difficulties, and the deed of arrangement was drawn up between them and the other defendants under which Mr. Cork was appointed inspector and the remaining defendants became the committee of inspection, with a view to carrying on the business to a successful point.

Defendants' contention was that Newman and Baynes were still the licensees of the plaintiffs, and they were carrying on the business under the control of Mr. Cork and the committee. The licence to Newman and Baynes had not been revoked, and had not been transferred to the inspector and the committee.

Giving judgment, his Lordship said he had come to the conclusion that the business remained under the control of Messrs. Newman and Baynes after the deed of arrangement had been come to. The inspector and the inspection committee acted in strict accordance with the terms of the deed. His Lordship added that he was not satisfied that Mr. Cork and the committee knew the sets involved the use of the Marconi patent. The claim against him and the committee failed and must be dismissed with costs, but plaintiffs were entitled to judgment against Newman and Baynes with costs.

Reduction of Capital.

A petition by the English Electric Co., Ltd., for confirmation of a reduction of capital from £5 000 000 to £3 244 472 was on May 26 heard before Mr. Justice Eve, in the Chancery Division.

Mr. Gordon Brown, for the company, said the reduction formed part of a general scheme of arrangement between the company and its debenture holders. The reduction involved a reorganisation of capital on the basis of the Second debenture holders accepting preference and ordinary shares in satisfaction of 65% of their debenture stock holding. Messrs. Lazard Bros. and Co. were prepared to put up £750 000 cash for the company by subscribing for ordinary shares at par. The reduction was to be effected by cancelling 7s. 6d. per share on the issued preference shares. The remaining 12s. 6d. was to be converted into 10s. preference shares, non-cumulative until December 31, 1933, and cumulative thereafter. As to the ordinary shares, 16s. 8d. was to be written off and the remaining shares of 3s. 4d. consolidated into £1 shares.

The resolution showed that the reduction was not due to capital lost or unrepresented by available assets, but that the real reason for the reduction was the reorganisation of the capital. The debenture stockholders were prepared to take shares rather than enforce their security, and that was the best reason for saying that the capital was represented by available assets.

His Lordship confirmed the reduction.

BUSINESS ITEMS.

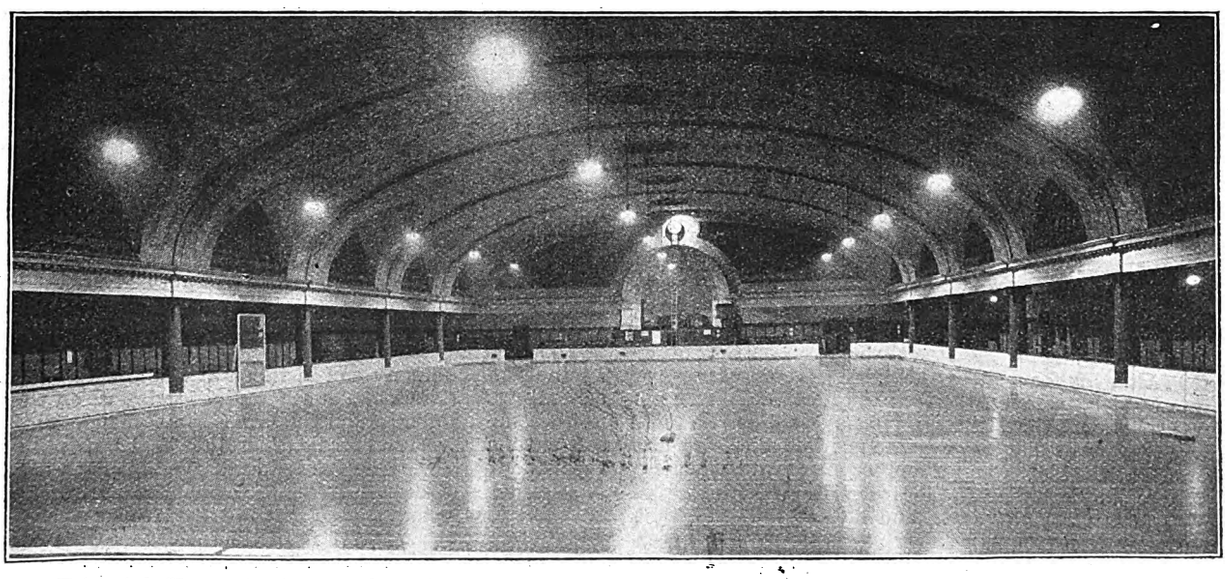
THE address of the SPRINGFIELD ELECTRICAL WORKS has been changed to River Road, Carmyle, Glasgow, E.2.

WILD-BARFIELD ELECTRIC FURNACES, LTD., Elecfurn Works, North Road, London, N.7, announce that their licensees for France, Switzerland, and the Netherlands, La Compagnie Francaise "Wild-Barfield," have recently taken new premises at 110, Avenue du Général Michel Bizot, Paris.

The Department of Overseas Trade has prepared a statistical report on the world's trade in wireless apparatus. Copies of this report may be obtained by United Kingdom firms upon application to the Department at 35, Old Queen Street, London, S.W.1. Reference B.X. 6 399 should be quoted.

The ALTON BATTERY CO., LTD., Alton, Hants, has received a contract to completely renew the positive plates in one of the largest batteries in London, and considers this to be one of its greatest successes. The battery, which is not of Alton manufacture, is situated at the Metropolitan Electric Supply Co.'s sub-station, Fisher Street, London, W.C.

Contractors who are concerning themselves with the sale of ventilating fans will be interested to hear that the GENERAL ELECTRIC CO., LTD. is advertising Magnet fans at the moment, and will continue to do so for some time to come, in many of the most prominent business journals, as well as in a large number of high-class magazines. To supplement this journal and magazine advertising the company has devised a number of showcards, printed in colours, for the use of contractors, and the display of these, in windows and showrooms and on counters, will effectively link up with the advertising campaign. In addition, a tastefully-printed folder advocating the advantages of fans, and giving details and prices of the Magnet range, is available for distribution. This folder is designed to be overprinted with a dealer's name and address.



THE ice-rink, Haymarket, Edinburgh, fitted with "Geco" reflectors. The installation was carried out by Martins (Electricians), Ltd., of Kirkcaldy.

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JOHN BENN HOSTEL.

Distinguished Speakers at the Annual Banquet.

OVER 300 guests assembled in the Mansion House, on Tuesday, for the annual banquet of the East End Hostels Association; Viscount Astor was the chairman. The banquet took place in the famous pillared dining-hall of the Mansion House, kindly placed at the disposal of Sir Ernest Benn, the President, and the Council of the East End Hostels Association, by the Lord Mayor (Sir William Waterlow, K.B.E.). At the end of the speeches Mr. A. Townshend, the Warden of the John Benn Hostel, announced that the Association would benefit by a record sum of about £2 200 as a result of the function.

The Prince's Message.

After the toast of "The King," the chairman read a message from the Prince of Wales, who inaugurated the John Benn Hostel and Milner Hall in 1927. His Royal Highness said:

"I was delighted to hear that the Lord Mayor had given permission for to-night's Banquet to be held in the Mansion House, and also that the Corporation of the City of London had subscribed to the funds of the John Benn Hostel, thus giving a mark of their approval to the work which I inaugurated by opening the Hostel in 1927.

"The high hopes expressed at the opening ceremony have not been falsified in the three intervening years, and from what I saw of the normal life of the Hostel on my second informal visit in 1928, I remained convinced of the vital need of work of this kind for boys in London.

"It is my intention to pay another visit to the Hostel before the close of the year, when I hope to hear that as a result of the Mansion House Banquet a record subscription will have been raised in 1930 for carrying on this fine constructive work. EDWARD P."

The toast of "The London Boy" was proposed by the Earl of Feversham, who asked whether any toast could be occupied with a more kaleidoscopic subject. The London boy, in school, was clean, alert and active. He took in the teacher's instruction with one eye and one ear, and with the other eye and the other ear he sought opportunities to place a pin for his classmate to sit upon. The work done at the Hostel was completely done, and every boy who went into the Hostel came out of it a new person. The boy of to-day would be the man of to-morrow, and to-morrow England would need every healthy and industrious man she possessed.

Miss E. S. Haldane, C.H., responded to the toast, and confessed that to her, in the boy full of fun and mischief, mischief was, perhaps, the most endearing quality. They knew how some people lived in the East End of London, and what chance had a boy there of growing up an honourable and healthy citizen? It was the business of those more fortunately situated to give them a chance, somehow or another, as, for example, they were given a chance in the John Benn Hostel.

Lord Astor Commends the Movement.

Viscount Astor gave the toast of "The John Benn Hostel." The fact that they were dining in the Mansion House was, as the Prince of Wales had pointed out, evidence that they were past the experimental stage and were a proved success. He joined with Miss Haldane in urging his hearers to go and see the Hostel for themselves. He had witnessed something of the work on its educational, recreational and social sides. He saw boys at work carpentering and others in the swimming bath. On a stage admirably equipped for theatricals he saw other boys acting a scene from Shakespeare, and showing real natural aptitude. The boys' characters were being trained; they had an old boys' association, and after they had left they nearly always retained for the Hostel the affection that other boys felt in after life for a good school.

Sir Ernest Benn, in reply, thanked the Lord Mayor for his kindness in lending the Mansion House for the banquet. There were two points that he wished to mention, one in regard to their work at the Hostel and the other in regard to finance. Three years ago, upon a visit to the Hostel, he found a group of fourteen or fifteen boys at work, and he was informed that they were a minstrel troupe. Never in his life had he seen such a complete absence of histrionic ability. To-day their minstrels were in great demand all over London, and from those efforts had sprung a dramatic club which was to appear at the Old Vic next week, having fought its way to the finals in the Stewart Headlam Shakespeare Competition. Turning to finance, Sir Ernest said that they spent something like £7 000 a year in running the Hostel and the community centre, and mentioned also the very striking fact that one-third of that sum was contributed by the boys themselves. It was a little difficult to divide the figures exactly, but it might roughly be said that one-third of the expenditure was upon the community centre, and if that were so the boys provided 50 per cent. of every 6d. spent upon the Hostel. That would help them to understand the motto of the Hostel, "No pains, no gains," chosen by the boys themselves and forming a striking illustration of the spirit of the institution. At the outset of the Hostel's career, the Carnegie Trustees gave £10 000, and looking upon the venture as an experiment, took a mortgage on the building. Since then, the Trustees had expressed satisfaction of the highest order with the conduct of the Association, and had suggested that if an endowment fund were set up, they would tear up the mortgage or return the deeds. This explained why the Association was anxious to see on the other side of the balance sheet the sum of £10 000 so that it could rely upon a regular income.

Mr. J. H. Thomas, M.P., spoke of the rise to power of the democracy, and emphasised the importance of early training in good citizenship, such as was provided for boys otherwise without help in an institution like the John Benn Hostel, if the democaracy were to use its preponderance with wisdom and credit to the Empire. He spoke also of his own association in other days with the late Sir John Benn and the late Lord Milner, in memory of whom the Hostel and the community centre had respectively been founded.

Mr. W. Clarke Hall, the well-known London magistrate, proposed "No pains, no gains," and spoke of some of the difficulties and perils that beset the path of the East End lad and which the work of the Hostel did so much to lessen. In a witty speech the Secretary of State for India (Mr. Wedgwood Benn, M.P.) replied.

The health of the Lord Mayor of London was honoured at the call of the Mayor of Stepney (Alderman H. Lazarus, J.P.), who proudly claimed to be a London boy himself, and the toast of the Chairman was given by the Earl of Elgin, who referred to the happy amalgam of East End boys, West End boys and all sorts of other boys (including himself as a boy from north of the Tweed), that had produced the good work of the Hostel and their gathering that evening.

LARGE TRANSFORMERS.

Some Big Units of American Design and Manufacture.

TWO transformers which for two seconds have a capacity of 1 250 000 kVA have been installed at the Schenectady works of the General Electric Co. of New York. This maximum capacity is more than twice as great as the installation of the Niagara Falls Power Co., which is rated at about 556 000 kVA. The transformers, which will be used with a 100 000 kVA generator, are normally rated at 33 333 kVA and are claimed to be the largest yet built in America for testing. They are to be used for testing switchgear of various types. The two transformers now installed are the nucleus of a bank of four. Each weighs nearly 200 tons, including 27 200 gallons or 100 tons of oil. The weight of the core and windings is 64 tons. The long diameter is 21 ft. 8 in., and the short diameter 12 ft. 2 in. There are thirteen high voltage bushings on the top of each, for ease in obtaining different voltage connections. The overall height is 28 ft. 1¼ in. In shipment from Pittsfield, Mass., the place of manufacture, to Schenectady the cores and windings were enclosed in steam-heated houses on standard transformer cars. A temperature of 90 deg. F. was maintained so that the cores arrived at Schenectady free from moisture.

Three other interesting units consist of 40 000 kVA, 220 000 V transformers of the non-resonating type, developed by the same company and installed at the Long Beach No. 3 generating station of the Southern California Edison Co. The non-resonating feature claims to permit higher factors of safety than have been reached heretofore. Electrical stresses throughout the winding are reduced. The insulation of these transformers is co-ordinated with that of the rest of the transmission system; that is, the transformers are designed to be electrically stronger than the insulators that carry the 220 000 V transmission line. Thus, if lightning should strike the line or very high voltage surges should be induced in the line by a nearby stroke, the line insulators will be the first to flash over and thus tend to relieve the abnormal voltage stress.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

FYLDE WATER BOARD.—Installation of impulse type water turbines and 40-50 kW generators. Specification, etc., from Mr. G. F. Atkinson, Head Office, Setton Street, Blackpool.

KIRK ELLA PARISH CHURCH.—Electric light installation. Particulars from the vicar, Canon James Foord, Kirk Ella, Yorks.

COMMISSIONERS OF H.M. WORKS, ETC., May 30.—Electric light shades, etc. Forms of tender from Controller of Supplies, King Charles Street, Westminster, S.W.1.

OGMORE AND GARW URBAN DISTRICT COUNCIL, May 30.—Supply, erection and connecting up of about 2 000 route yards of 11 000 V overhead service line, with short lengths of interconnecting cables. Specification, etc., from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £1 1s.

FARNWORTH URBAN DISTRICT COUNCIL, May 31.—Supply of 1l.t. cable. Specifications, etc., from Mr. A. J. Atkinson, Electricity Department, Albert Road, Farnworth, Lancs.

PORTADOWN URBAN DISTRICT COUNCIL, May 31.—Supply, erection, etc., of eight sets of electric motors and pumps and automatic switchgear at three pumping stations. Specifications can be seen and forms of tender obtained at the offices of Messrs. Taylor and Wallin, 1, Saville Place, Newcastle-on-Tyne; deposit 10s.

UPPER STOUR VALLEY MAIN SEWERAGE BOARD, May 31.—Treble ram pump (to deliver 15 000 gallons per hour), electric motor, automatic central gear and accessories. Particulars and tender form from Mr. G. P. Deeley, 13, Church Street, Stourbridge; deposit £1 1s.

ABERDEEN CORPORATION, June 2.—Electrical work in connection with new public conveniences, shelter and shop at the Bridge of Dee. Specifications, etc., from the Borough Surveyor.

BALLYMENA URBAN DISTRICT COUNCIL, June 2.—Provision of electricity supply equipment for the township. Specifications, etc., from Mr. James Scott, 358, Royal Liver Buildings, Liverpool; deposit £2 2s.

HULL CORPORATION, June 2.—Electric light and bell installation in new admission hospital at Willerby Mental Asylum. Specifications from the City Architect.

LIVERPOOL CORPORATION, June 2.—Supply of 41 motor-generator sets for cinema arc work, suitable for operation on 400 V, three-phase, 50 period supply, and to give d.c. output of 80A at 70 V. Tenders to Mr. Walter Moon, town clerk, Liverpool.

STOCKTON-ON-TEES CORPORATION, June 2.—Supply of paper insulated cables. Specifications from Mr. S. G. Marston, Electricity Works, Thompson Street, Stockton-on-Tees.

HULL CORPORATION, June 3.—Twelve months' supply of stores to the electricity department, including electric lamps and fittings (schedule No. 1); joint shells (No. 2); end connections (No. 3); fuse boxes (No. 4); fuse wire (No. 8); etc. Specifications, etc., from Mr. J. N. Waite, Electricity Works, Sculcoates, Hull.

BELFAST WATER COMMISSIONERS, June 4.—Electrically-operated pumping plant. Specification, etc., from the Secretary, Water Office, Belfast; deposit £1.

CLACTON URBAN DISTRICT COUNCIL, June 4.—Two transformers and e.h.t. and l.t. switchgear (all of British manufacture) for Great Clacton sub-station. Specification, etc., from the Electrical Engineer and Manager, 1, Arcade Buildings, Station Road, Clacton-on-Sea; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15 kW motor-generator set, battery trickle charger, milking booster, and spare parts. Specification (No. 10) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 4.—Supply and erection at Ironbridge generating station of works supply sub-station 3 300 V and 400 V metal clad switchgear. Specification (No. 9) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

LIVERPOOL CORPORATION, June 6.—Installation of automatic telephone exchange at Central Police Station, Dale Street, Liverpool. Specifications from Mr. Walter Moon, town clerk, Municipal Buildings, Dale Street, Liverpool.

A SPECIAL exhibition of G.E.C. products at the Imperial Hotel, Colwyn Bay, May 7–17.

HINDLEY EDUCATION COMMITTEE, June 7.—Electric light installations at Moss Lane and Argyle Street Schools. Specifications from Mr. O. P. Abbott, Council Offices; deposit £2 2s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., June 9.—Supply of electrical accessories. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, S.W.1.

GLASGOW CORPORATION, June 9.—One year's supply of l.t. and e.h.t. cables, small insulated cables and flexibles, electric cookers, meters and electric kettles. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow, C.2.

ATHERTON URBAN DISTRICT COUNCIL, June 10.—Supply of 2 600 yds. of 0·2 h.t., concentric, paper insulated, lead sheathed, served, steel tape armoured and compound cable, suitable for pressures up to 2 500 V, centre point earthed, and made in accordance with latest B.E.S.A. specification. Tenders to Mr. A. E. Hope, clerk to the Council.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., June 10.—Supply of fuse boards and switches. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, S.W.1.

CENTRAL ELECTRICITY BOARD, June 11.—Construction of site works, foundation works and buildings in the area of the North-West England and North Wales Electricity Scheme. Specification (N.W.E.-P.F.2) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 11.—Supply and erection of 33 kV transformers. Specification (No. S.E.E.-G.T. 1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.1; deposit £2 2s.

NOTTINGHAM CORPORATION, June 11.—Supply of 300 tons of steel tramway rails of British manufacture. Specification, etc., from Mr. T. Wallis Gordon, city engineer, Guildhall, Nottingham; deposit, £1.

OSWESTRY CORPORATION, June 14.—Supply, erection, etc., of 3 core, 11 000 V, paper insulated, underground cable; l.t. 3 core, 4 core and 2 core, 400 V, paper insulated cable service material, and link disconnecting boxes (specification No. 1A); e.h.t. 11 000 V, oil immersed, truck type switchgear, and 400V, ironclad, air break switchgear (specification No. 2A);

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and one, two or three oil immersed, self-cooled, three phase, step down (11 000 V to 400V) transformers (specification No. 3A). Specifications from Mr. H. W. Edwards, borough electrical engineer, 28, Oswald Road, Oswestry; deposit £2 2s. for each. All apparatus and materials to be of British manufacture and cable to be C.M.A.

Leeds Corporation, June 16.—Supply of (1) 100 tramcar bodies; (2) 100 tramcar trucks, with wheels and axles; (3) 100 tramcar pneumatic brake equipments; (4) 100 tramcar electrical equipments. Specifications from Mr. R. L. Horsfield, general manager and engineer, Tramways and Transport Department, 1, Swinegate, Leeds; deposit £2 for each.

Nottingham Corporation, June 17.—Twelve months' supply of general stores to the electricity department. Forms of tender, etc., from the Engineer, Electricity Station, Talbot Street, Nottingham; deposit, 5s.

West Midlands Joint Electricity Authority, June 17.—Supply and erection of double circuit, 33 000 V, overhead transmission line, supported by steel towers. Specification (No. 33/T/2), etc., from Mr. E. F. Hetherington, chief engineer and manager, West Midlands Joint Electricity Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit, 10s. 6d.

Coventry Corporation, June 18.—Pumping plant in duplicate, for the Brownshill Green Water Scheme—contract No. 4, each set including centrifugal borehole and force pump, with vertical electric motor and all accessories. Specification, etc., from Dr. H. Lapworth, 25, Victoria Street, Westminster, S.W.1; deposit £3.

East Ham Education Committee, June 18.—Electric light installations at Monega and Sandringham Schools. Specifications, etc., from Mr. F. R. Thompson, Education Office, Town Hall, East Ham, London, E.6; deposit 10s.

Central Electricity Board, June 19.—Supply and laying of 33 kV and other cables in connection with Central England Electricity Scheme. Specification (C.E.-G.C.3) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Metropolitan Water Board, June 20.—Twelve months' supply of electric lamps. Form of tender (No. 24) from the Chief Engineer (Room 155), 173, Rosebery Avenue, London, E.C.1. Stamped addressed envelope to be sent.

Oldham Public Assistance Committee, June 20.—Supply of electric lamps and fittings, for the Poor Law Institution. Tender forms from the Public Assistance Officer, Town Hall, Oldham.

Central Electricity Board, June 23.—Supply and erection of 66 000 V and other cables in connection with Mid-East England Electricity Scheme. Specification (M.E.E.-G.C.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Central Electricity Board, June 30.—Supply and erection of metering equipment required in the area of the Central England Electricity Scheme. Specification (C.E.—G.M. 1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Dundee Corporation, July 12.—Supply of six 300 kVA outdoor type transformers. Specifications from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

Westmeath County Board of Health, June 2.—Electric wiring, etc., at County Home and Hospital, Mullingar, and at Dispensary, Mullingar. Specification from Mr. M. O'Lionnain, Runaidhe, Mullingar; deposit £5.

Cape Town Municipality, June 4.—Supply of heavy current d.c. testing motor generator, and starting gear (specification No. 494/1930). (Reference B.X. 6 341.)

Indian Stores Department, June 9.—Supply and erection of oil engine and alternator set, with switch and protective gear and connecting cables, for Public Works Department's power station, Jaipur (order No. N. 11 096). (Reference B.X. 6 445.)

Auckland Harbour Board, June 10.—Supply of submarine cable (contract No. 902). (Reference B.X. 6 354.)

Hydro-Electric Power Commission of Ontario, June 10.—Supply and installation of transformers, for Chats Falls transformer station. (Reference B.X. 6 436.)

Melbourne City Council, June 11.—Supply of paper insulated, lead sheathed cables, suitable for use on three-phase, 50 cycle system at 6 600 and 420 V. (Reference B.X. 6 415.)

Copenhagen Lighting Department, June 12.—Two electrically driven gas compressors, with minimum hourly capacity of 20 000 cu. metres of gas at pressure of 1 metre water column. (Reference A.X. 9 598.)

South African Railways and Harbours, June 12.—Supply of 2 000 V switch units and l.t. switchboards (tender No. 1 649). (Reference B.X. 6 365.)

Generating Plant, etc., for Rhodesia.

Bulawayo Municipality, June 13.—One 5 000 kW turbo-alternator, condensing plant, switchgear, transformers, etc. (Reference B.X. 6 321.)

South African Iron and Steel Industrial Corporation, Ltd., June 14.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

Madras Government, June 15.—Complete electrical equipment of three 66/110 kV outdoor sub-stations, in connection with Pykara hydro-electric scheme. Specification (No. E.26) (price 30s.) and general conditions of contract (price 3s. 6d.) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4, on payment of the respective fees (not returnable).

Postmaster-General's Department, Melbourne, June 17.—Supply of indicators (schedule No. C.588.) (Reference B.X. 6 333.)

Postmaster-General's Department, Melbourne, June 17.—Supply of multiple twin cable. (Reference B.X. 6 349.)

Postmaster-General's Department, Melbourne, June 17.—Supply of loading coil pots. (Reference B.X. 6 350.)

Melbourne City Council, June 18.—Supply and installation of automatic electric signals for traffic control (contract No. 2 787.) (Reference B.X. 6 421.)

South African Railways and Harbours, June 19.—Supply of metal-clad, 2 000 V switchboard, for Bloemfontein workshops sub-station (tender No. 1 657). (Reference B.X. 6 402.)

India Store Department, June 23.—Supply and erection of 11 000 and 400 V a.c., and 220 V d.c. switchgear, power and control cables, etc., at Shanan power house. Forms of tender (£3 15s., not returnable) from the Director General, Belvedere Road, London, S.E.1.

Johannesburg Municipality, June 26.—Electricity meters and time switches (contract No. 405). (Reference B.X. 6 449.)

New Zealand Public Works Department, July 1.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 63. (Reference B.X. 6 443.)

Cape Town Municipality, July 2.—Supply of paper insulated, lead covered, impregnated, lead sheathed and armoured cable. (Reference B.X. 6 426.)

New Zealand Public Works Department, July 8.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

New Zealand Government Railways, July 16.—Supply of two overhead electric, 30 cwt., underhung, travelling jib cranes, with 12 ft. jib, for goods sheds at Wellington and Auckland. (Reference A.X. 9 442.)

New Zealand Government Railways, July 17.—Supply of cable, switchgear and junction boxes. (Reference B.X. 6 385.)

South African Railways and Harbours, July 28.—Supply and erection of 23 electric lifts at new Railway Building, Johannesburg (tender No. 1 673). (Reference A.X. 9623.)

New Zealand Public Works Department, July 29.—Supply of auxiliary turbines and generating sets for Arapuni power scheme—section 305. (Reference B.X. 6 356.)

Victorian Railway Commissioners, July 30.—Supply and erection of turbo-alternators, condensing plant and control gear. (Reference B.X. 6 355.)

Victorian Railway Commission, July 30.—Supply of renewals for caustic soda primary cells (contract No. 43 701). (Reference B.X. 6 441.)

New Zealand Public Works Department, September 16—Supply of 110 kV switchgear, steelwork and controlling

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e equipment, for Mangahao electric power scheme—(section 221). (Reference B.X. 6 453.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 110 kV and 50 kV switchgear and protective system, for Arapuni power scheme—(section 273). (Reference B.X. 6 450.)

Tenders Accepted.

BEXHILL CORPORATION.—Enfield Cable Works, Ltd., supply of l.t. cable for further six months. (Recommended.)

H.M. OFFICE OF WORKS.—T. Clarke and Co., laying main power and road lighting cables, Belfast Parliament Buildings.

BRADFORD CORPORATION.—English Electric Co., Ltd., supply of 12 double-deck, railless electric trolley vehicles, £27 000.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Metropolitan Electric Cable and Construction Co., Ltd., supply of cables, £3 026 5s. (Recommended.)

PORTSTEWART URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., supply of generator, and Crossley Bros., Ltd., supply of 120 B.H.P. vertical engine, for the electricity works.

GENERAL POST OFFICE.—Telephone exchange equipment, Edgware, General Electric Co., Ltd. Telephone repeater equipment, Manchester, Standard Telephones and Cables, Ltd.

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Enfield Cable Works, Ltd., British Insulated Cables, Ltd., and Edison Swan Cables, Ltd., supply of cables for one year. (All recommended).

SOUTHEND-ON-SEA CORPORATION.—General Electric Co., Ltd., electrically-driven pump for fountains, £247 17s. 6d.; H. A. Lee, two fans for sterilising room and operating theatre, £36 7s. 6d.

CAPE TOWN CORPORATION.—Bruce Peebles and Co., Ltd., supply of self-synchronising equipment for two convertors, £218 10s.; Associated Engineers Co., Ltd., supply of 1 000 house service meters of "Measurement" type, £2 9s. 6d. each.

GENERAL POST OFFICE.—Telephone exchange equipment, Ipswich, Automatic Telephone Manufacturing Co., Ltd.; Ayr and Prestwick (Ayr area), Ericsson Telephones, Ltd.; terminating equipment, Seabrook (Kent), General Electric Co., Ltd.

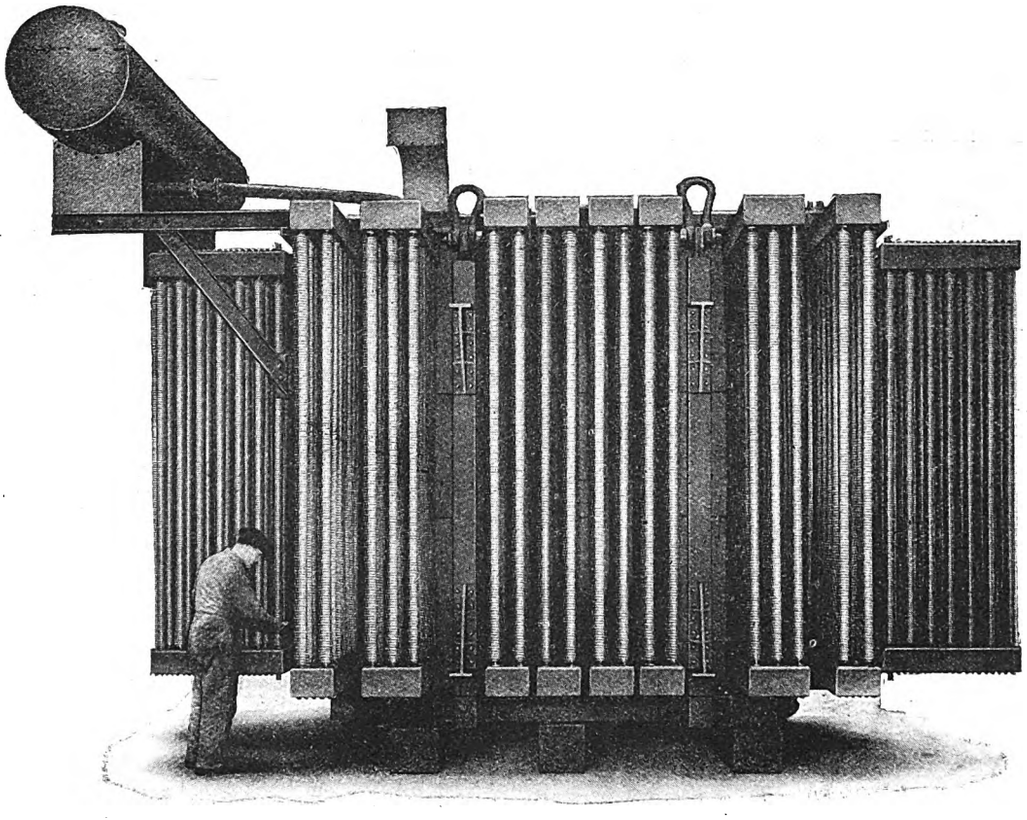
BEDFORD CORPORATION.—Robt. M. Russell, lines for use in connection with experimental scheme for provision of electricity supply in rural areas, £24 000. (Recommended.) Amount of tender is between £2 000 and £3 000 below estimated cost.

LONDON COUNTY COUNCIL.—Siemens Electric Lamps and Supplies, Ltd., all types of electric lamps (renewal order). This contract now covers supply of lamps to institutions formerly controlled by Metropolitan Asylums Board and boards of guardians.

SHOREDITCH (LONDON) BOROUGH COUNCIL.—Edison Swan Cables, Ltd., supply of e.h.t. lead covered cable, £1 410; l.t, lead covered cable, £3 145; and twin and three core armoured cable, £974, subject to increase or decrease based on prices of copper and lead at date of order. (Recommended.)

LONDON COUNTY COUNCIL.—Berkeley Engineering Co.. Ltd., fire alarm and automatic telephone wiring and fittings at Queen's Hospital, Sidcup, £867. Also tendered: Automatic Telephone Manufacturing Co., Ltd., £1 008; Buchanan and Curwen, £1 056; J. Briggs, Ltd., £1 066; T. Clarke and Co., Ltd., £1 122; A. Dean and Co., £1 268; L. G. Tate and Co., Ltd., £1 485; H. J. Cash and Co., Ltd., £1 692.

LONDON COUNTY COUNCIL.—Standard Telephones and Cables, Ltd., supply of h.t. and l.t. electric cables of British manufacture, and building up of existing cables, etc., for the tramways department, original tender, £46 725 19s. (accepted subject to reduction of prices to conform with ruling price of copper at date of acceptance, the result being a reduction to £42 061 11s. 7d.) Also tendered: Johnson and Phillips, Ltd., £48 232 17s. 3d.; Callender's Cable and Construction Co., Ltd., £48 975 15s. 11d.; W. T. Henley's Telegraph Works Co., Ltd., £49 171 13s. 8d.; Pirelli-General Cable Works, Ltd., £50 528 8s. 6d.; British Insulated Cables Ltd., £51 715 11s. 2d.; Macintosh Cable Co., Ltd., £51 993 10s. 7d.; Metropolitan Cable and Construction Co., Ltd., (incomplete); Siemens Bros. and Co., Ltd., (tender not signed); W. T. Glover and Co., Ltd., (tender not signed); Estimate of General Manager of Tramways, £52 000.



THIS large electrical transformer tank was constructed by G. A. Harvey and Co. (London), Ltd., Woolwich Road, London, S.E.7, for the South-East England Electricity Scheme. This unit, the first of a number in hand, is fitted with "Harco" gilled tubes of mild steel. One of the tubes shown dissipates, it is claimed, as much heat as three plain tubes. These batteries of tubes can be detached without emptying the oil from the tank, owing to the fact that special valves are provided, which, when closed, isolate the radiator, when it can be drained of oil and removed. The chief object in having the radiators detachable, is, however, to make transport from the works to the site possible by their removal.

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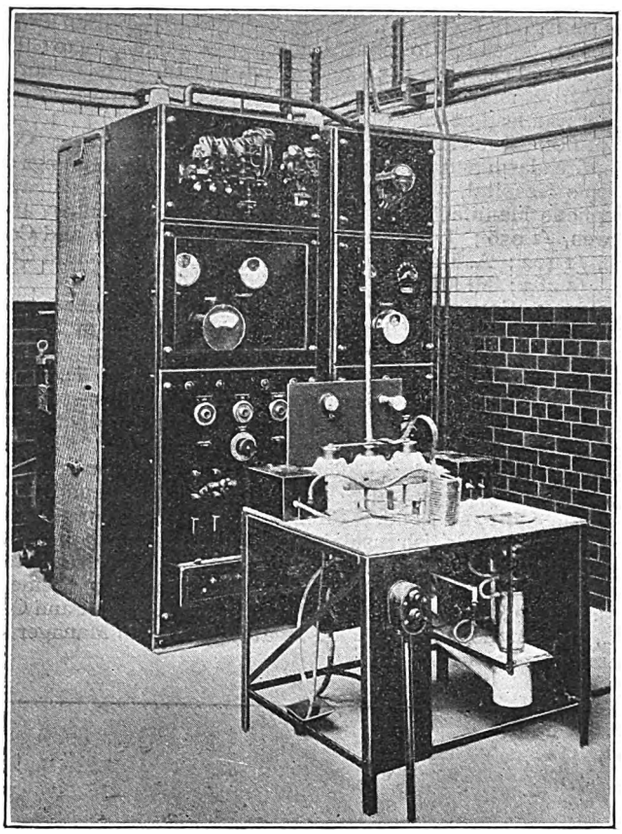
INDUCTION FURNACES.

Development of Small Equipments for Laboratory Use.

IN addition to the larger coreless induction furnaces developed by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD. for melting iron and steel and non-ferrous metals in commercial service, this company has also developed small induction furnace equipments which are particularly suited



"Metrovick" induction furnace at Manchester University.

to laboratory work. The latter development was carried out originally to meet the needs of the company's own research work, but the design was later commercialised and equipments supplied to the Universities of Manchester and Sheffield have been in operation for some time. An equipment of similar type but somewhat larger size has now been ordered by Imperial Chemical Industries, Ltd., for use in the research laboratories of the works of Brunner Mond and Co., at Winnington, near Northwich. The furnaces of this type have been developed in a range of sizes. The equipment ordered by Imperial Chemical Industries, Ltd., is designed to melt a charge of 20 lb. of metal and is rated at 20 kW. The equipment supplied to the University of Manchester is designed for a charge of ½ to 2 lb. and is rated at 5 kW. Two equipments at Sheffield University are of rather smaller size and are used for melting charges of a few hundred grams of metal in vacuo. In all cases the supply of power at high frequency for operating the furnace is obtained by means of a water-cooled oscillator valve. The development has thus an additional interest as an example of the use of thermionic valves for industrial work. The use of an oscillator valve, which gives a frequency of about 500 000 cycles, enables the furnaces to melt very small charges. While it is possible to melt a ¼ ton charge of steel with power at 500 cycles, charges of a few grams require very much higher frequency. In laboratory furnaces, especially when working with rare or costly metals, it is very desirable to be independent of any size restrictions imposed by purely electrical considerations, and so it is essential to provide a frequency which will melt all charges from a few grams up to several pounds. The furnaces will melt charges of up to ½ lb. in 2 to 3 minutes. The normal full charge is melted in 20 to 30 minutes. All the furnaces will melt quantities up to about twice their normal charge, provided that a correspondingly longer time is allowed for the operation.

THE "BRITANNIC."

Telephonic Communication to be Effected During Trials.

THE new White Star liner "Britannic" is one of the first new ships to be affected by the regulations of the 1927 International Radiotelegraph Convention of Washington, and by one regulation in particular, which restricts the power of spark transmitters, fitted after January 1, 1930, to 300 W. The Marconi wireless installation is in a spacious room at the after end of the chart room, and includes a valve transmitter and receiver, an emergency transmitter, and a direction finder. Two motor lifeboats are also fitted with transmitters and receivers. The main transmitter is a valve installation for continuous and interrupted continuous wave signalling on 600 and 800 metres, and for continuous waves only on wavelengths between 1 887 and 2 725 metres. This transmitter will work with an aerial 335 ft. in length, the horizontal span of which is 265 ft. long and is 144 ft. above the water line. There is a two-valve receiver which is a new development in marine work, as it covers in one instrument the whole of the commercial waveband of from 15 metres to 20 000 metres, for which two receivers were formerly used. The direction finder will be used in conjunction with a gyro repeater, and the direction finder aerials are mounted on top of the chart room forward of the Marconi room. These aerials are 7 ft. high and are of the latest double loop type in which the actual aerial wires are totally enclosed in rigid metal tubes.

An interesting wireless experiment has been permitted by the Post Office in connection with the "Britannic" trials off the Clyde. Temporary wireless telephone installations have been fitted in Harland and Wolff's offices and on the ship, so that representatives of the owners and builders can be constantly in oral communication during the three days trials. This has never been attempted before, and will be watched with interest by all those who know the many questions which arise on these occasions and which usually can be settled by a few minutes' talk by telephone. It will be particularly useful on this occasion as the trials take place at some distance from the builders.

It is probable that at a later date a short wave telegraph installation will be added to the present Marconi equipment, and this will give the "Britannic" a wireless range practically world-wide.

BATTI-WALLAHS SOCIETY.

Luncheon to Sir Edward Crowe—Consuls and Trade.

MR. WILLIAM McCLELLAND, C.B., O.B.E., occupied the chair at a Batti-Wallahs Society luncheon at the Hotel Metropole, London, on May 22, when Sir Edward T. F. Crowe, C.M.G., Comptroller of the Department of Overseas Trade was the principal guest.

Sir Edward Crowe, who talked with humour and understanding of the Consular Service, in which he served with so much distinction before taking up his present position. He said that consuls had not been spoken of very highly and the criticism was directed against consuls of all nationalities. It was, however, not the fault of the consuls if they had not helped trade as much as they should have done. Consuls could not sell goods; all they could do in that direction was to supply information and to try to put two and two together and send intelligence home as quickly as possible. Foreigners often appeared to be more eager to secure British commercial reports than our own manufacturers. British manufacturers and merchants did not study these reports as much as they should. They seemed to be satisfied that they had done all that was necessary if they glanced at Press summaries of documents which might extend from 150 to 200 pages.

As far back as Lord Palmerston's time British consuls were in the habit of reporting on commercial matters; to-day the Consular Service had very definite instructions that it must go all out to help commerce, and if manufacturers would take advantage of the information that was gathered by consuls they would find it of some use to them.

Sir Edward Crowe drew attention to the advantages offered by the Consular Service to the boy with brains and some gift for languages. He said that he would be very pleased to give any information that might be required by parents who might be interested in the service as a possible career for their sons.

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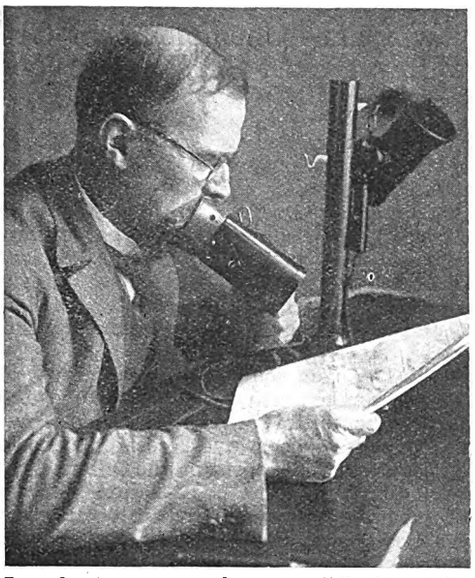
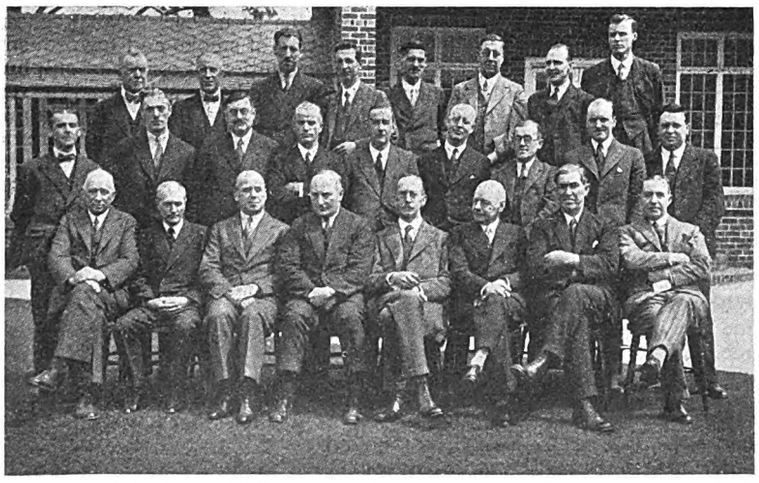
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



In order to overcome language difficulty at the World Power Conference, which opens at Berlin on June 16, special speech transmitting apparatus has been installed, which will enable members to listen to speeches in any one of the three official languages of the Conference—i.e., German, English, or French. Three sets of apparatus have been built and will be installed so as to provide for a total number of 1 000 members. Placed in front of each seat in the auditorium will be a pair of headphones, connected to a specially designed switch box by means of which the listener can switch in to the language he best understands. In addition, a volume control is included. The speakers and the interpreters, who will translate on the spot, will speak into microphones equipped with sound-proof mouthpieces.

Two E.D.A. window displays designed in connection with the Selling Campaign for June. The window on the left features cookers, kettles, etc., and maintains that atmosphere of simplicity which has so far characterised all E.D.A. windows. Refrigerators form the subject of the second display, and here, again, the design is strikingly attractive.



Members of the South Midland Area Committee of the E.D.A. photographed on the occasion of their May meeting at the headquarters of the Shropshire, Worcestershire and Staffordshire Electric Power Co., Ltd., Mucklows Hill, Halesowen, near Birmingham.

A new system of lighting has been installed in St. Paul's Cathedral, ready for the reopening next month. This view of the main transept shows the effect of the new fittings.

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ELECTRICITY SUPPLY.

Official Returns of Electricity Generated—St. Helens' New Plant—Unemployment Grant for Hull—Progress of East Midlands Scheme—Lancashire Power Co's. Rural Extensions—Canadian Hydro-Electric Development.

BEDFORD Electricity Committee is to seek sanction for a loan of £20 000 for mains.

Battersea (London) Electricity Committee has obtained sanction to borrow £6 987 for mains and £13 320 for plant, switchgear, etc.

Whithorm Town Council has accepted the draft of an agreement with the Scottish Midlands Electricity Supply Co. for a supply of electricity.

Sanction to loans of £24 064 for mains, £5 900 for sub-station equipment, and £10 000 for services and apparatus in connection with the change-over is being sought by Halifax T.C.

Aberfeldy T.C. has received a letter from the Grampian Electric Supply Co. intimating that the company is including a supply to the burgh in its programme of extensions for the current year.

Sanction has been received by St. Helens T.C. to extend the generating station by the installation of a 12 500 kW turbo-alternator with cooling tower and other ancillary works, at a cost of £48 150.

On behalf of the owners of the Hinderton Electric Light Works, a letter has been addressed to Birkenhead Electricity Committee offering to sell the undertaking. The Committee is having a report prepared on the matter.

St. Pancras (London) Electricity Committee reports that it is necessary to provide 10 l.t. mains for distributing electricity from Arlington Road sub-station. The cost of the work will be £7 200, including the laying of the cables and reinstatement charges.

The Unemployment Grants Committee has given sanction to a scheme of Hull Corporation for laying electric service cables at an estimated cost of £100 000. The scheme will permit of cables being laid in any areas irrespective of immediate return on expenditure.

Shoreditch (London) Electricity Committee recommends seeking sanction for a further loan of £20 000 for free wiring. The Committee reports that 570 applications for supplies under the free wiring scheme are in hand, and applications are being received at the rate of 50 per week.

The extension of Clitheroe Corporation's cable to Chatburn has been held up through differences between the Corporation and the P.C. The latter put forward an objection to overhead wires, but the Electricity Committee has intimated that the underground system is too costly.

A loan of £1 548 for excess expenditure incurred in connection with the electricity scheme for Bradenham is being sought by Aylesbury T.C. The Electrical Engineer is to submit a further report with regard to a scheme for the supply of electricity to Cholesbury, Longwick, and Wotton.

The Electricity Commissioners have sanctioned the borrowing by Fulham (London) B.C. of £12 500 for consumers rental wiring installations, £7 500 for domestic apparatus for hire, and £10 000 for unspecified mains extensions. The Electricity Committee has authorised mains extensions at an estimated cost of £6 212.

A beginning was made last week with the construction of the Lincoln to Grimsby section of the Central Electricity Board's East Midlands scheme. From Lincoln a further line will proceed southward to join up with Peterborough. The line is being constructed by the Pirelli General Cable Works, Ltd., and it will carry current at 132 000 V.

Mr. M. G. E. Rhodes, on behalf of the Ministry of Health, held an inquiry last week into the application by South Shields T.C. for sanction to a loan of £50 057 for the conversion of the street lighting from gas to electric, at a cost of £42 865. Mr. C. B. Fenwick, for the Corporation, said had it not been for the purpose of relieving unemployment the scheme would not have been launched for at least another three years. Amongst the opponents was the South Shields Gas Co.

The official returns rendered to the Electricity Commissioners show that 837 000 000 kWh of electricity were generated by authorised undertakers in Great Britain during April, 1930, compared with 807 000 000 in April, 1929, an increase of 3·7 %. During the first quarter of 1930, the amount of electricity generated by authroised undertakers was 3 017 000 000 kWh, compared with 2 844 000 000 for the corresponding quarter of 1929, increase over 6%. The Commissioners propose to issue a similar statement each month.

Watford Electricity Committee seeks sanction for a loan of £20 000 for mains extensions under the unemployment scheme.—The Committee has received from the Electricity Commissioners a copy of a letter from the chairman of Chipperfield Village Council on the subject of the supply to certain premises in the village, and the Commissioners asked for the observations of the Corporation. The Committee is replying to the Commissioners that without an adequate contribution from the persons desiring the service the Corporation cannot give a supply.

Construction is to be begun shortly on a new power plant on the Abitibi River, 65 miles north of Cochrane, Ontario. The waters falling through the Abitibi Canyon and Rapids above are to be harnessed to develop 275 000 H.P., at a cost of $23 000 000. An additional $3 500 000 is to be spent by the Ontario Hydro-electric Power Commission on the construction of a transmission line to Sudbury. The new plant is to be constructed by the Hudson's Bay Power Co., and a contract has been entered into for the delivery of 100 000 H.P. for 40 years to the Power Commission.

The Electricity Commissioners have granted an Order to the Lancashire Electric Power Co. to supply in the urban districts of Lathom and Burscough, part of the rural district of Wigan (Parbold and Dalton), part of the rural district of West Lancashire (Bispham and part of Bickerstaffe) and the mining township of Skelmersdale. The company recently purchased the private undertaking at Ormskirk, and is converting this station to receive alternating current from two 10 000 V cables from Southport. It is proposed to spend £18 000 on h.t. mains, and £32 000 on distribution mains.

Tynemouth Electricity Committee has decided to enter into an agreement with the Electrical Manufacturers' Finance Co. in connection with the hire purchase of electrical apparatus. The Corporation is to receive a discount of 20%, with an additional 2½% for cash on all sales, and the company accepts all responsibility for the collection of moneys. The Committee has authorised the Electrical Engineer to enter into arrangements with other companies in connection with the hire-purchase of electrical apparatus on similar terms to that made with the Electrical Manufacturers' Finance Co.

Sanction has been received by Tunbridge Wells T.C. to a loan of £13 200 for mains. The Electricity Commissioners have had under consideration the Council's application regarding a supply of electricity to premises at Chiddingstone Causeway, and, in view of the comprehensive scheme which is being carried out by the Kent Electric Power Co., they suggest that the Corporation consider the question of affording a bulk supply to the Kent Co. for the purpose of the development of the area in question. The Lighting Committee is not prepared to recommend the Council to afford such a supply.

Prof. Wheeler, Dr. Ardern, Messrs. Kennedy and Donkin and Dr. J. S. Owens, who were appointed by Marylebone (London) Electricity Committee to advise as to precautions to be taken for the consumption of smoke and for preventing the emission of grit and the evolution of oxides of sulphur at the Council's generating station, have submitted a report which is being considered by the Committee. The Committee reports that the suitable plant is now available for the removal of dust from the boilers and economisers when they are undergoing periodical cleaning, and it proposes that such improved plan be installed at a cost of about £2 000, and is inviting tenders accordingly.

The Manitoba Power Commission contemplates the expenditure of $2 066 114 during the present year on rural transmission lines. A programme has been arranged for extension of the hydro-electric system into all of the important Manitoba municipalities within the next two or three years. The proposals for the coming year are for the construction of 540 miles of line in 18 schemes, the most important of which is a 82-mile high-voltage line connecting Portage le Prairie with Brandon, and branch lines of lower voltage to serve towns to the south and north of this main transmission line. The system will be extended into the area south-west of Brandon. Two smaller systems are being established in the north-western part of the Province, with local generating stations. North of Winnipeg the line is to be extended from Selkirk to serve Winnipeg Beach, Gimli and Toulon.

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POWER PLANT.

New Equipment to Interest the Supply Engineer and Contractor.

IT is stated that the new Martindale super-blower, manufactured by the MARTINDALE ELECTRICAL CO., LTD., Aerial House, The Hyde, Hendon, London, N.W.9, is unusually powerful, while the common defect of allowing the air in the air-chamber to be churned has been overcome—providing greater pressure and giving cooler operation by reducing the load on the motor. The specification is given as follows: Oversize ⅓ H.P. motor, 32, 110, 220 or 250 V (universal); mounted on Norman precision ball-bearings; 20 ft. of cab-tyre flexible cord, with 2-pin bakelite plug; 11 in. semi-hard rubber nozzle; weight, 9 lb. The U tube water column pressure is stated to be 32·5 in. and the air velocity 312 ft. per sec. For those desiring a smaller blower, the Martindale "Blow-er Clean" is offered. It weighs only 7 lb., but gives an air velocity of 260 ft. per sec. and develops a pressure of 23·95 in. water column. It is fitted with a ¼ H.P. motor and has a polished aluminium case.

To fit either type of blower is offered a special attachment containing a heating element. It can be used—among other purposes—for supplying warm air for drying insulating varnish, for drying out magnet coils, small transformers and insulation on wiring, for thawing water pipes or valves and for melting ice on insulators. The warm air stream is also recommended for drying out a moisture "earth" in conduit, since heat alone cannot be used for this purpose on account of the moisture recondensing elsewhere in the conduit.

An interesting addition has lately been made to the standard range of counter e.m.f. starters manufactured by THE GENERAL ELECTRIC CO., LTD. (Magnet House, Kingsway, London, W.C.2). The new starter has been developed to deal with relatively large motors, and the starter is specially suitable for all d.c. services where the machine starts up light, including such applications as machine tools, wood-working tools, small printing machines and small compressors and pumps. Two patterns are manufactured—a light duty pattern (type 1) and a heavy duty pattern (type 2) for the higher horse powers (up to 5 H.P.). The starter consists essentially of a line contactor and an accelerator contactor mounted with a resistance in a ventilated box. In the new type 2 starter, the line contactor is fitted with a magnetic blow-out and is electrically interlocked with the accelerator contactor. Since the coils of the line contactor are shunt-operated, the starter also functions as a no-volt release.

Blue-printing.

Supply engineers, whose duty it is sometimes to prepare drawings, blue prints, etc., for specifications, will be interested in the new "Peerless" equipment, for which unusual speed of production, high quality prints and low operating cost are claimed. The equipment is put on the market by the C. F. PEASE COMPANY, 813, North Franklin Street, Chicago, and the model 30, it is stated, is suitable for producing blue-prints, negative prints, blue line and brown line prints; although the operation is similar to that of the former "Peerless" model, the design differs in several respects.

The tracings are laid face up on a continuous roll of paper, feeding at the front of the machine, and are carried upward around a semi-circular, uniformly curved segment of French plate glass, past a glowing bank of arc lamps. These lamps are individually mounted in horizontal alignment in front of the glass and give an intense light rich in actinic value. After the exposure has been made, the tracings are automatically returned into the tray at the front of the machine, near the operator's hands, while the prints on the continuous roll of paper are carried through the machine. The operations of washing, potashing, and drying take place in succession. The paper is then automatically rolled up in loose cylinder form at the rear of the machine for convenient cutting and trimming. Throughout its travel the roll of paper is gear-driven without drag or possibility of strain. The machine is direct gear-driven throughout, has a speed range of from 4 inches to 12 feet per minute and is driven by a variable speed ¼ H.P. motor direct connected to a fully enclosed gear reduction unit running in oil. At the extreme left-hand side of the machine and mounted in the feed table is a four-point auto-type gear shift providing for two forward speeds, high and low, also neutral and reverse. The reverse gear is stated to be a new departure in blue-printing machine construction.

LIGHTING INDIA HOUSE.

Novel Fittings in New Kingsway Building.

AMONG the features of electrical interest at India House, Kingsway, London, which will, it is expected, be opened in July, those of most novelty are the lighting fittings, which have been carried out for the architect, Sir Herbert Baker, from his designs, by Higgins and Griffiths, Ltd., of 21, Orchard Street, London, W.1. The fittings have been definitely designed to harmonise with the architecture. The whole scheme has been treated as an entity; it centralises on the main octagon hall of the building, and, as one passes farther from this hall, the design gradually falls away—the fittings steadily dropping their ornamentation until at length they become merely service fittings. At all times the aim has been to have the illumination both ample and pleasant, and the question of efficiency has also been carefully studied. The most remarkable part of the lighting scheme is the large Jali lantern. This great central light extends through and above the first floor, and is so designed that, in addition to illuminating the hall, it throws a gentle diffused light through the Jali work forming the sides of its dome, giving a similar effect to daylight streaming through a series of openings. The Jali work is exquisitely carved and beautifully decorated, and the whole furnishes a superlative example of the combination of art with the science of electric lighting. The light is derived from an unusually large pendant, which consists not only of the large lamp, but also carries on the suspension a secondary lamp to light the Jali, while from the main lamp depend eight satellites in the form of small globular lamps resembling those used in other parts of the building.

In various details the pendants and wall brackets throughout the greater part of India House reproduce the octagonal characteristic that is the basis of the scheme. All the principal fittings have the same light touch combined with an appearance of strength; in some of the principal apartments fittings close to the ceiling are substituted for pendants. The corridors are lighted by Doric globes with a special type of domed gallery in harmony with the main scheme of design. On the High Commissioner's floor the lighting scheme has been carried out in polished silver plate.

COLLIERY MOTORS.

New Specifications for Motor Generators for Mines—Miners' Handlamp Bulbs.

IN continuance of the programme of work in their Colliery Section, the British Engineering Standards Association has just issued B.S.S. for electric motors and generators for mines and for miners' handlamp bulbs. The specification for electric motors and generators for use in mines applies to machines of one brake horse power and upwards per 1 000 r.p.m. having windings insulated with class A material, and wound for voltages not exceeding 7 000 V. The specification has been drawn up to comply with the General Electric Regulations made under the Coal Mines Act, and in its preparation due regard has been paid to the explanatory notes made in Mines and Quarries, Form No. 11. The specification does not apply to turbo-type machines, rotary converters, motors for traction purposes, *i.e.*, motors mounted on vehicles for their propulsion, nor does it apply to motors embedded in coal cutters, drills and conveyors, for which another specification will be prepared. Two classes of machines are provided for by the specification, those for use in locations where General Regulations 127 (v) and 132 of the Coal Mines Act are applicable.

The miners' handlamp bulbs specification provides for the ordinary class of 2 V bulb with a nominal rating of 2 W, used underground in collieries. The terms of this specification have been determined after a series of tests which are probably unique. Batches of lamps were manufactured under normal conditions, having filaments designed to operate at different efficiencies. All these lamps were carefully measured and a proportion of each design tested, in the manner defined in the specification, at several test stations, including those at the National Physical Laboratory, and the Mines Department, Sheffield. Lamps of each design were also sent to six coal mines, chosen to represent the widely varying conditions normal to the industry, and details of their performances were carefully logged. The data so obtained from both laboratory tests and experience in the mines, has been used in framing the specification, and its utility in defining a lamp satisfactory to the industry is thereby guaranteed.

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FINANCIAL INTELLIGENCE.

Supply Companies' Profits for 1929, with Appropriations and Percentages to Capital.

By "AUDITOR."

TABLE SHOWING PROFITS REALISED BY CERTAIN ELECTRICITY SUPPLY COMPANIES DURING 1929; THE DIVIDENDS, RESERVES, AND OTHER APPROPRIATIONS; WITH PERCENTAGES IN RELATION TO CAPITAL INVESTED; AND RECENT PRICES AND YIELDS.

	Capital Dec., 1929.	Brought Forward		Profit 1929		Total		Dividends Distributed		Reserves, &c. Allocated		Other Appropriations		Carried Forward		Total		Ann. Divs.	Par Val.	Recent Price	Yield
	£	£	%	£	%	£	%	£	%	£	%	£	%	£	%	£	%				
Adelaide Elec. Supply	500 000	31 902	1·06	331 534	11·05	363 436	12·11	226 406	7·55	105 000	3·50	—	—	32 030	1·06	363 436	12·11	12	Stk.	—	—
„ 8% Cum. Pref'd Ord. Stock	750 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	Stk.	—	—
„ 6% Cm. Pref. Stock	250 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£100	101	5·94
„ 5% "A" Cm. Pref. Stock	250 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	£100	101	4·95
„ 8% "B" Cm. Pref. Stock	250 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	Stk.	—	—
„ 6½% "C" Cm. Pref. Stock	1 000 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6½	£100	104	6·25
	3000 000																				
Barbados Elec. Supply	60 000	2 007	3·34	10 939	18·23	12·946	21·57	3 397	5·66	7 500	12·50	—	—	2 049	3·41	12 946	21·57	6	£1	—	—
	60 000																				
Charing Cross Electy.—West End	1 036 800	79 706	5·54	174 231	12·12	253 937	17·66	102 510	7·13	63 843	4·44	—	—	87 584	6·09	253 937	17·66	8·151	£1	27/9	5·87
„ 4½% Cm. Pref.	400 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4½	£1	17/6	5·14
	1 436 800																				
Charing Cross Electy.—City	550 000	18 227	1·91	122 472	12·89	140 699	14·80	67 000	7·05	73 699	7·75	—	—	—	—	140 699	14·80	8·90	£1	—	—
„ 4½% Cm. Pref.	400 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4½	£1	17/6	5·14
	950 000																				
Chiswick Electy. Supply Corp.	150 000	2 653	1·76	34 174	22·78	36 827	24·54	24 000	16·00	—	—	9 000	6·00	3 827	2·54	36 827	24·54	16	£1	55/6	5·77
Clyde Valley Elec. Power	2 100 000	84 586	2·91	354 495	12·22	439 081	15·13	187 485	6·46	162 500	5·60	808	0·03	88 288	3·04	439 081	15·13	8	£1	39/–	4·10
„ „ 6% Cm. Pref.	300 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	23/6	5·11
„ „ 8% Cm. 2nd Pref.	500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	£1	29/–	5·52
	2 900 000																				
City of London Elec. Light	1 200 000	7 657	0·40	264 638	13·93	272 295	14·33	168 000	8·84	58 043	3·06	39 278	2·07	6 974	0·36	272 295	14·33	10	£1	34/–	5·88
„ „ 6% Cm. Pref.	400 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	23/6	5·11
„ „ 8% Cm. Pref.	300 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	£1	28/–	5·71
	1 900 000																				
Elect. Distrib. of Yorks.	1 400 000	21 905	1·56	96 482	6·88	118 387	8·44	77 230	5·51	17 500	1·25	—	—	23 657	1·68	118 387	8·44	9	£1	35/3	5·11
Kensington & K'bridge Elec. Light	317 500	10 664	2·55	36 650	8·78	47 314	11·33	30 877	7·39	10 316	2·47	3 998	0·96	2 123	0·51	47 314	11·33	1/7·18	£1	26/9	5·97
„ „ 6% Cm. 1st Pref.	50 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£5	—	—
„ „ 5% 2nd Pref.	50 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	£5	—	—
	417 500																				
Kidderminster & Dis. Elec. Light & Trac.	47 000	446	0·46	3 806	3·92	4 252	4·38	3 675	3·79	—	—	—	—	577	0·59	4 252	4·38	2½	£10	—	—
„ „ 5% Cm. Pref.	50 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	£10	—	—
	97 000																				
London Elec. Supply Corp.	699 300	25 437	1·82	161 284	11·53	186 721	13·35	104 889	7·50	35 000	2·50	—	—	46 832	3·35	186 721	13·35	9	£1	29/–	6·21
„ „ 6% Pref.	699 200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£5	5½	5·36
	1 398 500																				
Melbourne Elec. Supply	800 600	—	—	99 009	7·61	120 296	9·25	120 060	9·23	—	—	236	0·02	—	—	120 296	9·25	10	£100	175	5·71
„ „ 8% Cm. Pref.	500 000	—	—	—	—	(a)	—	—	—	—	—	—	—	—	—	—	—	8	£5	5½	7·76
	1 300 600																				
Metropolitan Elec. Supply	2 000 000	87 149	3·49	281 766	11·27	427 300	17·09	172 500	6·90	160 054	6·40	10 000	0·40	84 746	3·39	427 300	17·09	10	£1	40/6	4·94
„ „ 4½% Cm. Pref.	500 000	—	—	—	—	(b)	—	—	—	—	—	—	—	—	—	—	—	4½	£1	17/6	5·14
	2 500 000																				
Midland Counties Elec. Supply	2 250 000	5 676	0·14	211 079	5·27	216 755	5·41	196 000	4·90	16 177	0·40	—	—	4 578	0·11	216 755	5·41	7	£1	28/–	5
„ „ 6% Cm. Pref.	1 750 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	23/–	5·22
	4 000 000																				
Midland Elec. Corp. for Power Distrib.	700 000	24 550	2·72	151 365	16·81	175 915	19·53	70 000	7·77	70 325	7·81	—	—	35 590	3·95	175 915	19·53	8	£1	31/10	5·03
„ „ 7% Cm. Pref.	200 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	£1	25/9	5·43
	900 000																				
Newcastle-upon-Tyne Elec. Supply	4 007 681	80 653	1·14	687 784	9·76	768 437	10·90	422 409	5·99	250 000	3·55	—	—	96 028	1·36	768 437	10·90	6	£1	23/–	5·22
„ „ 7% Cm. Pref.	1 500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	£1	25/8	5·46
„ „ 5% Pref.	1 538 952	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	£1	19/3	5·19
	7 046 633																				
Northampton Elec. Light & Power	547 500	9 690	1·62	64 455	10·74	74 145	12·36	57 375	9·56	7 000	1·17	—	—	9 770	1·63	74 145	12·36	10	£1	46/6	4·30
„ „ 5% Cm. Pref.	52 500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	£1	—	—
	600 000																				
St. James' & Pall Mall Elec. Light	670 000	112 377	14·59	75 339	9·79	187 716	24·38	59 900	7·78	22 361	2·90	4 993	0·65	100 462	13·05	187 716	24·38	7·894	£1	27/9	5·69
„ „ 7% Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	£1	24/4	5·76
	770 000																				
Salisbury Elec. Light & Supply	110 000	152	0·14	10 943	9·95	11 095	10·09	11 000	10·00	—	—	—	—	95	0·09	11 095	10·09	10	£1	—	—
Scottish Power	2 350 000	3 399	0·13	132 530	4·90	135 929	5·03	121 365	4·49	7 854	0·29	—	—	6 710	0·25	135 929	5·03	8	£1	29/–	5·52
„ „ 6% Cm. Pref.	350 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	23/6	5·11
	2 700 000																				
Shropshire & Worc. & Staff. Elec. Power		—	—	180 520	9·47	180 520	9·47	122 625	6·43	57 895	3·04	—	—	—	—	180 520	9·47	—	—	—	—
„ „ "A" Ord.	300 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	£1	—	—
„ „ "B" Ord.	755 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	£1	—	—
„ „ 6% Cm. Pref.	850 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	22/9	5·28
	1 905 000																				
Smithfield Markets Elec. Supply	60 000	2 508	4·18	8 572	14·29	11 080	18·47	4 800	8·00	3 500	5·84	—	—	2 780	4·63	11 080	18·47	8	£1	25/–	6·40
Tees Power Station	1 012 978	750	0·07	60 290	5·95	61 040	6·02	58 246	5·75	—	—	—	—	2 794	0·27	61 040	6·02	5½	£1	—	—
	1 012 978																				
Wellingborough Elec. Supply	45 000	1 690	3·76	2 103	4·67	3 793	8·43	2 250	5·00	—	—	—	—	1 543	3·43	3 793	8·43	5	£10	—	—
Yorkshire Elec. Power	2 500 000	78 234	1·89	341 084	8·27	419 318	10·16	237 905	5·77	100 000	2·42	—	—	81 413	1·97	419 318	10·16	8	£1	32/6	4·92
„ „ 6% Cm. Pref.	1 623 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	23/9	5·05
	4 123 000																				

(a) Including £21 287 (1·64%) from reserve. (b) Including other income, £58 385 (2·33%).

Capital invested in above 25 companies at end of 1929, £40 783 011. Summary of appropriation accounts :—

Brt. Fwd. from 1928	£692 018	Divs. Distributed ..	£2 651 904
Profits, 1929 ..	3 897 544	To Reserves, etc. ..	1 228 567
Other Income ..	79 672	Other Appropriations	68 313
		Carried Fwd. to 1930	720 450
	£4 669 234		£4 669 234

The average dividend *declared* on ordinary capital was 8·32% and the dividends actually distributed on ordinary and preference capital averaged 6·50% of the invested capital. The percentage of profit realised in relation to capital works out at 9·56%, and the percentage allocated to reserves, etc., was 3·01%. The sum brought forward from 1928 was 1·70% of the capital and the sum carried forward to 1930 is 1·77%. "Other Income" and "Other Appropriations" were 0·19% and 0·17%, respectively.

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COMPANY NEWS.

Less Active Market in Electrical Shares—Chloride Co.'s Increased Profit—Birmingham Investment Trust's Share Bonus—Directors' Reports and Dividends.

BUSINESS in the electrical share markets has been less active during the past week. The principal feature shown by our usual contrast of prices is the marking down of the official quotation for Electric Construction ordinary shares from 16s. 3d. to 13s. 1½d.—we mention in each case the middle between buying and selling price. W. T. Henley's shares have shed a further half-crown to £6 5s.; Callender's and Enfields are unchanged at £3 12s. 6d. and £4 5s. respectively. Crompton Parkinson 8% preference have retained their higher level at 24s. 4½d., and Ever Ready ordinary shares have put on 3d. to 19s. The 10s. shares of the National Electric Construction Company, despite the larger dividend, are 7½d. down, to nearly 23s.

A scheme for re-arrangement of the capital of Ferranti, Ltd., has been sanctioned by the Court. It provides for increase of the company's capital to £900 000 by the creation of 300 000 new preference shares of £1 each and 600 000 ordinary shares of 10s. each. For some time the directors have realised that it is in the interests of the company that the capital should be increased to provide for present financial requirements, and extension and development of the business.

General Electric Company's ordinary shares are 1s. 3d. down at £2 10s. Of the other transatlantic leaders, Hydro-Electrics are slightly higher at nearly 48, while International Holdings have remained steady around 6⅜. Radio Corporation of America shares at 53¼ are nearly 5 points higher. Cables and Wireless stocks are a shade better; American Telephone and Telegraph stock has lost 15 points, to 240 dollars. Anglo-American Telegraph ordinary is up a point.

Bournemouth and Poole Supply shares are 57s. 6d., ex dividend. Central Electric Supply Co.'s debenture stock is a couple of points down at 93½, and Cornwall Power 7 per cent. preference shares are 9d. lower at 23s. On the other hand, County of London shares have recovered 1s. 3d., to 47s. 6d., and City of London and Electric Supply Corporation preference are each 6d. better at 23s. and 22s. respectively.

Last Annl. Divd.%	Description.	This Week.	Last Week	1926 to 1929 Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98⅝
6½	,, ,, "C" 6½% Cm. Pf. Stk.	106	106	117½	98⅝
15	B'mouth & Poole El. S. Ord. ..	57/6*	58/9	78/–	29/9
6	,, ,, 6% Cm. Pf.	22/–	22/–	24/–	21/–
(*d*)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	46/10½	48/1½	60/–	32/6
5	,, ,, 5% Cum. Pref.	20/–	20/–	23/3	19/10
4	Central Electricity Board 4% Stk.	81	81	81	77½
4	Central Elec. Sup. 4% Deb. ..	93½*	95½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	27/6	27/6	51/–	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/–	17/–	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	,, ,, ,, ,, 6% C.P.	23/–	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord. .	38/1½	38/1½	44/6	26/6
8	,, ,, ,, ,, 8% Pref.	28/6	28/6	29/6	26/–
7	Cornwall Power 7% Pref. ..	23/–	23/9	25/6	19/–
11	County Lon. Elec. Sup. Ord. ..	47/6	46/3	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/–	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/6	24/6	27/–	21/6
(*g*)	Electric Supp. Corp. Ord.	46/10½	46/10½	59/6	29/6
6	,, ,, ,, 6% Cum. Pref.	22/–	21/6	23/–	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/–	35/–	47/4	26/9
4	Fife Tram. Lt. & P. Ord.	12/6	12/6	23/6	10/–
6	,, ,, ,, 6% C.P. ..	17/6	17/6	20/6	16/–
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	,, ,, 4½% 1st Mt. Deb. Stk.	90	90	92	80½
—	Hydro Electric Securities ..	47½	46½	87	20
—	International Holdings	6⅜	6⅜	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/–	27/–	32/9	22/10
6	,, ,, ,, 6% C. 1st Pref.	27/–*	27/–	28/6	24/9
7	,, ,, ,, 7% Part. Cum. Pf.	28/–	28/–	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	29/6	29/6	37/6	23/–
5	London Power Co. 5% Deb. Stk. ..	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	170*	172	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/–	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties' E.S. Ord.	28/6	28/6	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	26/3	26/3	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord.	23/1½	23/1½	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/–
6	Notting Hill 6% C.P. (£10) ..	10¾	10¾	11¼	9½
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	27/6	27/6	28/6	23/6
8	Scottish Power Ord.	29/–	29/–	35/9	22/–
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/–	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/–	25/–	26/–	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/–	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/–	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	94	95	98½	86½
7	Urban E.S. Ord.	27/6*	33/9	46/6	18/–
5	Victoria Falls Power Ord. ..	63/1½	63/1½	69/–	46/3

Last Annl. Divd.%	Description.	This Week.	Last Week.	1926 Highest.	to 1929 Lowest.
1/9½	W'minster Elec. Sup. Ord. (£1) ..	27/–	27/–	52/9	24/–
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/9	24/9	25/4½	18/9
6	,, ,, 1st Mt. Deb. ..	103	103	106	97½
8	Yorks Elec. Power Ord.	33/1½	33/1½	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/–	23/–	26/9	20/7
	Railways and Tramways.				
4½	BirminghamDist.Inv.TrustIstDeb	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref.Stk.	94½	94½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	,, ,, ,, ,, 6% Pf. Stk.	132½	131½	133	103½
6	Calcutta Trams Ord.	12/6	12/6	24/–	14/–
5	,, ,, ,, 5% Cum. Pf.	12/6	12/6	15/9	13/–
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)	77	77	74½	54
4½	,, ,, ,, 4½ Pf.	80½	80½	85½	78
4	,, ,, ,, 4% Deb.	79	79	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	,, ,, 4% Perp. Deb. ..	78	78	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	,, ,, ,, ,, 4% Pf. Stk.	71	71	77	68
4	,, ,, ,, ,, 4% Deb...	79	79	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95	95	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	78	75½	75½	62
5	,, ,, ,, 5% Deb. ..	82½	79½	72⅝	65½
4	Met. Rly. Cons. Ord. Stk. ..	66½	66½	81	54½
3½	,, ,, 3½% Pf. Stk. ..	64½	64½	76	60½
3½	,, ,, ,, 3½% Deb. ..	71	71	73⅝	67½
5	Met. Dist. Rly. Ord. Stk. ..	77	77½	81⅛	52½
4½	,, ,, ,, 4½% 1st Pref. ..	81½	81½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	115½	115½	118⅛	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	89½	89½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
(*i*) 9	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/6	22/6	28/6	11/–
5	Winnipeg Elec. Refg. Mt. Stk. ..	87	87	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	,, ,, ,, 1st Deb.	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	27/–	27/–	58/6	26/3
8	,, ,, ,, 8% C.P.	50/7½	50/7½	56/9	49/6
4	,, ,, 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/–	75/–	99/4½	56/–
6	,, ,, ,, 6% C.P.	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref.	23/6	23/6	24/9	19/7
7	,, ,, ,, 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	120½*	127½	153⅜	120
15	Callender's Cable Ord.	72/6	72/6	91/3	63/9
6½	,, ,, 6½% C.P. ..	23/9	23/9	25/9	22/–
7½	,, ,, 7½% B. Pref.	26/10½	26/10½	28/3	25/–
12	Consolidated Signal Ord. ..	35/–	35/–	52/–	6/6
5	,, ,, 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	24/4½	24/4½	27/–	14/–
6	,, ,, 6% Cum. 2nd Pf.	19/–	19/–	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/–	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	13/1½	16/3	32/6	23/6
7	,, ,, 7% C.P. ..	21/3	21/3	22/9	20/–
4	,, ,, 1st Mt. Deb...	69½	69½	75	68
20	Enfield Cable Works Ord. ..	85/–	85/–	112/6	60/–
7½	,, ,, ,, 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/–
—	,, ,, 6% C.P.	7/6	7/6	18/9	5/–
5½	,, ,, 1st Mt. Deb. ..	89	89	103½	86
6	,, ,, Conv. Deb. ..	67½	67½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/–	18/9	92/3	17/10½
10	,, ,, 7% Partic. Pref. ..	29/6	29/6	34/2	23/9
6	Ferranti 6% Pref.	19/6	19/6	19/4½	16/9
10	General Elec. Ord.	50/–	51/3	81/3	26/6
6½	,, ,, "A" C.P. ..	23/9	23/9	26/–	22/–
7½	,, ,, "B" C.P. ..	26/6	26/6	27/9	22/9
7	,, ,, 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	125/–	127/6	136/10½	69/3
12½	International Auto. Telephone Ord	32/6	32/6	50/6	35/–
10	Johnson & Phillips Ord. ..	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref. ..	23/9	23/9	25/6	22/3
12½	Nat. Elec. Construction (10/–) ..	23/1½*	23/9	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	24/4½	24/4½	36/6	23/6
10	,, ,, Cum. Pref.	31/3	31/3	34/3	28/9
4½	,, ,, Deb. Stk.	92½	92½	95	88½
10	Telegraph Const. Ord. (£12) ..	21½	20½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	$240	$255	314½	144½
4½	,, ,, ,, Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	59⅜	63½	56½
6	,, ,, 6% Prefd. Stk	103½	103½	105½	91
1½	,, ,, Deferred Stk.	24⅜	24⅜	27	22
8	Anglo-Portuguese Tele. Ord. ..	21/10½	21/10½	26/–	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	50½	49½	90½	73½
—	"B" Ord. Stk.	23½	22½	104	33
—	5½% Cum. Pref. Stk. ..	93½	93½	99	90
3½	Eastern 3½% Pref. Stk. ..	64½	64½	70½	58½
4	,, 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	32	32	43⅜	26
—	International Teleph. & Teleg. ..	$65½	$65½	161½	48½
15	Marconi Int. Mar.	38/9	40/–	90/–	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	99½*	102½	95
12	Oriental Telephone Ord.	55/–*	55/7½	65/–	41/–
—	Radio Corporation of America ..	53⅜	48⅛	115⅜	18⅛
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/–	81/3
	Western Tel. 4% Deb. Stk. ..	78	78	82	75

(*a*) 19$\frac{9}{11}$d. per share. (*b*) 1s. 9·2d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·477d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2⅝d. per share. (*h*) 88s. 2·136d. (*i*) 9%, plus special bonus of 30% from sale of omnibus company's shares. * Ex dividend.

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Directors' Reports, etc.

CARLISLE AND DISTRICT TRANSPORT CO., LTD.—Tradg. blce. for 1929, includg. £81 brt. fwd., £353. Loan int., £1 852. Debit blce., £1 499.

ELECTRIC CONSTRUCTION CO., LTD.—Pft. for year ended March 31, 1929, £14 874, agst. £8 739. Div. for year 5%, agst. total of 5½% for previous year.

RICHARD JOHNSON AND NEPHEW, LTD.—Net pft. for year ended March 31, 1929, £40 672. Div. on ord. shs., 8% p.a., less tax (same as last year). Fwd. £16 370, agst. £10 835.

FOOT'S CRAY ELECTRICITY SUPPLY CO., LTD.—Pft. for 1929, £4 042. To depreciatn. res. £800, res. for renewals, £455, res. agst cost of change over, £800. Div. 10%. Fwd. £1 147, agst. £1 351.

BOSTON AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Rpt. for 1929 shows amt. to credit of net rev. acct., £8 984. To res. for depreciatn., £2 200; res. for renewals, £2 690; div. 4%; fwd. £600, agst. £133.

NORTHWOOD ELECTRIC LIGHT AND POWER CO., LTD.—Pft. for 1929, £13 848; provisn. for tax, £800; depreciatn. res., £2 500; res. for renewals, £1 389; gen. res., £2 000. Div. 15% on ord.; fwd. £3 616, agast. £3 597.

LEWES AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Net rev. for 1929, £12 487, agst. £11 218. Addg. int. and deductg. expenses, income tax and deb. int. leaves £7 217, plus £2 735 brt. in. To gen. res. £4 500, div. on ord. shs. 8%. Fwd. £2 452.

COLNE VALLEY ELECTRIC SUPPLY CO., LTD.—Pft. for 1929, £29 211. Provisn. for income-tax, £3 000, to depreciatn. res., £2 500, res. for renewals, £1 773, res. agst. cost of changing pressure of supply, £5 000. Div. 12% (same). Fwd., £2 600, agst. £1 802.

LOTS ROAD POWER STATION.—Hldrs. of Metropolitan District and London Electric Railways joint power house rent charge stk., at a meeting on May 22, sanctioned issue of £675 000 additnl. cap. for purpose of extendg. Lots Road power station.

WESTON-SUPER-MARE AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Net rev. for 1929, £40 690, agst. £42 685. Available blce. £33 296. To gen. res., £15 000. After provisn. for div. on 6% pref. shs. for year, div. on ord. shs. of 10% for year is recommended. Fwd. £4 896.

DIRECT SPANISH TELEGRAPH CO., LTD.—Rev. for 1929, £90 130, plus income tax recovered, £600, and blce. brt. in, £1 990. After provisn. for all expenditure, blce. is £12 348. Divs., on pref. shs. 10% p.a., and on ord. shs. 8% p.a., tax free. To deb. redemptn. acct., £2 000. Fwd. £2 176.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Net pft. for year ended March 31, 1930, £287 183, agst. £216 936. After provisn. for pref. div., ord. div. of 30% (agst. 25%), plus capitalised bonus of 100%, is recommended. To res., £100 000, agst. £50 000. Fwd. £85 824, agst. £69 833.

DUDLEY, STOURBRIDGE AND DISTRICT ELECTRIC TRACTION CO., LTD.—Working loss on operatn. of tramways for 1929, £5 410. Debit blce. of £6 009 to be carried fwd. Arrears of div. on 5% cum. pref. shs., £35 000. Whole system of lines operated by company was discontinued on March 1, 1930.

ELECTRICAL ENTERPRISES-LUDWIG LOEWE CO. ("GESFUEREL").—The 6% debs., due 1953, of this German public utility holdg. company, have been introduced on the New York Curb Exchange. The debs. are part of a $5 000 000 (£1 000 000) issue made for the company in 1928 by Harris Forbes and Co.

MERTHYR ELECTRIC TRACTION AND LIGHTING CO., LTD.—Net. rev. for past year, £25 277, agst. £23 868 for 1928. After deducting administratn. and gen. exes., income tax and deb. int., blce. is £12 422, which, added to £3 653 brt. fwd., makes available blce. £16 076. To gen. res., £7 000, to div. on 5% pref. shs., £1 500; to div. on ord. shs. of 2½% for year, £1 625; fwd., £5 951.

ELECTRIC FURNACE CO., LTD.—Net pft. for year ended March 31, £13 520, agst. £16 047, plus £1 586 brt. in. Div. of 7% on ord. shs. is recommended. Fwd. £4 043. During the year a private company, known as Electric Resistance Furnace Co., Ltd., was formed with object of facilitg. organisatn. of this branch of business. The company has a cap. of £5 000, and all the shs. are owned by the Electric Furnace Co. Subsidiary company deals in furnaces for industrial heatg. by electl. resistance. It is proposed in future to pay dividends on Jan. 1 and July 1.

SOUTH STAFFORDSHIRE TRAMWAYS (LESSEE) CO., LTD.—Share of net traffic receipts under workg. agreemts. and other rev. for 1929, includg. div. received from South Staffordshire Tramways Co., £7 427. After deductg. paymts. to local authorities, interest, tax, etc., blce. was £2 429, plus £1 790 brt. fwd. To res., £2 500; fwd., £1 719. During year tramway from Great Bridge to Burnt Tree was sold to West Bromwich Corporation, and Dudley to Wednesbury tramway has been abandoned. Negotiatns. have been concluded for sale of remaining tramways operated by co.

CABLE TELEPHONE AND GENERAL TRUST.—In order to comply with Stock Exchange regulatns., particulars have bn. published of this company. The trust has undergone rapid expan., its capital havg. increased from £200 000 in 1926, to £698 737. It is a link in a chain of telephone companies in the U.S.A., Great Britain, and elsewhere, and is in associatn. with International Automatic Telephone Co., Automatic Telephone Mfg. Co., British Insulated Cables and Associated Telephone and Telegraph Co. of U.S.A. Valuatn. of company's assets made in April last showed present issue of 288 737 pref. shs. was covered 2½ times as to cap.

LANCASHIRE ELECTRIC LIGHT AND POWER CO., LTD.—Trading pft. of the Parliamentary company (Lancashire Electric Power Co.) for 1929, plus int. receivable, amts. to £257 525, and adding blce. brt. fwd., £3 186, makes available blce. £260 711, of which £19 792 has been appropriated for income tax, £35 000 for depreciatn. (making that acct. £465 000) and £4 562 is carried fwd., leavg. blce. £201 358, which has been paid to the Lancashire Electric Light and Power Co., Ltd., in respect of int. and div., less tax, for year to Dec. 31, 1929, and, with management fees and items accrued to March 31, 1930, makes a total of £209 892. Company acquired during year whole of sh. cap. of Ormskirk Electric Supply Co., Ltd., and has received from that company net div. and management fees amtg. to £1 282. Net blce. for year, after providg. for deb. int., £173 109. Amt. brt. fwd. from 1929 is £3 308, showg. available blce. £176 417, from wh. fall to be deducted fixed divs. on 6% 1st pref. and 7% participatg. pref. shs., less tax, £85 811, leavg. £90 606. Div. at rate of 7% p.a., less tax, on ord. shs. recommended. Fwd., £3 806.

Company Meetings.

ENNISKILLEN ELECTRIC LIGHT CO.—At the annual meeting on May 21, Dr. Leonard Kidd, presiding, a net profit for the past year of £1 142 8s. 11d. was reported. After paying a dividend of 7½% up to December 31, there was a credit to profit and loss account of £1 608 7s. 11d. Out of that sum, £500 has been transferred to reserve account, which now stands at £1 500. The dividend was approved and Dr. L. Kidd was re-elected chairman of the company.

YORKSHIRE TRACTION CO., LTD.—Presiding at the meeting on Monday, Mr. W. S. Wreathall, deputy chairman, said that they had again had a good year, total receipts amounting to £282 000, against £225 000. They had been able to place the same amount to reserve as in the previous year, and had been able to pay the same rate of dividend, 10%, on the increased ordinary share capital. They had also been able to increase the amount carried forward. During the year the L.M. and S. and the L. and N.E. Railway companies had acquired a joint interest in the company equal to that of the largest shareholder. The reports and accounts were adopted.

YORKSHIRE (WOOLLEN DISTRICT) ELECTRIC TRAMWAYS, LTD.—Mr. W. S. Wreathall, deputy chairman, presiding at the meeting on Monday, said that there had been a satisfactory increase in gross traffic receipts, which were £312 400, compared with £267 650. There were two reasons why the profit had not grown correspondingly with the increase in the traffic receipts. The receipts on the tramways were not as good as they had been in the previous year, and although the receipts on the omnibuses had gone up considerably, they had had to run more miles in order to take the same money. The L.M. and S. and the L. and N.E. Railway companies had acquired a joint interest in the company equal to that of the British Electric Traction Co., Ltd. The report and accounts were adopted.

KALGOORLIE ELECTRIC POWER AND LIGHTING CORPORATION, LTD.—Mr. G. C. Howard presiding at the meeting on May 22, said the net result of the year's operations was an increase in the profit of £1 846. That increase has been obtained notwithstanding that in October last their plant had been practically closed down for nine days owing to a lightning storm which had caused a fire at Dunlops Line Crossing, costing the company about £500 in repairs, in addition to loss of profits. They recommended the payment of a dividend of 6% on the ordinary shares. The financial position continued to be strong. They had a surplus of over £55 000, and of that £30 000 was at the close of the year invested in British

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Government securities. The interests of the Corporation were bound up with the mining industry of the Kalgoorlie field. Whether the developments of that district would enable it to take a much larger quantity of power than at present, time would tell, but they were in a position to meet all reasonable requirements in the near future. The report and accounts were adopted.

BIRMINGHAM AND DISTRICT INVESTMENT TRUST, LTD.—Mr. P. M. Rossdale, presiding at the meeting on Monday, said the outstanding event of the year had been the sale of their shares in the Shropshire, Worcestershire and Staffordshire Electric Power Co. They received 50s. for each £1 ordinary share. The proposed final dividend of 6% was, of course, equivalent to 12% on the original share capital, so that the shareholders would have received in respect of the year 1929 a dividend of 15% on their original holding, or 7½% on the doubled capital. Shareholders would have gathered from the report that the policy of disposing of the tramway assets of their subsidiary tramway companies was now reaching its final stage. The directors had decided to utilise the surplus derived from the sale of these shares, with certain other moneys available for distribution, for paying up in full 1 119 560 £1 6% cumulative redeemable preference shares. When the shares were thus fully paid they would be distributed to the shareholders in the proportion of one share for every share now held. The report was adopted and the resolutions authorising the increase of capital were passed.

POWER INVESTMENT CORPORATION, LTD.—Mr. R. O. Hambro, presiding at the meeting on May 21, said they were actually a new company; that was only the second meeting since they took over the shell of another company, and therefore they had not yet had time to build up reserves comparable to those shown by the older companies. In fact, 93% of the present issued capital had been subscribed in the last three years. Their investments were composed of 39·79% in high class bonds, 8·03% in preference shares, and 52·58% in ordinary shares. Although they were confident that in the long run the valuation of their investments would show an improvement, in view of the present depreciation they felt that the only wise policy to pursue to-day was to strengthen their position. They therefore proposed, out of the balance of £60 530 available after paying the preference dividend, to restrict the dividend on the ordinary stock to 5%, less tax, or the same as last year, and to carry forward the balance of £39 745. It would, no doubt, have been noticed that the item of £449 222 representing bank loans was considerably larger than at the corresponding period last year. But since that date the whole course of money rates had changed, and with the low rates now ruling they felt it was an opportunity of which the company should take advantage, and which was to-day paying them well. The report and dividends were approved.

URBAN ELECTRIC SUPPLY CO., LTD.—At the recent general meeting, Mr. P. D. Tuckett, chairman, said during the past year the company's business had continued to show healthy expansion. Including subsidiary companies, connections increased by 3 468 kW, a 7% increase on the previous total, whilst the output increased by over 4 000 000 kWh, or nearly 12%. They carried down to the net profit and loss account a balance of £154 274 9s. 2d., an increase of £2 392 over the corresponding figure a year ago. After providing for debenture interest and redemption, income tax, interim dividends, depreciation, general reserve, dividend on preference shares, final dividend of 4% on ordinary shares, making 7% for the year, and contribution to staff benevolent fund, £26 029 was left to be carried forward, an increase of £3 076. He mentioned last year that notices had been received from the Stamford and Twickenham Corporations of their intention to purchase the company's Stamford undertaking and part of the undertaking of the Twickenham company. They had since received notice from the Teddington and Hampton Councils of the exercise of their rights of purchase over other portions of the undertakings of the Twickenham company. So far as the undertakings of the Twickenham company were concerned, they expected that the purchase price would be settled by agreement, and negotiations were proceeding to determine the price and arrange for the transfer. The company would be paid the book value of the assets to be sold, less a small deduction for renewals, but unfortunately the purchase terms in the Provisional Orders and agreements prevented the company receiving any adequate compensation for the business it had built up. Hence the loss of this rapidly expanding area of supply would reduce the future earning power of the company. In the case of Stamford the Corporation had withdrawn their notice of purchase, and agreed to the company's tenure of the undertaking being extended for a further period of 40 years, in return for the concession of a tariff based on profits. Stamford was one of their least profitable undertakings, with only a limited scope for development, so that this new arrangement was unlikely to bring them any immediate benefit, but they thought that it should in due course prove beneficial in enabling them to earn a more adequate return.

SIEMENS BROTHERS AND CO., LTD.—Lord Queenborough presided at the meeting on May 22, and, after dealing with the accounts (abstracted in our issue of May 23), said the output of the works was in excess of the average for several preceding years. In order to be in a position to undertake contracts for the manufacture and laying of transoceanic submarine telephone cables, they had carried out a considerable amount of research and experimental work, so that when the time arrived for the establishment of a submarine telephone cable service with those countries which had hitherto been beyond the range of speech transmission by submarine cable, it was hoped to play as important a part as Siemens Brothers had hitherto taken in the domain of submarine telegraphy. Some important contracts were carried out in connection with that form of submarine telephone cable in which they had particularly specialised. The demand by the British Post Office for telephone subscribers' cable was maintained. The Post Office development programme on the trunk cable lines was, however, still further curtailed. The Treasury had now authorised an accelerated programme, and some substantial orders had been placed. They were successful in obtaining the largest contract for super-tension mains which had ever been placed in Australia. This consisted of 645 large drum lengths of three-phase 33 000 V. cable, the whole consignment weighing about 5 000 tons. Other important super-tension and high-tension cable contracts were carried out for various municipal authorities, notably Bristol and Hull. The chairman then gave particulars of contracts which the company had received for telephone exchange equipments in the United Kingdom, Canada, South Africa, Chili, Japan, Brazil, China, Italy, Portugal, etc., and he went on to say that their new type of telephone, the "Neophone," had, after exhaustive tests, been found to be a great advance in transmission efficiency and articulation, and had, in consequence, been adopted by H.M. Post Office as the standard instrument. New machinery had recently been installed at their works which should be of considerable assistance in cheapening production and in further improving the quality of their batteries. A new type of radio telegraph auto-alarm was developed at their works which, though proving a very great technical advance, was less costly to produce, enabling them to give shipowners a considerable reduction in price. Siemens Electric Lamps and Supplies, Ltd., a subsidiary which they fully owned and controlled, has for several years past made continued and satisfactory progress and was now an important factor in the company's business. The report and accounts were adopted and the dividends approved.

New Companies.

H. A. LAMB AND SONS, LTD.—Cap., £1 000. To acquire business of electrician now carried on by H. A. Lamb at 119, Fulham Road, Chelsea, London, as "H. A. Lamb and Sons."

PAINTER AND MADEW, LTD.—Cap., £2 000. Manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, wireless apparatus and accessories, etc. Solicitors: Huntbach and Son, Hanley.

ROBSONS (LIVERPOOL) TRADING CO., LTD.—Cap., £500. Electrical engineers, boilermakers, manufacturers of, and dealers in, dynamos, motors, electric hammers, etc. Solicitors: Luya and Williams, 20, North John Street, Liverpool.

HERBERT SMITH (BRADFORD), LTD.—Cap., £3 000. Electrical and general engineers, manufacturers of, and dealers in, accumulator batteries, plates, motors, dynamos and electrical supplies. Solicitors: A. V. Hammond and Co., Bradford.

W. H. LAWTON, LTD.—Cap., £750. To acquire business of electrical engineer, manufacturer of, and dealer in, electric, magnetic, telegraphic and telephonic accumulators, etc., formerly carried on by W. H. Lawton at 121A, Liverpool Road, Stoke-on-Trent.

ELECTRO-GAS DEVELOPMENT CO., LTD.—Cap., £1 000. To acquire business of supplier of electrical, heating, cooking and other apparatus carried on by H. P. Barker at 100, Victoria Street, London, S.W., and elsewhere as "Electro-Gas Development Co." Reg. Office: 3, Arundel Street, Strand, London, W.C.2.

BARTON AND SONS (1930), LTD.—Cap., £10 000. To adopt agreement with Barton and Sons, Ltd., and W. J. Edwards, liquidator thereof, to acquire business of manufacturers of conduits, fittings and accessories for electric lighting and power transmission, etc., now carried on by old company at Green Street, Walsall.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BAWTREE, Donald Wells, 43/51, Oakhill Road, Sutton, wireless engineer. £22 16s. April 14.

BERKELEY STUDIOS, 9, Ross Parade, Wallington, radio dealers. £18 1s. 6d. March 26.

CITY AND GENERAL RADIO CO., LTD., 44, Watling Street, E.C., radio dealers. £12 5s. 7d. April 19.

CLEMENTS, V. S., The Bungalow, Hughendon, High Wycombe, electrical engineers. £48 11s. 8d. April 3.

DAVIS, W. A., AND CO., 28, Clayton Street West, Newcastle-on-Tyne, electrical engineers. £26 0s. 1d. March 27.

ELECTRADIO CO., LTD., 25, Westbourne Grove, Bayswater, W., electrical engineers. £20 13s. 2d. April 3.

SKINNER, Mr. A. E., 808, Ashton Old Road, Openshaw, wireless dealer. £22 7s. 1d. April 9.

START AND SONS, Chilson Common, near Chard, electricians. £33 5s. 7d. April 8.

ZOELLER, Mr. E., 12, The Crescent, Croydon, wireless dealer. £15 19s. 5d. March 21.

Deeds of Arrangement.

GANDER, Albert, 2, Piccadilly Buildings, Kettering, and Cottesbrooke, wireless dealer. Dated May 20, filed May 24. Trustee, H. C. Palmer, Kingham Chambers, Abington Street, Northampton. Liabilities unsecured, £222; assets, less secured claims, £65.

SHAW, Alex., 66 and 68, Brook Street and 46, Southfield Road, Hull, electrical engineer. Dated May 19, filed May 23. Trustee, W. B. Hall, National Provincial Chambers, Silver Street, Hull, Secured creditors, £2 129; liabilities unsecured, £6 577; assets, less secured claims, £4 023.

SMITH, Herbert William, trading as BROADMEAD WIRELESS CO., 61 and 62, Broadmead, Bristol, wireless retailer. Dated May 13, filed May 20. Trustee, A. Taylor, Exchange Chambers, Corn Street, Bristol. Secured creditors, £800; liabilities unsecured, £1 958; assets, less secured claims, £960.

WILLIAMS, Mrs. Jennie (wife of Owen Robert Williams), trading as ORWYL (or ORWIL) RADIO AND HARDWARE STORES, Water Street, Penygroes, wireless and hardware dealer. Dated May 16, filed May 23. Trustee, P. S. Booth, 2, Bixteth Street, Liverpool. Liabilities unsecured, £661; assets, less secured claims, £255.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

DORIAN WIRELESS CO., LTD., London, W.—Reg. May 12, deb. securing £2 000 (not ex.) owing by Halcyon Wireless Co., Ltd., to Bank, for which the holder, E. L. Lumley, 39, Lombard Street, E.C., may be liable under a guarantee; general charge. *Nil. February 18, 1930.

ELECTRICAL FINANCE AND SECURITIES CO., LTD., London, E.C.—Registered April 29, £53 200 debenture stock (secured by Trust Deed dated April 24, 1930, supplemental to Trust Deeds dated July 27, 1927, and July 6, 1928); general charge. *£194 780. May 9, 1929.

GODDARD (P.) AND CO., LTD., London, N.W., electricians.—Reg. May 8, £500 and £250 debs., to C. Miles and P. F. Goddard, both 98, Hampstead Road, N.W.; general charges. *Nil. September 2, 1929.

HEXHAM AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Reg. May 8, £1,000 debs., part of £10,000; general charge. *£25,050. April 22, 1929.

LANGSTON (R.) JONES AND CO., LTD., Teddington, electrical engineers.—Reg. May 5, £5,000 debs.; general charge.

LUSTRE ELECTRIC LAMPS, LTD., London, W.C.—Reg. May 6, £1,200 debs.; general charge.

PAINTER AND MADEW, LTD., Hanley, manufacturers of dynamos, etc.—Reg. May 5, £800 equitable mortgage, to Alice Madew, 60, Thistleberry Avenue, Newcastle-under-Lyme; charged on 10, Albion Street, Hanley.

Satisfaction.

DULVERTON ELECTRIC LIGHTING CO., LTD.—Satisfaction reg. May 6, £1 000 reg. June 16, 1927.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

FAIRFIELD, H. and R. W., trading as FAIRFIELD AND CO., 27, 38 and 42, London Road, Leicester, wireless dealers, etc. Creditors were called together recently, when a statement of affairs was submitted which showed ranking liabilities of £5 143, of which £4 895 was due to unsecured creditors, and assets estimated to realise £2 919, less preferential claims, or a deficiency of £2 796. It was reported that the business was originally commenced in 1914, when the joint capital was approximately £1 000. During the year to January 3, 1926, the turnover was £22 347, and in the following year it fell to £20 209, and in the succeeding 12 months was £19 708. During the year to January, 1929, the sales still further declined to £14 215, whilst for the 12 months to January 3 last, the turnover was £10 677. During the year to January, 1925, there was a profit earned of £1 049, and in the two following accounting periods the net profit was £135 and £283 respectively. During the last three years, there had been losses incurred ranging from £700 to £1 000 per annum. The deficiency was attributed to the losses on trading together with the depreciation written off the assets in the statement of affairs. The fully secured creditors were discount companies who had taken assignments of a large number of hire purchase agreements. No offer of a composition was submitted, and it was eventually decided that a committee should be appointed to consider the matter, and to make recommendations to the general body of creditors as to the way the estate should be dealt with.

SIMKINS, F. W., trading as BROADWAY RADIO SUPPLIES AND THE CORNER CABINET WORKS, Roxeth Corner, Harrow. In response to a circular letter issued by Mr. James Mortimer, accountant, of 12, Coleman Street, E.C., a meeting of the creditors of the above was held on May 26, when a statement of affairs presented disclosed liabilities of £250 (of which £175 was due to the trade and the balance to loan creditors) and net assets (including stock in trade valued at £140) of £163, or a deficiency of £87. Mr. Mortimer reported that the debtor started business in Middle Road, Harrow, in March, 1927, with a borrowed capital. He acquired his present premises in December, 1929, at a rental of 25s. per week. The net profits for the year ended March 31, 1930, amounted to £162, out of which the debtor had to pay interest on borrowed money. The drawings had averaged £2 10s. weekly. The debtor attributed his present position to losses incurred on the cabinet business, bad trade generally and lack of working capital. The creditors decided to confirm the deed of assignment already executed in favour of Mr. E. H. Hawkins as trustee and to accept the debtor's offer of 10s. in the £, payable by minimum payments of £8 monthly, the first payment to be made on June 1, 1930. The following are creditors:—Hobday Bros., Ltd., £58; Kolster Brandes, Ltd., £47e Cossors, Ltd., £20.

WEBB, R. N., trading as THE WEBB CONDENSER CO., 42, Hatton Garden, London, W.C.1. Creditors met recently at the offices of Jones and Peel, 109, Kingsway, London, W.C.2, when a statement of affairs was submitted showing liabilities of £3 069 (of which £1 069 was due to unsecured trade creditors, and the balance to an unsecured cash creditor), and net assets of £428, or a deficiency of £2 641. No offer was made, and creditors intimated that the matter should be dealt with in bankruptcy. Subsequently, however, the cash creditor, debtor's brother, agreed to stand aside in respect of his claim of £2 000 in favour of the trade creditors, and a resolution was passed requesting the debtor to execute a deed of assignment in favour of Mr. E. H. Hawkins, of Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C., as trustee, with a committee of inspection.

London Gazette, etc.

Company Winding-up Voluntarily.

HOUGH BROTHERS, LTD. By special resolution, May 22. W. L. Dominy, chartered accountant, Friary Chambers, Friar Lane, Nottingham, appointed as liquidator.

Notices of Intended Dividends.

COLLER, Lawrence James, 63, Henton Road, Leicester, electrical engineer, trading as J. AND F. COLLER. Last day for receiving proofs, June 4. Trustee, E. Barlow, 1, Berridge Street, Leicester, Official Receiver.

HORSFALL, William Miles, electrical engineer, 7, Redcross Street, Liverpool. Last day for receiving proofs, June 7. Trustee, J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver.

SMITH, Leonard John, 3, Lower Kings Road, Berkhamsted, electrical, radio and cycle engineer. Last day for receiving proofs, June 3. Trustee, G. Mallam, 37, Cornmarket Street, Oxford, Official Receiver.

Partnership Dissolved.

HILDER AND BOGGIS (Edwin Gordon Archer HILDER and Frederick Arnold BOGGIS), motor, wireless and electrical engineers, 22, Sack-

(*Continued on page 722.*)

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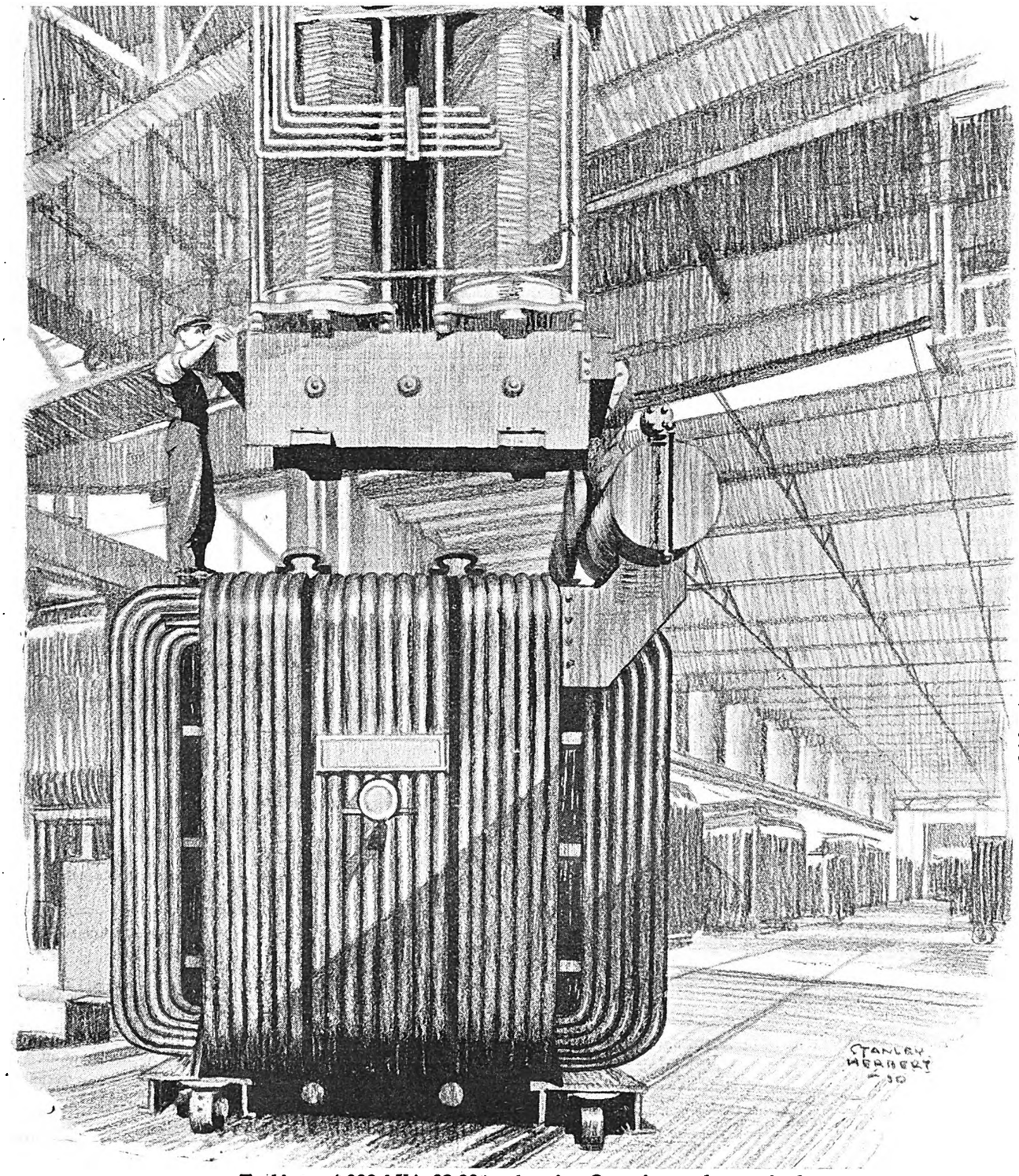
HACKBRIDGE TRANSFORMERS



Tanking a 4,000 kVA 32,000 volt unit. One of an order received for 21 units totalling 84,000 kVA for Birmingham Corporation.

HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD.,

WALTON-ON-THAMES, SURREY.

Telephone: Walton-on-Thames 760-1. Telegrams: "Electric, Walton-on-Thames."

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ville Road, and at Victoria Works, Victoria Road, Bexhill-on-Sea, by mutual consent as from September 22, 1928. Debts received and paid by F. A. Boggis, who continues the business.

Bankruptcy Proceedings.

BALL, Ernest, Old Hall Street, Middleton, Lancs, electrical contractor. The statement of affairs produced at the examination of the debtor showed ranking liabilities of £768, and a deficiency of £604. Debtor attributed his failure to loss on contracts, bad debts, legal costs on summonses, heavy wages bill, and domestic illness. It would seem that at one time he had a partner, and borrowed £100 with which to pay him out when the partnership was dissolved. In March, 1924, he had a debit balance, but throughout his business career he had been handicapped with regard to capital, as a result of the arrangement made with his former partner. Accounts had not been prepared since March, 1926. The debtor added that he had received £140 from his father's estate.

DOUDNEY, Edward, 93, East Street, and 40, South Street, Chichester, wireless and wholesale and retail salesman. The public examination was held on May 21 at Brighton. The statement of affairs showed liabilities £2 428, and assets of £350, thus leaving a deficiency of £2 078. The debtor started business May, 1919, as a wireless dealer. The business, however, was not successful, and he was allowed an overdraft from the bank. In February, 1928, he gave the guarantor a mortgage on the premises at Chichester, for £750. At that time he was responsible to the bank for an overdraft, and that liability had not been discharged. He did not think there was much value in the lease of the premises. In June, 1929, he found that the retail business was unsuccessful, and then commenced a wholesale business, borrowing £500 from his sister for the purpose. The debtor attributed his failure to bad trade, competition and ill-health.

METAL AND CHEMICAL PRICES.

Tuesday, May 27.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£60 0 0	10s.	—
Electro Wirebars	„	£61 10 0	—	—
H.C. Wire, basis	per lb.	9 7/16d.	—	—
Sheet	„	9¼d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0 1/16d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	8¼d.	—	—
Sheet „	„	8¼d.	—	—
Wire „	„	9¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 10 0	—	—
Foreign or Colonial	„	£18 2 6	6s. 3d.	—
Tin—				
Ingot	per ton	£142 0 0	—	£1 15s. 0d.
Wire, basis	per lb.	2s. 0d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£16 15 0	7s. 6d.	—
Mercury	per bottle	£22 10 0	—	2s. 6d.

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2¾d.
Sodium Bichromate—Per lb., 3¾d.

Rubber—Para fine, 7¾d.; plantation, 1st latex, 6 15/16d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.,

THE LEAD MARKET.

According to James Forster and Co. the market had a steadier tone last week, opening a little easier but subsequently firming up. The American price was put back again, on May 20, to 5.50 cents per lb. in sympathy with the fall in London. Closing prices on May 23 were £17 18s. 9d. for May and June, £18 for July, and £18 1s. 3d. for August, 3s. 9d. per ton higher on the week.

GOVERNMENT PUBLICATIONS.

The following Government publications have been issued, and are on sale at H.M. Stationery Office, London, Manchester, Cardiff, Edinburgh and Belfast (The titles of the publications are given in the order in which they were issued.):

Ministry of Transport.—Electricity (Supply) Acts, 1882 to 1928: Draft Special Orders, 1930: Aylesbury (Extension), 4d. Certified Special Orders, 1930: Exmouth, 4d.; Hythe (Hants), 6d.; Swindon (Extension), 6d.

General Post Office.—Engineering Department: Technical Instructions: XXV. Automatic Telephone Exchange Systems: Part 6D: Director System. Exchanges installed by Siemens Bros. (System S.) April, 1930, 4d.

Ministry of Transport.—Electricity (Supply) Acts, 1882 to 1928: Draft Special Orders, 1930: St. Helens (Extension), 6d. Certified Special Orders, 1930: Haverfordwest, 9d.; Ilfracombe (Extension), 9d.; Ipswich (Extension), 1s.; West Lancashire Rural, 9d.; Whitby (Extension), 9d.

Scientific and Industrial Research Department.—Fuel Research Board: "Babcock" Low Temperature Carbonisation Plant installed at Dunston power station of Newcastle-upon-Tyne Electric Supply Co., Ltd.: Report of Test by Director of Fuel Research, June 25-30, 1929, 9d.

Ministry of Labour.—Industrial Court Awards: 1 454, Railway Electrical Workers (Day Workers—Rates of Pay for work after normal stopping time—Interpretation of Agreement relating to certain provisions of Committee on Production Award No. 2 773), 1s.

Post Office.—Engineering Department: Technical Instructions: XXXII, Subscribers' Circuits and Apparatus: Part 3, Party Line Circuits, 9d.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

PHONIXION (sign). 510 439. Class 8. Electrical sound reproducing apparatus. Mildred Elsie Cox, trading as Connor and Co., 23, Charing Cross, Whitehall, London, S.W.1; supplier of electrical goods. February 17, 1930.

MAGIC NOTES.—510 817. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Columbia Graphophone Co., Ltd., 102 to 108, Clerkenwell Road, London, E.C.1; manufacturers. February 28, 1930. To be associated with No. 367 102 (1 969) and others.

PORTOPED.—509 661. Class 8. Sound reproducing instruments. Charles Blankstone, "Chartrude," Nursery Road, Edgbaston, Birmingham; manufacturer. January 21, 1930.

510 957. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Silas Quaker, Ltd., 110, Park Street, Camden Town, London, N.W.1; manufacturers. March 6, 1930. To be associated with No. 510 958 (2 716) xiii.

ROX.—508 400. Class 13. Hollow-ware, electric conduits and terminals, electriclighting, heating and cooking fittings, incandescent electric lamps (ordinary), lamp reflectors, barbed wire, wire netting, bells, rivets, bolts and nuts, door bolts and locks, gas fittings, gas cylinders, gas tubing, hinges, nails, screws and staples, all being metal goods not included in other classes. Weiss, Biheller and Brooks, Ltd., 71, Chiswell Street, London, E.C.1; general merchants. December 3, 1929. To be associated with No. 319 334 (1 676) and others. (By consent.)

ROLLISTIC.—510 312. Class 50. Soap bowls, powder bowls, flower bowls, containers and container lids; knife and razor handles; bradawl handles; parts of shaving and hair brushes; finger plates and knobs for doors; ornaments (not being jewellery); napkin rings; fishing rod handles; butts of rifles, pistols and revolvers; panelling; electrical insulators and insulating parts of electrical apparatus; trays, drinking utensils and toilet sets; all being goods manufactured from synthetic resin and not included in other classes. Rolls Razor, Ltd., 255 to 289, Cricklewood Broadway, London, N.W.2; manufacturers. February 12, 1930.

VIKING.—510 826. Class 6. Domestic vacuum cleaning machines, domestic washing machines, electric fans for domestic use, and electrically driven sewing machines for domestic use. VIKING SALES, LTD., Harvesta House, 37, Peter Street, Manchester, merchants and manufacturers.—March 1, 1930. (By Consent.)

SINGER.—Advertised before acceptance, the Applicants alleging distinctiveness. 500 780. Class 8. Rheostats, electrical resistances and devices for controlling electric motors for sewing and like machines (and not forming parts of or accessories for motor vehicles and cycles). THE SINGER MANUFACTURING CO. (a Corporation organised under the laws of the State of New Jersey), 149, Broadway, New York, County and State of New York, United States of America; Sewing machine manufacturers and dealers.—March 8, 1929. To be Associated with No. 432 357 (2 347) and others.

LIVER. 508 132. Class 17. Goods for electrical purposes manufactured from mineral and other substances for building or decoration, but not including Portland cement and reinforced concrete, and not including any goods of a like kind to any of these excluded goods. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. November 23, 1929. To be associated with No. 505 075 (2 705) and others. (By consent.)

TIRON. 510 901. Class 8. Electric cables. St. Helens Cable and Rubber Co., Ltd., Trading Estate, Slough; manufacturers. March 4, 1930.

READI-RAD. 510 988. Class 8. Wireless telegraphic and telephonic instruments and apparatus and parts thereof. R. R., Ltd., 159, Borough High Street, London Bridge, London, S.E.1; merchants and manufacturers. March 7, 1930.

PRIMROSE. 511 087. Class 8. Dry electrical batteries and electrical cells, not for medical purposes. Norman Stanley, 8, Cranbrook Road, Ilford, Essex; merchant. March 12, 1930.

NUZ. 509 263. Class 13. Electric switches (ordinary), plug box covers of ordinary metal and electrical fusible cut-outs of ordinary metal. Siemens Schuckertwerke Aktien-Gesellschaft, 101 to 110, Nonnendamm-Allee, Berlin; manufacturers. January 4, 1930. (Date claimed under International Convention, July 13, 1929.)

LIVER. 508 131. Class 16. Goods for electrical purposes made of porcelain or earthenware. The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool, manufacturers. November 23, 1929. To be associated with No. 474 578 (2 543) and others.

DEXIM. 511 774. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex; manufacturers. April 3, 1930.

COMING EVENTS.

Friday, May 30—Saturday, May 31.

I.M.E.A. CONVENTION.—Eastbourne.

Monday, June 2.

ROYAL INSTITUTION.—21, Albemarle Street, London. General meeting.

Monday, June 2—Saturday, June 7.

INSTITUTION OF ELECTRICAL ENGINEERS.—Summer meeting at Irish Centre.

Tuesday, June 3.

ELECTRICAL CONTRACTORS' ASSOCIATION (DERBY BRANCH).—Ordinary meeting. 5 *p.m.*

ILLUMINATING ENGINEERING SOCIETY.—32, Victoria Street, Westminster, S.W. Annual meeting. 7 *p.m.*

Wednesday, June 4.

PHYSICAL AND OPTICAL SOCIETIES.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington. Discussion on Photo-electric Cells, their History, Development and Manufacture, and their Various Applications. 3–5.30 *p.m.*, 5.30 to 7 *p.m.*, demonstrations.

FARADAY SOCIETY.—King's College, Strand, London. Papers by Prof. T. H. Laby on "Quantitative and Qualitative Analysis by X-Rays," and Mr. J. T. Calvert on "The Determination of Potassium in Soil Samples by the Application of an X-Ray Method." 5.30 *p.m.*

PHYSICAL AND OPTICAL SOCIETIES.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington. Discussion on Photo-Electric Cells, their History, Development and Manufacture, and their Various Applications. 10.30 *a.m.*–1 *p.m.*, and 3–5.30 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (BATH SUB-BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (SOUTHERN SECTION).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (CARDIFF BRANCH).—Ordinary meeting. 2.30 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (DUBLIN BRANCH).—Ordinary meeting. 2.30 *p.m.*

POLYTECHNIC ENGINEERING DEPARTMENT.—307-311, Regent Street, London. Lecture V. (Course of six lectures) by Mr. W. H. Date on "Thermionic Valves." 6.30 *p.m.*

Thursday, June 5.

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN STUDENTS' SECTION).—Visit to the Parkington Steel and Iron Co. at Irlam.

ELECTRICAL CONTRACTORS' ASSOCIATION (NEWCASTLE BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (BRISTOL BRANCH).—Ordinary meeting. 3.15 *p.m.*

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THE ELECTRICIAN

Vol. CIV.—No. 2714. Friday, June 6, 1930. [Registered at the General Post Office.] Sixpence

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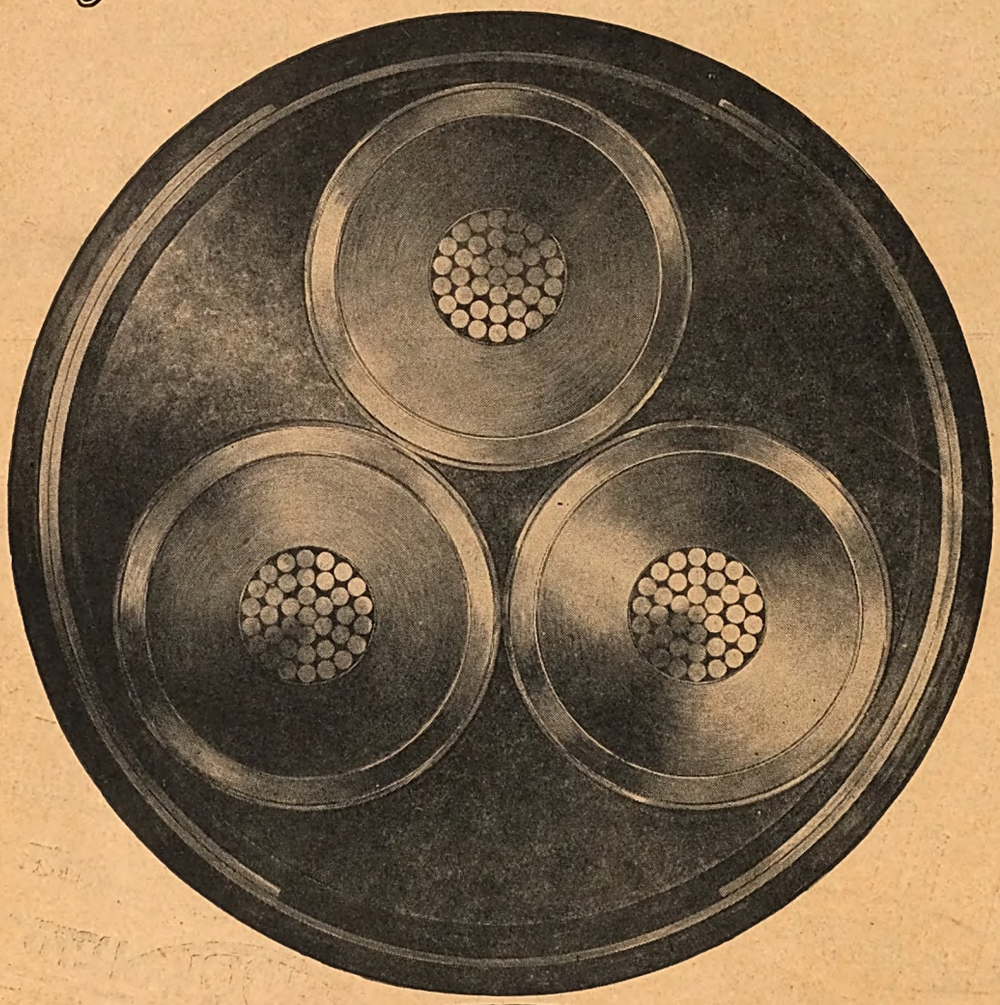

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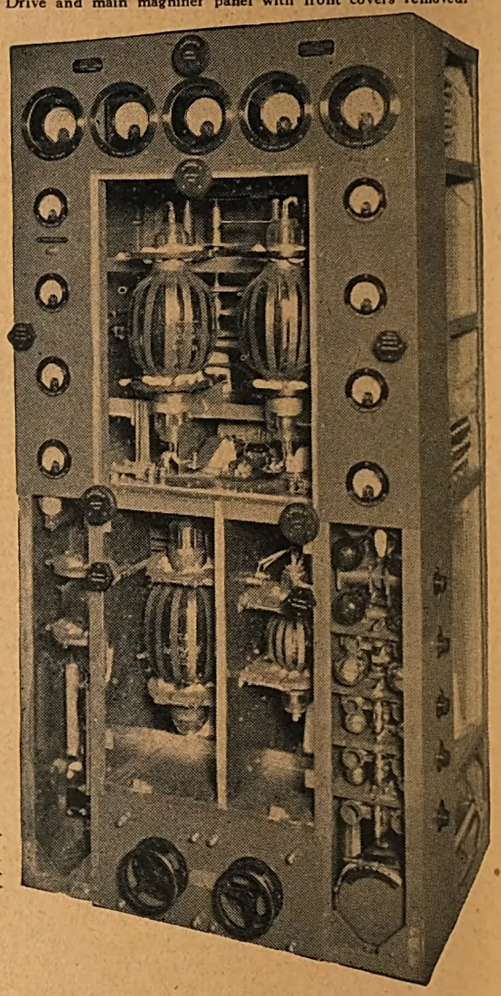

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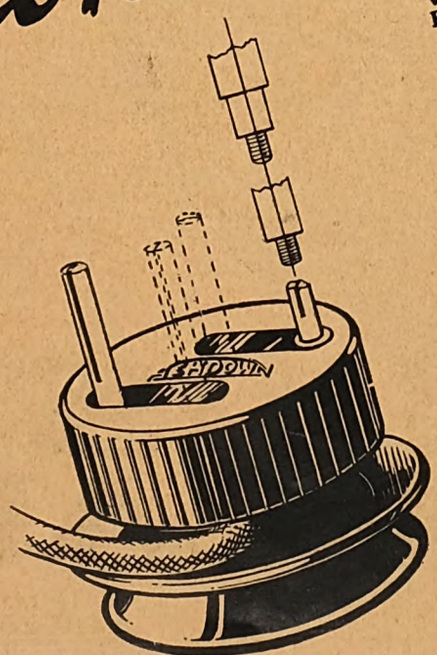

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THE ELECTRICIAN

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

No. 2714. [No. 23. Vol. CIV.] Friday, June 6, 1930. Annual Subscription, 25s. Overseas, 30s.

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Last Week at Eastbourne.

IT was generally agreed that this year's I.M.E.A. Convention, with its record attendance, was a thoroughly successful affair. For this happy result the efficient organising work of Mr. CRAMB and Mr. SIMPSON, and the local efforts of Mr. and Mrs. BRYDGES and the civic authorities of Eastbourne deserve cordial thanks, but the Clerk of the Weather certainly supported them in a most efficient way. The change which came over the scene in the course of Monday afternoon proved to be the harbinger of three wonderful days of brilliant sunshine and warmth—the dancers could have wished that the evenings had been a trifle less tropical—and this must have contributed very largely to the general atmosphere of geniality and good fellowship. Friday was not so good, but it would be ungrateful to say too much about this lapse. Possibly the tutelary deity of the district was alarmed by the somewhat defiant incitation to the visitors, contained in the Mayor's speech at the annual dinner on the previous evening, to indulge in flood-lighted night bathing on the beach, and thought it desirable to damp the ardour of any who might contemplate taking Lieut.-Col. ROLAND GWYNNE too literally. He had been goaded into making this reckless suggestion by the sly fun poked at Eastbourne's recent attempt to pose as a censor of seaside manners by Sir HARRY HATT.

Turning to the serious side of the Convention, it may be said that the discussions on pulverised fuel firing and electric heating of buildings provoked by the papers read by Mr. LAKE and Mr. BURR and by Mr. MCKENZIE's remarks on domestic water heating resulted in a useful exchange of ideas on two very important current problems of supply undertakings. On the subject of pulverised fuel there is still a wide difference of opinion, but it would appear that there is fairly general agreement as to the necessity of adopting this method in the case of plants of the size now reached in the United States. Just where the dividing line is to be drawn above which stoker firing ceases to be able to hold its own is still uncertain. Dr. PEARCE puts it at about 400 000 lb. steam capacity. Mr. LAKE would certainly divide this figure by more than two, and other engineers favour a combination of both methods. Local conditions of coal supply and quality naturally exert a large influence on the decisions taken by station engineers as to which plan should be adopted. Mr. SELVEY rightly emphasised the promising value of Mr. LAKE's work at Derby, and Mr. CHATTOCK quite reasonably made the point that efficiency and capital cost comparisons between the still partly experimental pulverised fuel-fired plants and stoker-fired stations which were on a more permanent basis could not fairly be drawn.

Considerable diversity of view was also apparent on a number of points connected with the heating of large buildings, and the best method of securing and distributing the domestic water heating load. Mr. MCKENZIE advocates giving the consumer the choice of a variety of tariffs, and in his district he seems to be successfully working on these lines, but elsewhere greater simplicity in the system of charging for current regarded as essential. The women speakers were all is emphatic on this point. They strongly urged the desirability of having tariffs which could be readily understood by the average housewife. A certain liveliness characterised the encounter between Mr. MCKENZIE and Mr. SHARP on the question of the comparative costs and merits of time switches and synchronous motor switches, and Mr. SHARP would appear to have some ground for complaint at the lack of response by engineers to inquiries as to which type of apparatus they preferred. Clearly it is very necessary, in order to cheapen the manufacturing cost of the British article, that some indication of the character of the demand should be obtainable.

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Current Topics.

Sussex and the Grid.

ONE or two aspects of the grid situation in Sussex, arising out of Mr. BRYDGES references to the subject in his presidential address and in his speech at the annual dinner, deserve attention. Eastbourne is to take its entire supply from the grid, according to programme, by October, 1931, and a partial supply has been promised by October 1 of the current year. Mr. BRYDGES appears to be a little dubious as to this promise being implemented, and is consequently, concerned as to what may happen during the coming winter in view of the veto on extensions to his own station. We gather that there is still a good deal of obstruction being encountered by the Central Electricity Board in the matter of obtaining way-leaves in this and other areas. It is a scandal that such a condition of affairs should exist, especially now that the erection of some of the overhead lines on the South Downs has shown how unobtrusive the pylons really are. If, as seems to be the case, the Board is getting seriously behind its time table the consequences in certain supply areas are likely to be awkward and the national scheme will receive some very undesirable publicity.

Standard Cookers.

VISITORS to the electrical exhibition held in conjunction with the I.M.E.A. Convention at Eastbourne, had an opportunity of inspecting the British Standard Electric Cookers which have been produced to the standard specification approved in September last by the Joint Committee of the I.M.E.A. and B.E.A.M.A. This attempt to cheapen and simplify electric cookers will, we hope, achieve the objects with which it has been designed, but it cannot be said that manufacturers are wildly enthusiastic about their co-operative progeny. Their preference for their more individual products may, perhaps, be compared to that of parents for their own offspring in comparison with other children of the same clan. The lagging of the standard cookers is exceptionally thick, but it is claimed by the designers that, although their appearance is certainly somewhat massive, this robustness has resulted in very efficient heat retention being obtained.

Getting Prices Down.

THE return to normality after the unheaval of the war is a long, painful and difficult process, of which such troubles as unemployment are only a part. A good deal of the difficulty is due to the fact that no one can say what normal will be. It is by no means to be assumed that we are going back to the pre-war price level, but it is quite certain that we must get sooner or later on to a natural price level. That process will not be complete until every little bit of inflation and all the other artificial price arrangements of the last fifteen years have been wiped out. Meanwhile the wholesale price level has reached the lowest figure since the war. "The Times" index, published on Monday, gave the level of wholesale prices at 116·3, or 2·2 per cent. lower than a month ago, 11·8 per cent. below a year ago, and 15·4 per cent. less than the corresponding figure at the beginning of 1929. In the meantime, however, retail prices have shown no such reduction, and the great big lag between wholesale and retail prices is one of the most disturbing factors in the economic situation. Commodity prices fall, wages fall or people go out of work, and then when they go shopping they are astonished to find that the stuff which was cheaper at the factory, remains at the inflated price in the shop. The most glaring examples of this difficulty are to be found in food. The present price of bread is about double pre-war price, while the price of wheat is close to the pre-war level. Coal is not quite, but nearly as bad. But the difficulty is spread more or less over the whole realm of retail trading, and presents a problem with which many of our readers are intimately concerned.

An Interesting Experiment.

THE head of the firm of John Lewis and Co. has been expounding some novel doctrines on the duty of the heirs of successful business men. Mr. LEWIS seems to assume that there are only two possible courses open to a man in his position, either to sell out of the family business and invest the proceeds in gilt-edged securities and take up a public career, or to do as he has done—keep his capital in the business, "stick to the shop," so arranging matters that he takes no profit of any kind. It will be interesting to see how the experiment works, for to the plain man there seems to be a third and much sounder course for everybody concerned; those employed in the business as well as those whose money is invested in it. That course is to keep every penny of capital in the business and to devote every scrap of energy to its development, with all the profits which may accrue from the enterprise and ambition of its head. Mr. LEWIS is, apparently, not unmindful of the flaw in his argument, for in his speech at the annual meeting of the company, after assuring the preference shareholders that none of them could lose a penny until he had lost the whole of his estate, he added that he could be trusted to part with the control of the company long before that point was reached. The moral is that there could be no playing with economic forces without the certain risk of the stopping of initiative and the loss of confidence.

High Speed Circuit Breakers.

AFTER extended tests last August on the 220 kV system of the Philadelphia Electric Company, a new design of high voltage high speed oil circuit breaker is now being manufactured by the Philadelphia works of the American General Electric Company on a commercial scale. These new circuit breakers have an interrupting rating of 2 500 000 kVA at 230 000 V. They are of the moulded non-metallic explosion chamber type, with stationary contacts. The operating mechanism is a double motor-operated centrifugal device. This closes the breaker contacts and at the same time stores energy in springs to accelerate the opening stroke. The complete breaker is 39 feet long and 12 feet wide, the height to the top of the bushing being 23 feet. The tanks have an inside diameter of 9 feet and contain 13 700 gallons of oil. Completely assembled the breakers and oil weigh 92 tons. At the three generating stations of the New England Power Company's new development —Fifteen Mile Falls, Andover and Tewksbury—17 of these new circuit breakers are being installed. The operating time of 8 cycles from the energising of the trip coil until extinction of the short circuit compares with 20 cycles for the ordinary explosion chamber design of similar size, and it is believed that developments now in progress will lead to the production of a still more rapidly acting type.

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THE ENGINEERING BUDGET.

Analysis of Development Expenditure of an American Supply Undertaking—Method of Predicting Future Requirements by Extending Graphs.

By VERNON W. PALEN.

IT is the purpose of this paper briefly to outline the essential parts of the engineering budget as annually prepared by an electric company in the eastern United States, having in use upwards of 250 000 meters. The material is set out in such a way that the growth in the budget items of a similar company elsewhere may be compared with those described.

From figures 2, 3 and 4 some idea may be gained as to the very rapid growth in population and corresponding rapid growth in electric meter installation and load which have taken place in the territory under discussion. It is well to point out that in this community at present every meter serves an average of slightly less than four individuals, since there are very few locations which are not entirely electrified. In short, the growth in electric meter installations shown in Fig. 4 represents almost entirely new building installations.

Account must also be taken of the fact that the territory in question, due to its proximity to metropolitan districts, is populated by individuals who are used to or at least are familiar with the best in electric service. The annual expenditures for the various items to be described may, for the above reason, necessarily be somewhat higher than for a company serving the average suburban territory. Besides this, the city developments and improvements in a community such as is described here greatly influence the amounts expended annually for removal of overhead lines and for subway construction.

The company under discussion in this paper has as yet no generating station of its own. All energy is purchased from one of the large generating stations in the nearby metropolitan district.

In 1915 we find this company owned and operated six sub-stations indicated on Fig. 1 by the letters A, B, C, D, E and F. In 1917 sub-stations E and F were rebuilt and enlarged. Up to 1918 power was distributed two-phase almost entirely, but in 1918 extensive changes to three-phase were made, and this work was extended in the years following 1918, so that at the present time practically all power is distributed three-phase.

In 1925, 1926 and 1927 respectively automatic sub-stations G (controlled from D) and H (controlled from D) and I (controlled from A), as shown on Fig. 1, were added.

Very little construction of any kind was done during the war, and when the armistice was signed, this company found itself several years behind in its enlargement programme. With money becoming more easily available, 1919 saw considerable subway construction in the vicinity of sub-station A. A 15 000 V tie feeder was installed between sub-stations B and E as well as a 15 000 V distribution feeder in the vicinity of sub-station A.

In 1920 subway construction was done in the neighbourhood of sub-stations C, D and E, and a 15 000 V tie feeder was installed between stations D and E. A commercial office at D and a new sub-station at C were built in 1922, and additional subways were constructed at C.

In 1923 a new store-room and garage at A, additions to office building at A, a 15 000 V tie feeder between A and C, a 15 000 V tie feeder between A and D, subway construction in the vicinity of A, C and D, and installation of underground distribution systems at A, C, D and E, were among the improvements. Additional distribution subway was built in 1924 at A, D, C and I, and the underground distribution system at A, C, D and E were extended in this year. A 15 000 V transmission feeder from C to D, and a 15 000 V distribution feeder at A were also installed.

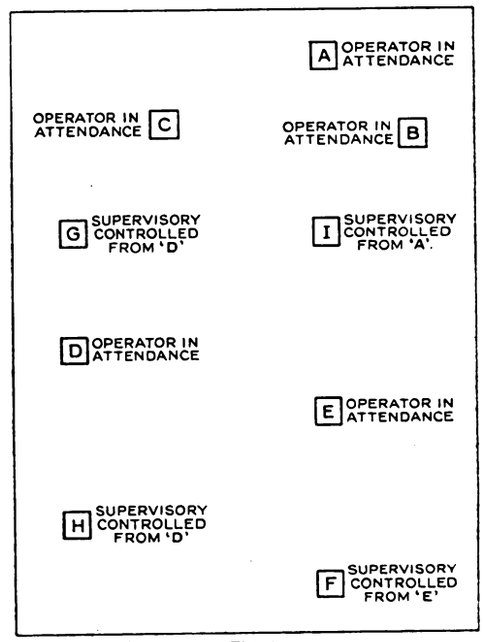

Fig. 1.

In 1925 a new garage and storeroom at D, considerable subway construction at A, C, D, E and G, a 15 000 V transmission feeder from C to G and another from D to G, and considerable additions to the underground distribution systems at A, C and D were on the programme.

Subway construction at A, C, D, E and H was carried out in 1926. A 15 000 V transmission cable from D to H, a 26 000 V transmission cable from A to D and added underground distribution systems at A, D and E were also among the improvements. In 1927 a 15 000 V transmission cable was installed between A and I and also between E and I.

The foregoing outline indicates work which was, for the most part, not affected by natural growth in load, but more par-

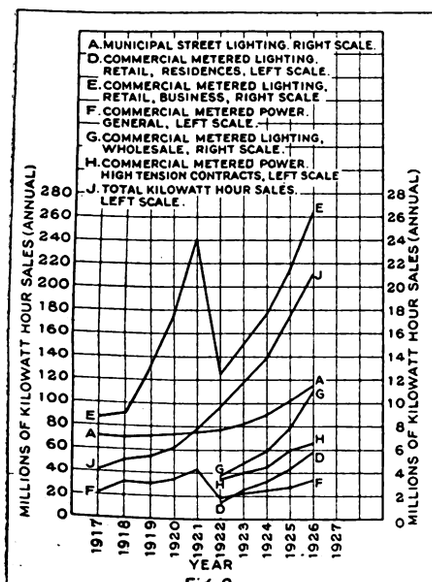

Fig. 2.

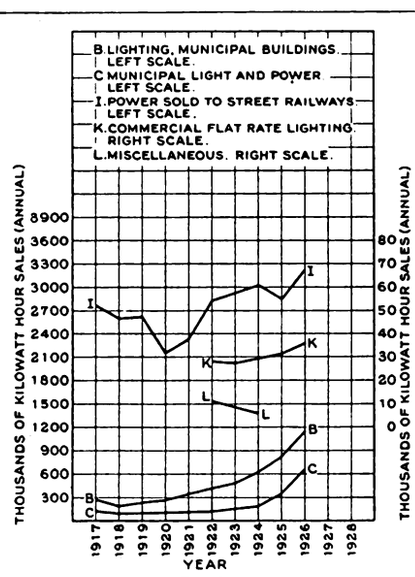

Fig. 3.

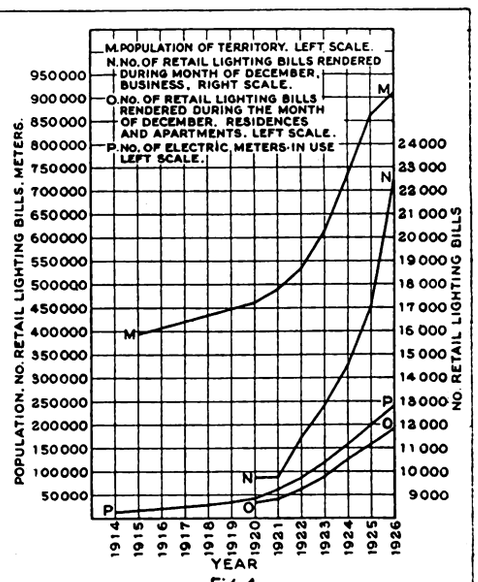

Fig. 4.

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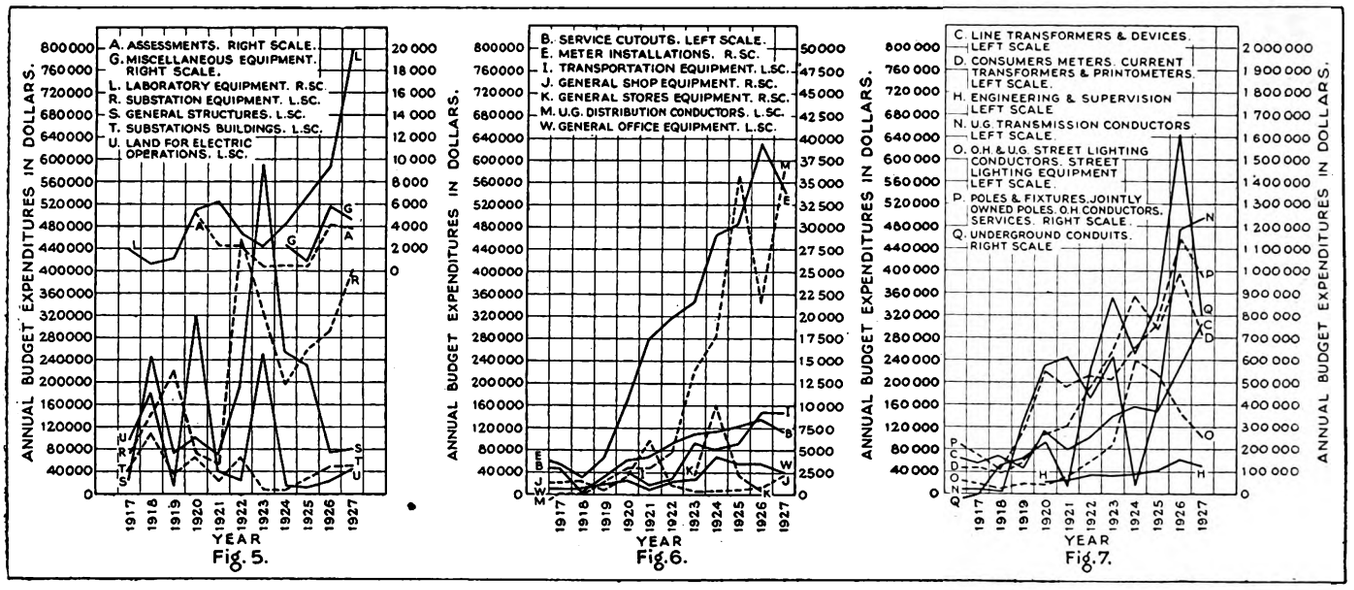

ticularly dependent upon local conditions. Practically all other budget accounts show a proportionate yearly increase with the load. The data given should aid the reader materially in comparing this company's annual budget expenditures and scope of improvements with similar items of another company. The annual expenditures for these various items will be found on Figs. 5, 6 and 7.

Project (*A*): Labelled "Assessments."—Covers the amount for the payment of assessments for local improvements.

Project (*B*): Labelled "Service Cutouts."—Covers the purchase and delivery of service cutouts to supply requirements for coming year.

Project (*C*): Labelled "Line Transformers and Devices."—Covers the purchase and delivery of line transformers to supply the requirements for the coming year.

Project (*D*): Labelled "Consumer's Meters, Printometers and Current Transformers."—Covers the purchase and delivery of said equipment to supply the requirements for the coming year.

Project (*E*): Labelled "Meter Installations."—Covers the cost of installing new meters.

Project (*G*): Labelled "Miscellaneous Equipment."—Covers the purchase and delivery of electric tools and implements to supply requirements of coming year.

Project (*H*): Labelled "Engineering and Supervision."—Covers the amount of such expense which is charged to capital.

Project (*I*): Labelled "Transportation Equipment."—Covers additional business and commercial vehicles required for new business and to replace vehicles removed from service.

Project (*J*): Labelled "General Shop Equipment."—Covers the cost of such material due to expansion of business.

Project (*K*): Labelled "General Stores Equipment."—Covers the cost of such material due to expansion of business.

Project (*L*): Labelled "Laboratory Equipment."—Covers cost of testing equipment due to expansion of business.

Project (*M*): Labelled "Underground Distribution Conductors."—Covers all new and existing commercial 4 000 V feeder requirements.

Project (*N*): Labelled "Underground Transmission Conductors."—Covers all new and existing transmission feeder requirements.

Project (*O*): Labelled "Overhead and Underground Street Lighting Conductors and Equipment."—Covers all new and existing street lighting requirements.

Project (*P*): Labelled "Poles and Fixtures, Overhead Conductors and Services."—Covers all new and existing commercial feeder requirements.

Project (*Q*): Labelled "Underground Conduits."—Covers all Subway Construction and depends greatly on local conditions.

Project (*R*): Labelled "Sub-station Equipment."—Covers all electrical equipment required by new and existing sub-stations.

Project (*S*): Labelled "General Structures."—Covers all construction on other than sub-station buildings.

Project (*T*): Labelled "Sub-station Buildings."—Covers the construction of new sub-station buildings and miscellaneous additions to existing sub-station buildings.

Project (*U*): Labelled "Land Devoted to Electric Operations."—Covers the amount necessary for the purchase of sites for sub-station buildings.

Project (*W*): Labelled "General Office Equipment."—Covers the cost of such material due to expansion of business.

In making up the annual budget this company estimates items A, B, C, D, E, G, H, I, J, K, L, Q, S, and W from expenditures of previous years. In other words, to find approximately what amount to include in the 1928 budget for any one of these items, it is only necessary to extend the graph for that particular item on the curve sheet.

On the other hand, items M, N. O, P, R, T and U, which depend primarily on load conditions, are all more or less involved together, and for this reason it is best to study load conditions over the entire territory at one time. This procedure will show what sub-stations and primary feeders must be relieved. New sub-stations and new feeders are laid out to meet the estimated future peak and suitable amounts to cover the cost of all work are incorporated in the budget.

WORKS WELFARE.

ALTHOUGH welfare work need not be a costly item of management, a considerable proportion of the activities covered by it being practically chargeless, or capable of being made self-supporting, there are some items which must be debited to the welfare account. This question is discussed in detail in a confidential memorandum on "The Introduction of a Works Welfare Scheme," which has been compiled by special request for the use of member firms of the Industrial Welfare Society. To a firm with 4 000 employees the allocation of a penny per per day per worker would mean a fund of over £5 000 per annum; this would be sufficient to cover the salaries of the welfare staff and groundsman and the firm's contributions to the various benevolent funds. The memorandum attempts a definition of the scope of works committees and suggests that executive functions should include such matters as determination of hours of work, control of mess rooms, heating, lighting and sanitary arrangements, collections, entertainments, works magazines and the organisation of the sports association. Advisory functions should deal with the engagement, discharge, dilution and transfer of labour (excluding disciplinary discharges), training and education of apprentices and suggestions for improvement in method, time-keeping and so on. Actually, in matters involving expense by the firm, a works committee is naturally advisory, in others, and certainly in all minor matters, it becomes executive in fact if not in name.

NATIONAL RADIO EXHIBITION.

The National Radio Exhibition, organised by the Radio Manufacturers' Association, will be held in the New Hall, Olympia, London, from September 19 to 27. The plan of the stands has been prepared and the allocation of space, as in past years, will be by ballot. There will be three ballots held consecutively on the same day, and all firms whose applications for space are received on or before June 14 will be then included.

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MODERN BOILER HOUSE PRACTICE—III (b).

Water and Air Cooling of Furnace Walls—Corner Firing—Pulverised Fuel Firing—Boiler Efficiencies.

By F. JOHNSTONE TAYLOR.

WHILE water cooled walls are now to be regarded as prevalent practice the air cooled furnace can in many instances be justified on account of its lower cost. The M.A. Detrick Co. of New York, who are specialists in this type of furnace (shown in Fig. 6), lay stress on the important matter of the bonding of the key tile, which as shown in detail consists of a small casting which fits into a recess in the bottom face of this tile eliminating any possibility of its working out into the furnace. Shortening of the height of the vertical sections, too, is claimed to facilitate erection and to make possible a more equitable distribution of the steel supporting members. Nine inch tiles are adopted as standard, while the supporting steel is so arranged that the outer wall may be of red brick laid up between and supported by the steel members, thus giving lanes for air cooling. The tile supporting castings are made with horizontal arms of various lengths. The air passages can, therefore, be made to suit the particular conditions of each installation. That is to say, if all the combustion air is to be taken through the walls, these arms can be made long with large air spaces, while if only the primary air for a unit mill is required a thinner air space can be provided. In addition the design permits of baffling vertically or horizontally, as desired, with equal facility. Obviously there is a limit to the rate of combustion which is possible with such furnaces, but for moderate rates they are satisfactory if properly designed and constructed, and as already stated their cost is relatively low.

Another development is that due to the Combustion Engineering Co. of New York, which takes the form of tangential or corner firing. This arrangement has proved of value at high ratings in the form of reduced carbon loss and good furnace distribution. By means of a special type of mixing burner all the air necessary for combustion is admitted through the burner either as primary air entering with the coal stream or as secondary air entering around the fuel inlet nozzle. Baffles and deflectors are so arranged that an intimate mixture exists when the fuel and air enter the combustion chamber. It is claimed that corner firing entirely eliminates smoke at any rating, the minimum excess air being determined by the fusing temperature of the ash.

Typical of a large boiler unit is that installed by Simon Carves at the Birmingham, Nechells station, which is an interesting study in itself. This installation is on the "central" system of pulverised coal firing with four rotary driers and four mills of the ball type, while the four boilers are

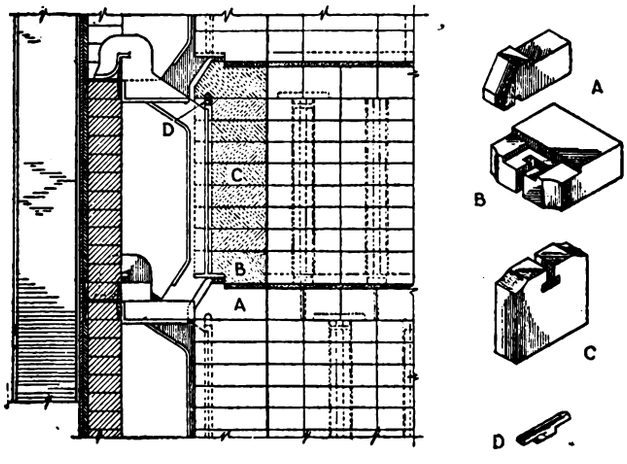

Fig. 6.—Air cooled Detrick furnace.

rated at 150 000 to 180 000 lbs./hour at 350 lb. and 700 deg. F. On a 54 hours official test at an average rating of 140 600 lb./hour the overall efficiency after deducting all coal used for drying and power purposes was 81·18% on the gross and 84·76% on the net lower calorific value, while that of the boiler alone was 84·69% and 88·46% respectively. Later tests at a higher rating and after certain modifications to the plant showed a maximum boiler efficiency of no less than 91·10% on the net lower value. The fuel used was an inferior grade with 20% moisture content and 25% ash.

The foregoing may be compared with the general system applicable to Babcock boilers as shown in Fig. 7, and that of Messrs. Clarke, Chapmans' Woodeson boiler in Fig. 8, which may be taken as representative of British practice at the

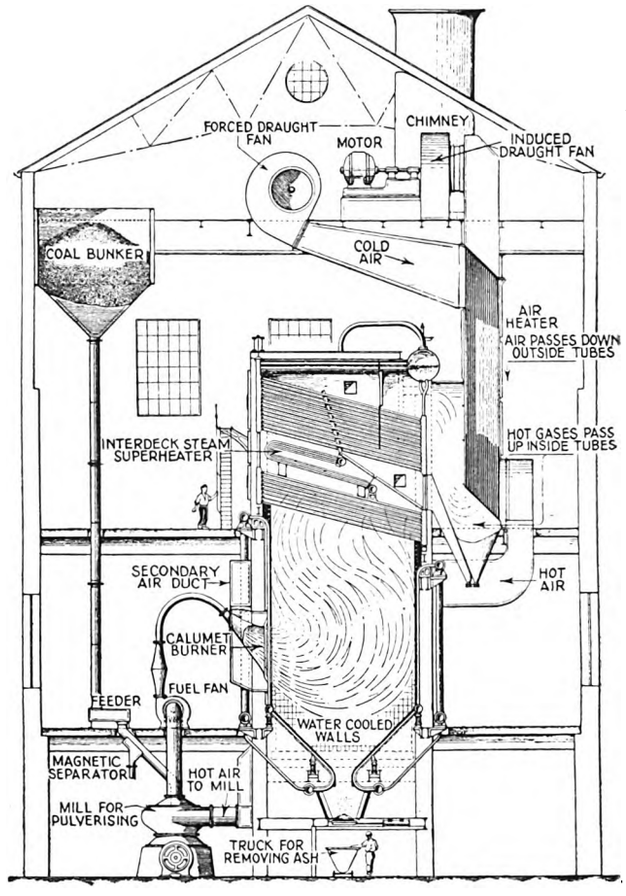

Fig. 7.—Babcock boiler.

present day, while Fig. 9 shows the principal features of a Foster Wheeler boiler at the Rockway, N.Y., station of the Queensboro' Gas and Electric Co., which could be regarded as good average American practice. These units have a maximum capacity of 280 000 lb./hour, with an evaporation of 13·5 lb./sq. ft. of heating surface (450% rating).

Of plants in this country the previously described Nechells boilers and those recently installed at Hams Hall, Birmingham, may be taken as representative of large installations, the latter described in "Engineering" of November 22, 1929, comprising five boilers with a normal rating of 190 000 lb./hour at 375 lb. and 710 deg. F. They are of the B. and W. cross drum type, and are fitted with Usco air heaters.

The sets at Wallasey ("Engineering," April 26, 1929), and Peterborough ("The Engineer," May 24, 1929) are indicative of what can be done in the case of relatively small stations. The boilers at Wallasey already shown in Fig. 3 have a rating of 53 500 lb./hour at 300 lb. pressure and 600 deg. F., though they are only at present being operated at 200 lb. They are of Simon Carves' semi-vertical tube tri-drum type, the previously mentioned cooling tubes in the walls forming part of the circulating system.

The Peterborough station is claimed to be unique so far as this country is concerned in its being entirely operated by pulverised fuel and also in its having the boilers and turbines in the same room, while the coal is dealt with and stored in an entirely separate building. Here, as opposed to Wallasey, however, the central in place of the unit system is employed incorporating a pulverised fuel fired raw coal

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dryer, ball type mills, screw conveyors and steel plate bunkers with a capacity of 240 tons together with the necessary feeders and subsidiary equipment.

The builders point to some pertinent facts relating to this very interesting plant.

At the present time the coal cost per unit generated is 0·157d. per unit. A striking point about this figure is that rail freightage and wagon hire together account for no less than 65 per cent. of the total. That is to say, of 14s. per ton paid for coal delivered on the station siding, the foregoing

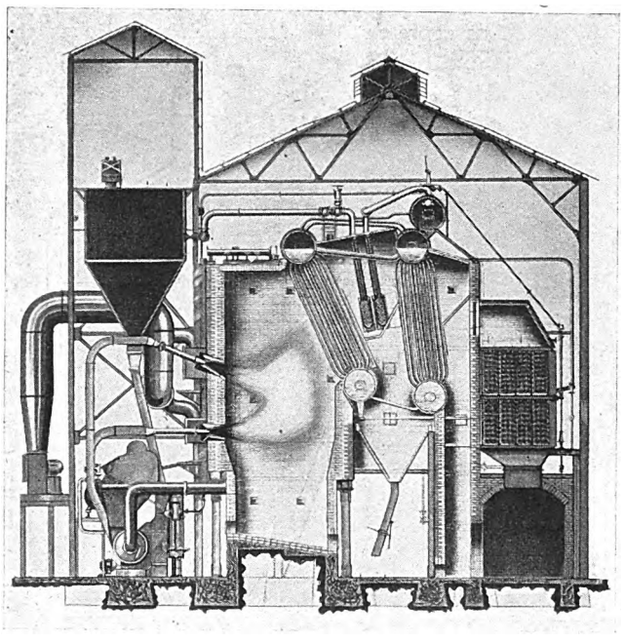

Fig. 8.—Clarke, Chapmans' Woodeson boiler.

items are responsible for 9s. 2d. The plain figures speak for themselves and need no comment.

Energy absorbed in drying and pulverising with different systems of pulverised fuel firing have been the subject of considerable discussion from time to time. At Peterborough the overall consumption in coal handling, drying and pulverising, including boilers, fans and auxiliaries, averages 27 units per ton. Labour cost of coal drying and pulverising is 2·8d. per ton of raw coal.

Experience in the storage of pulverised coal is always interesting. At Peterborough coal has been stored for over six months in unlagged bunkers without deterioration. and has subsequently fed freely to the boilers when used. This successful result is attributed to some extent to the practice of filling up the bunkers to the top when the plant is shut down, and at week-ends, and keeping all openings to the bunkers down to a minimum size. The object is to eliminate condensation of moisture by excluding air from the bunkers as far as possible. It is moisture in the coal, of course, that is largely responsible for caking and spontaneous combustion in the bunkers. Dryness factor of the coal in the bunker is about 2½%. The foregoing practice is diametrically opposite to that followed in some power stations, where the bunkers are emptied during any appreciable interruption in the operation of the plant. The nature of the coal is, of course, another factor of importance. An average analysis of the coal at present being burned is as follows :—

Volatile matter	27·26%
Coke	54·28%
Ash	16·40%
Fixed carbon	37·88%
Free moisture	8·02%
Hygroscopic moisture	10·44%

Calorific value :—Gross, 8 852 B.Th.U.
Net, 8 351 B.Th.U.

Coal with 20% of moisture has been handled over long periods.

While a comparison of recent tests is apt to be misleading unless local conditions are carefully taken into account, the results appended in respect of the Calumet (Chicago) station as given in " Engineering " serve as a general guide as to the conditions which lead up to boiler efficiencies approaching 90% in the case of large units.

Duration of test	30 min.	20 min.
Total steam generated, lb. per hour	243 000	285 000
Pressure in drum, lb. per sq. in.	348	363
Steam temperature, deg. F.	741	739·5
Superheat, deg. F.	314	300·2
Air pressure in primary duct, inches of water	9·5	9·3
Air pressure in secondary duct (fan), inches of water	4·5	5·05
Air pressure in secondary, below burner damper, inches of water	1·1	1·3
Gas temperature at boiler, deg. F.	1 290·5	1 294·5
Gas temperature at economiser outlet, deg. F.	580·8	576·0
Gas temperature at preheater discharge, deg. F.	315	308·6
Gas temperature at washer discharge, deg. F.	164	154·6
Air temperature at preheater discharge, deg. F.	358·0	358·0
Air temperature at preheater inlet, deg. F.	95·0	96·0
Water temperature at economiser discharge, deg. F.	475·8	479·2
Water temperature at economiser inlet, deg. F.	172·0	172·5
Water pressure at feed pump delivery, lb. per sq. in.	495·0	485
Coal consumption, lb. per hour	32 000	—
Boiler efficiency, per cent.	89·4	—
Power consumption—		
Forced draught motor, No. 1, kW per hour	55·68	59·52
Forced draught motor, No. 2, kW per hour	64·64	62·08
Exhaust fan motor, kW per hour	26·40	26·00
Pulveriser, kW per hour	156·00	149·00
Primary air fan, kW per hour	23·48	22·76
Fuel pump, kW per hour	8·24	8·14
Gas washer, kW per hour	43·64	42·76
Induced draught fan, kW per hour	372·00	370·80
Total A.C. kW per hour	750·08	741·66

The following figures are given by Messrs. Clarke, Chapman in respect of a relatively small moderate pressure Woodeson boiler, fired with powdered fuel by a " Resolutor " pulveriser, and can be taken as representative of good average practice :—

Duration	4 hours.
H.S. of boiler	5 200 sq. ft.
Method of firing	Powdered fuel.
Calorific value of fuel as fired	10 670 B.Th.U's.
Steam pressure by gauge	201 lb.
Temperature deg. F. saturated steam at above pressure	388 deg. F.
Final temperature of Superheated Steam	517 deg. F.
Degrees of superheat	129 deg. F.
Temperature of gases leaving economiser	380 deg. F.
Temperature of feed water to economiser	112 deg. F.
Factor of evaporation over plant	1·23
Total amount of water evaporated (actual)	123 341 lb.
Water evaporated per hour (actual)	30 835 lb.
Total amount of fuel burnt during test	16 380 lb.
Fuel burnt per hour	4 095 lb.
Amount of water (actual) evaporated per lb. of fuel	7·53 lb.
Amount of water (F. and at 212 deg.) evaporated per lb. of fuel	9·27 lb.
Draft of economiser outlet	0·27 W.G.
Average percentages of CO_2 in flue gases	16%
Efficiency of boiler, superheater and economiser	84%

Particulars relating to the operation of the Thompson boilers at Cadeby Colliery are given in " Power Engineer " of June, 1929, from which it would appear that this plant, showed 84·68% efficiency on an average rating of 40 000 lb./hr. on fuel of an average calorific value of 10 348 B.Th.U. per lb.

Large Observation Doors.

While pulverised fuel firing is a distinct problem in itself and one concerning which there is no doubt much to be yet learned through practical experience, probably the most important criterion of good results is to so design the furnace and the burners and to so adjust the air and fuel that while the two latter are in the correct ratio the flames do not strike the boiler tubes and to maintain this condition the operator should have large observation doors, one on each side, about three feet below the tubes and two small observation doors on each side, about one foot below the tubes. In the case of installations provided with storage bins the primary air should be fed at the rate of about 60 cu. ft. per lb. of fuel fed per minute. It is improper adjustment of the air supply that causes a general deficiency of air in the furnace and leads to

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incomplete combustion and this is indicated by the flames licking the tubes over the entire width of the furnace. The result is an excessively high furnace temperature causing molten ash to trickle down the walls and the accumulations of ash to soften and slide down to the bottom of the furnace, while dark grey smoke will be visible at the stack. The remedy is to increase the furnace draught or, if this is not possible, to reduce the rate of coal feed.

When the rate of steaming has to be increased, the speed of all the feeders should be increased in the same proportion, the point being to ensure that all parts of the furnace burn equal amounts of coal. The draught must always be increased in a greater proportion than the rate of coal feeding owing to the rate of air flow into the furnace varying as the square root of the draught.

Flames may impinge on the tubes by reason of their turning up before descending low enough into the furnace. The path of the coal being thus shortened it leaves the furnace in a partly unburned condition which can be remedied by reducing the draught and increasing the air pressure on the feeders. The latter has the effect of forcing the flame down into the furnace so as to practically complete combustion before the flame reaches the tubes; at the same time the flames must not be driven against the bottom of the furnace where they will melt the ash and cause considerable trouble.

Those who are interested in the practical results and operating conditions of pulverised fuel in large power stations will do well to consult the very comprehensive report thereon issued by N.E.L.A. and referred to as publication No. 06/1929. This

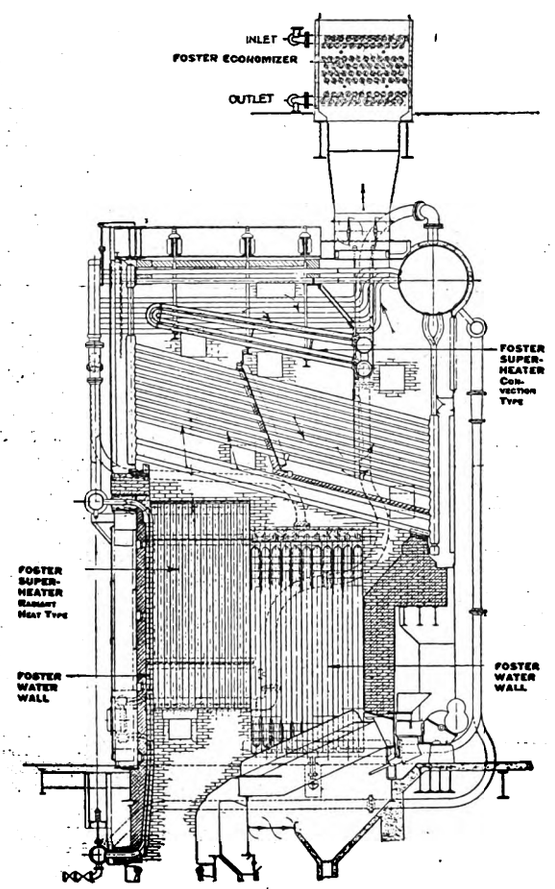


Fig. 9.—Foster-Wheeler boiler.

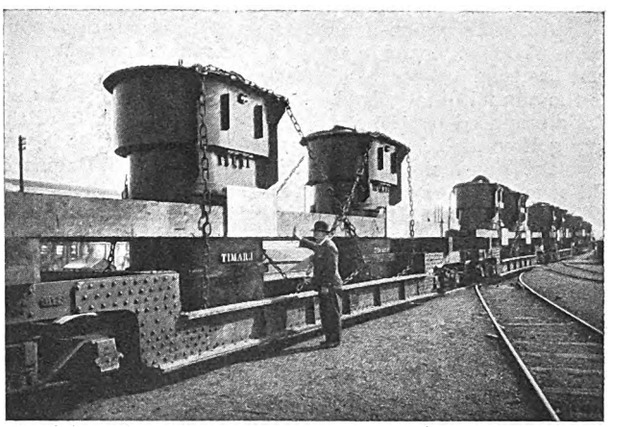
contains in condensed form the reports of those responsible for the operation of a number of large stations, some interesting statements by manufacturers of pulverised fuel equipment and a very comprehensive index of the current literature on the subject.

The general manager of the Oldham tramways has reported on the representations which had been made with reference to interference with wireless broadcast reception alleged to arise in connection with the running of tramcars. The Committee does not see its way to take any action at the present time.

LARGE TRANSFORMERS.

Special Units Designed and Made for Power Scheme at Waitaki.

AMONG recent important developments overseas is the electric power scheme at Waitaki, being carried out to the plans of the Public Works Department, New Zealand. Part



Part of a train prior to leaving Rugby with seven transformers destined for New Zealand.

of the plants for installation in connection with this scheme are seven 5 500 kVA single-phase transformers of special design, manufactured by the British Thomson-Houston Co., Ltd., Rugby. In the accompanying illustration is seen part of a train prior to its departure from Rugby with the seven units in question, the shipment having a net load of over 90 tons, the weight of each transformer amounting to about 13 tons. The transformers, which are of the oil-immersed, water-cooled outdoor type, will form the initial installation of two 16 500 kVA three-phase banks, with one spare, at the Waitaki power station, where ultimately the transformer installation will consist of five banks of the same capacity. Current from the alternators will be taken to the transformers and stepped up from 11 000 V to 110 000 V, three-phase, 50 cycles, for feeding the transmission lines. All the transformers will be delta-connected on the primary, or 11 000 V, side, and star-connected on the secondary, or 110 000 V, side, with the neutral point solidly earthed. An interesting feature in connection with the plants supplied for the Waitaki power station is that the 110 000 V transformer bushings are interchangeable with those on the oil-immersed circuit breakers. These breakers are of similar construction to the 132 000 V. oil-immersed circuit breakers which this company has supplied for various sub-stations on the Scottish grid scheme. In addition to oil-immersed circuit breakers, the B.T.H. switchgear for the Waitaki scheme includes a metering desk and an indoor control board, with voltage regulators and engine-room telegraphs.

ELECTRO-FARMING.

Visit of Electrical Engineering Society of the Borough Polytechnic Institute.

MEMBERS of the Electrical Engineering Society of the Borough Polytechnic Institute recently visited the all-electric farm of Mr. R. Borlase Matthews. The visitors were particularly interested in the Law "Bloc" Utility Farm Machine which has been installed on the farm during the past few weeks, and is the only one of these machines in this country. This machine was first shown at the Paris Agriculture Show in January of this year. In the design of this machine the principal of the disintegrator has been adopted, but instead of mounting the plates on a horizontal shaft, the vertical axle of a 0·9 horse-power squirrel-cage pipe-ventilated motor is employed. The machine can be employed for four main purposes: (*a*) for crushing and grinding cereals; (*b*) for crushing or grating cider apples and potatoes; (*c*) for breaking up chalk, artificial manures, oyster shells, etc.,; and (*d*) for cutting and slicing roots. In fact, all the usual food preparing operations for livestock, with the exception of tumbling and cleaning of roots and the chaffing of hay and straw, can be carried out by this machine.

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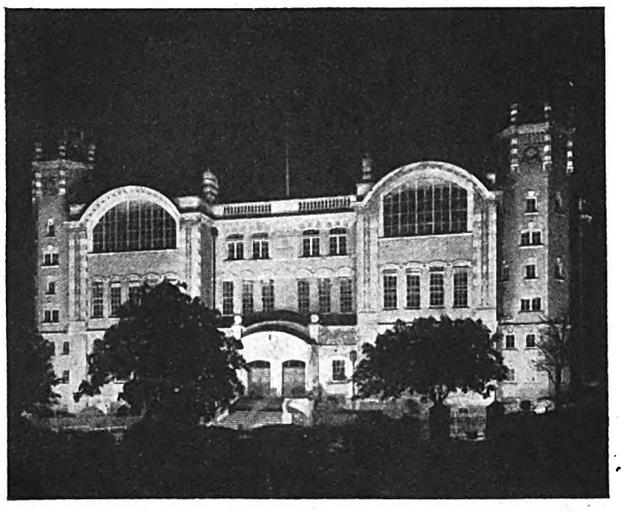
THE I.M.E.A. CONVENTION.

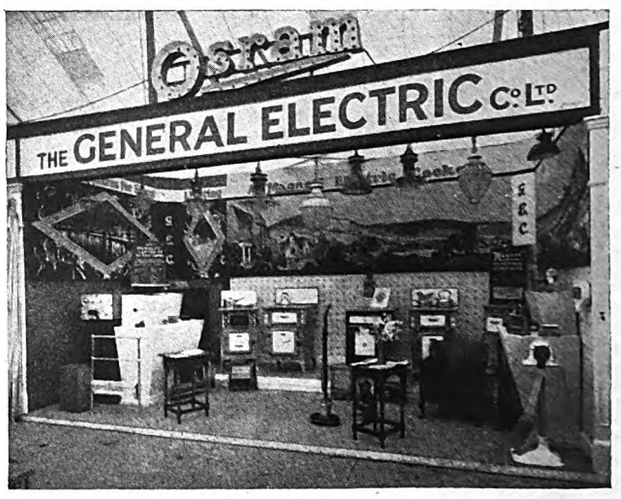
Municipalities and the Post Office—Supporting the Electrical Association for Women—New List of Officers—Next Year's Meeting.

ALTHOUGH our special illustrated report of the 35th annual convention of the Incorporated Municipal Electrical Association at Eastbourne last week occupied no less than twenty-four pages, and included reports of all the papers and of all the discussions, time and space considerations compelled us to hold over the report of the annual dinner and of the annual meeting.

At the annual dinner, held in the Grand Hotel on May 29, it was announced by the President that as the result of the annual golf contest for the cup presented by Mr. Dennis, the Benevolent Fund of the Institution of Electrical Engineers would benefit to the extent of £5 10s. The winner of the contest was Capt. Kennard. It was added that the first prize in the sweepstake held in connection with the contest had been won by Capt. Kennard, and the second prize by Mr. J. H. Rothwell.

Proposing "The Incorporated Municipal Electrical Association," Col. Sir Thomas Purves (President of the Institution of Electrical Engineers) referred to the close working between the Institution and the I.M.E.A., inasmuch as the latter was represented upon many of the Standing Committees of the Institution, and he assured them that the Institution of Electrical Engineers appreciated the help it received in this and many other ways, which he believed was mutually beneficial. Continuing, Sir Thomas said he not only represented the Institution of Electrical Engineers on this occasion, but presumed he would also be regarded as representing a very much more questionable organisation, the Engineering Department of the Post Office! The work of that Department involved negotiations with municipalities throughout the country, but he claimed that the Post Office plant never gave any trouble to anybody. It never looked for trouble, and it never started trouble, but he had to confess that it had a wonderful faculty for blundering into other people's troubles and getting mixed up with them in such a way that it was blamed for being an offender. It really, however, was only a victim. That, perhaps, was the penalty the Post Office had to pay for keeping bad company in the streets! He did not think, however, they would be very far wrong in regarding the Post Office as a very well meaning and human old institution, and that if it made mistakes it should be given the benefit of the doubt. Really, however, the relations between the Post Office and the municipalities were of the most cordial and friendly kind. Moreover, these friendly relations he always endeavoured to preserve because the telephone service, for instance, was not so much embarrassed by its friends that it could afford to overlook any of them. As to the relations between the I.M.E.A. and the Post Office, he did not remember any really acrimonious discussions between them. The I.M.E.A. might, at times, have taken part in some concerted action against the Post Office, but he did not remember that it had ever played the part of a spear-head, and the Engineering Department had always got along well with municipal electrical engineers. When there was any difficulty in regard to Post Office regulations on such things as clearances between telephone wires and lighting and power circuits, it would always be a good thing if the engineers concerned would go to the Post Office and let them know about it quietly, so that it could be discussed as between man to man. It was not a very easy matter to devise safety regulations which could be applied under all kinds of local conditions, and they would always find the Post Office ready to take account of special local conditions. He was certain that a great deal of trouble was often caused by trying to apply regulations to conditions which it was never intended they should be applied to when they were framed, and therefore he asked electric supply





THE left-hand picture shows one of the two multiple spray-design G.E.C. illuminated fountains installed at Eastbourne in connection with the I.M.E.A. Convention. The fountains emitted three different forms of spray, the jets being controlled by a special form of valve distribution gear, permitting of pyramid, cylindrical and floral sprays. The change from one form to another was timed at one minute intervals, while a colour wheel gave continuously changing effects, the wheel making some three revolutions per minute. Within each of the fountains was installed a 1 h.p. electrically-driven centrifugal pump, the main lighting source being provided by a 1 000 W projector fitted within the fountain, and surrounded by 17-40 W amber sprayed lamps. The whole of the lamps, together with the projector, the pumping arrangements and the distribution gear, were enclosed in a watertight compartment, over which the rotating colour wheel operated, this being driven by a fractional h.p. motor. The first of the bottom pictures shows the School of Art at Eastbourne floodlighted by G.E.C. projectors and Osram lamps. In all there were 14 projectors, two being mounted on pedestals, and the remaining floodlights being installed at ground level. The types employed were G.E.C. FB2 505 and IE2/96. The second picture is of the company's main stand in the Winter Garden Exhibition.

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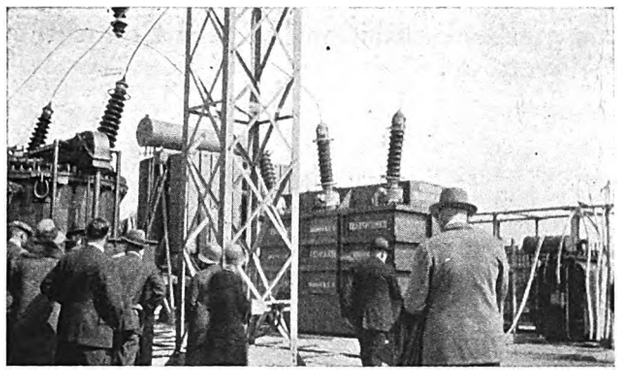
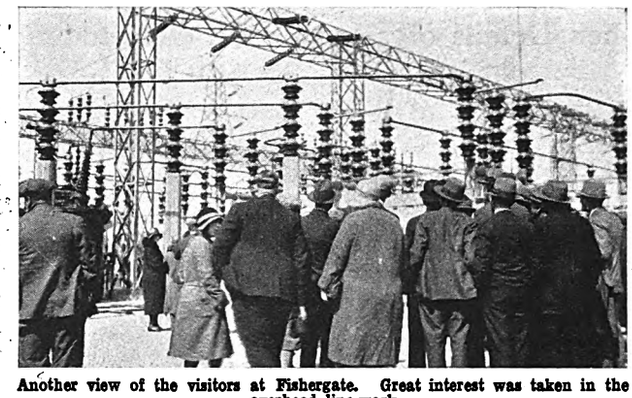
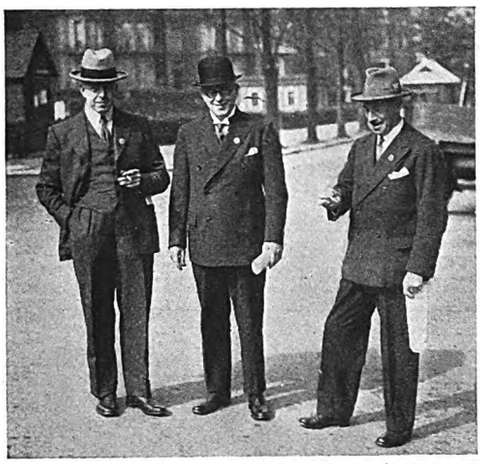


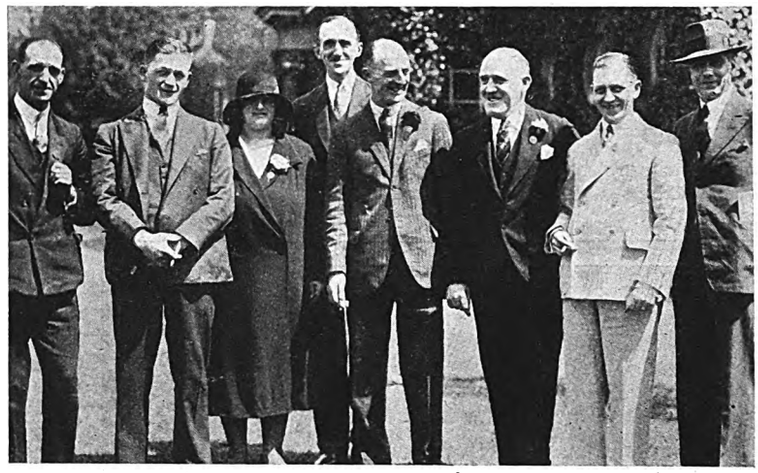
Alderman W. Walker "takes one" on his own at Fishergate sub-station, Kemp Town.



Another view of the visitors at Fishergate. Great interest was taken in the overhead line work.



Mr. A. W. Barham; the newly-elected President; and Mr. J. Bell.



Some well known "Magnet" personalities posing for "The Electrician" camera.

engineers to bear in mind that the Post Office was always pleased to discuss matters with them from this point of view. A great deal of misunderstanding would be avoided if both sides got together in this spirit.

The President, responding to the toast, spoke of the growing importance of the I.M.E.A., and how it is now consulted by all important Government departments upon any matter relating to electricity supply. In the matter of supply from the grid, he said Eastbourne had been promised a supply by October 1, and he hoped that the anticipations of the Central Board on that matter would be fulfilled, otherwise he feared Eastbourne would be in a rather difficult position during the coming winter, because the Commissioners had refused the Corporation permission to extend its generating plant. Referring to the Convention, he commented on the fact that the attendance of over 1 100 constituted the largest of any Convention, and he thanked the Mayor and Corporation on behalf of the members and visitors for all that had been done for them. Reference was made to the exhibition held in conjunction with the Convention, and on the same matter the President called attention to the showroom of the Eastbourne Corporation as well as the well-arranged showrooms of the electrical contractors in Eastbourne. Bearing also on the same subject of propaganda, he referred to the work of the British Electrical Development Association, and made a strong plea that every municipal electricity committee should subscribe on the full scale. Again, all possible support should be given to the Electrical Association for Women, which now had a membership of 4 000, and was doing valuable propaganda work among the women of the country, who were such an important factor in developing the use of electricity in the home. The hope was further expressed that all educational authorities would equip their schools with electrical cooking.

"The County Borough of Eastbourne" was proposed by Sir Harry Hatt (chairman of the Bath Electricity Committee), and was responded to by His Worship the Mayor of Eastbourne (Councillor Lt.-Col. Roland Gwynne, D.S.O.).

Mr. A. J. Fuller (Vice-president) proposed "Our Guests and Ladies."

Mr. W. W. Lackie (Electricity Commissioner), who responded, spoke of the loss sustained by the death of Dr. Ferranti, who had been such a familiar figure at I.M.E.A. Conventions for so many years. It was, he continued, reassuring that the I.M.E.A. continued to invite a member of the Electricity Commission to their annual conventions. Many people, he believed, thought the Commissioners were a Parliamentary nuisance, but he assured them that the Commissioners aimed to do everything within their power to promote the interests of the electrical industry. The Commissioners had suffered a loss in the retirement of Sir Harry Haward and Col. Ekin, but they had obtained a very able colleague in Sir John Brook. It might be felt that as the Commissioners had prepared eight schemes under the Electricity Act of 1926, their work was finished, but in his opinion their work was only beginning, and probably many supply authorities would think the same if the Central Board fixed the price of their supply at 0·4d. per unit when they thought it ought to be 0·39d.! Finally, Mr. Lackie drew attention to the extent to which the Central Board had drawn upon municipal electrical engineers for their staff, and he particularly mentioned the appointments of Mr. Allen, Mr. Fedden, and Mr. Watson.

The Annual Meeting.

The annual meeting, which was held on Friday, May 30, was, as usual, private. We give below the new president and officers, together with new members of Council :—

President.—A. J. Fuller (Fulham, London).
Vice-president.—C. G. Morley New (Cardiff).
Hon. Treasurer.—A. Nichols Moore (Newport, Mon).
Hon. Solicitor.—J. H. Rothwell (Town Clerk, Brighton).
Hon. Secretary.—A. C. Cramb (Croydon).
Members of Council, to fill vacancies :—
Large undertakings—
E. E. Hoadley (Maidstone).
G. Porter (Worthing).
R. W. L. Phillips (Bedford).
Small undertakings—
F. Newey (Long Eaton).
Local Authority representatives—
Alderman R. S. Chatfield (Eastbourne).
Councillor R. Richardson (Hull).

An invitation has been received from Douglas (Isle of Man) to hold next year's Convention there.

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The DOWSING RADIANT HEAT CO., LTD., of the Electrical Works, Bollo Lane, London, W.3, dressed their stand with cordless electric ironing outfits for tailors and dress-making workrooms, public wash-houses, training schools, etc.; a few samples of various sized laundry irons, a new large pattern 35 lb. machine iron, and a new special bench iron, in which the material is moved on the polished surface as distinct from the usual method of ironing; one or two samples of special appliances showing the application of electrically heated elements, namely: a collar roller (part of a laundry machine), one 35 lb. drag iron for laundry work, and automatic sealing wax heater. An electrically heated instrument steriliser with the company's new float system protective device; this latter is arranged so that a circuit breaker is operated when some predetermined level of the water is reached, say, the last ½ in., was exhibited, as were also electrically heated branding machines; electrically heated clothing (waistcoat, gloves, and soles) particularly applying to airmen's clothing; a new folding pattern "Solarium" electric light cabinet bath for home use, new milliners' hat steamer with wide rose spreader and small spreader of the latest pattern for millinery workrooms.

The ELECTRICAL CONTRACTORS' ASSOCIATION (Eastbourne Branch). The members of the Eastbourne Branch of the Electrical Contractors' Association, which is a sub-branch of the Sussex Branch, organised a good co-operative display, consisting mainly of electrical fittings and apparatus for use in the home. Members of the E.C.A. in Eastbourne realise the pressing need for publicity and educational work, and it is their policy to co-operate wholeheartedly with the supply undertakings in promoting all electrical development activities.

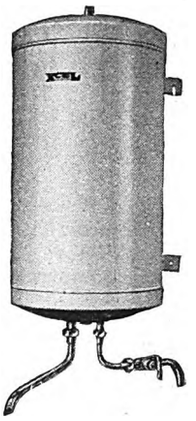
METROPOLITAN VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, included in their exhibits a number of boiling plates of the cast-in type, for which is claimed a higher permissible loading than any other boiling plate. A special feature is the small thickness of the plates—9/16 in. The principle of construction is as originally introduced and depends on the conversion of magnesium into magnesium hydroxide by the aid of very high pressure steam. The magnesium expands in the process of conversion to the hydroxide resulting in the iron or nickel enclosing tube being tightly packed. The method of manufacture is such that the heating spiral is definitely centralised and located in the magnesium oxide which, as well known, is not only an excellent conductor of heat but also has very high insulating qualities. The elements are bent by jigs into shapes depending on the type of boiling plate required and then completely embedded in a cast metal plate, the casting being then machined to a thickness of 9/16 in. The boiling plate is finally completed by sealing up the ends of the heating element with a cemented cap, which also serves to shield completely the brazed joint to the lead out wire. The design of the terminals assures that they run cool.

The use of these Met-Vick heating elements is not restricted to boiling plates, they are used with advantage for grills (nickel tube), immersion heaters (copper tube), and another interesting application is for car and room heating. Other items of interest included types of modern electric lighting fittings, cookers, automatic and self-regulating kettles, two and three kW fires, various electric domestic appliances, both for the table and for house cleaning and a full display of ultra-violet ray equipment and high frequency and vibrator apparatus.

Oil Heaters.

A. REYROLLE AND CO., LTD., Hebburn-on-Tyne, showed a wide range of apparatus for heating water and other liquids, comprising a domestic water-heater, a steam-raiser, and immersion heaters, including two special arrangements of the latter, one being a bank of nine heaters for heavy-duty water-heating in factories, and the other a heater for raising the temperature of oil in oil-purifying equipments.

The domestic water-heater shown was one of their smaller sizes, holding 2½ gallons. The 500 W heating element is controlled by a thermostat. The steam-raiser has a total capacity of 18 kW, and will raise steam in 10 to 15 minutes, the pressure being 80 lb. per square inch. The heating elements are built up of three 6 kW units, and the required selection is made by means of standard Reyrolle earthed plugs. Three sockets are provided, so arranged that either one, two, or three units can be in circuit, giving 6, 12, or 18 kW respectively. The fittings are nickel-plated, and the whole equipment is finished in white enamel. The immersion heaters are of the tubular pattern, and are manufactured in units ranging from 0·75 to 6 kW capacity for use on circuits up to 500 V a.c. or 250 V d.c. The heating elements comprise spirals of high-grade, high-temperature-resistant wire, and are wound on special bobbin-shaped formers of refractory material, which are themselves supported on a central metal rod. Each element is enclosed in a strong copper casing, which is provided either with a 2 in. B.S.P. thread for screwing into the tank, or with a bolted flange when the heater is to be used for high-pressure heating or for heating chemicals. The oil heater shown was a 9 kW unit for use in an oil-purifying equipment. It is in the form of an oil-tight box containing six 1½ kW immersion heaters each fitted with a three-pin plug and socket for three-heat control. The use of multiple heaters provides a simple and efficient means of adjusting the temperature of the oil with varying loads.



One of the water heaters shown by Siemens Electric Lamps and Supplies Ltd.

A collection of small metal-clad air-break switches, for domestic and other purposes, was also exhibited. The domestic apparatus included a cooker control-board with an indicating lamp and a red lens to show when the switch is on. The control boards can be fitted with change-over switches, with or without a neutral position, for those users who contemplate water-heating as well as cooking by electricity. On the same stand, Messrs. Reyrolle's associated company, J. H. HOLMES AND CO., LTD., exhibited a controller designed to give automatic push-button control of a.c. commutator motors, such as those used for driving rotary-web newspaper printing presses. The pilot motor on the top of the controller is operated by means of push-buttons, which effect the operations of "inching," "speeding up," "slowing down," and "stopping." A small reduction gear box is fitted to the pilot motor, and four spindles protruding from this box transmit the energy from the motor for the required operations. The use of this controller makes it possible to alter the speed of an a.c. commutator motor of the brush-moving type from standstill to full speed, and in addition any desirable interlocks or safety features can be provided.

BELLING AND CO., Bridge Works, Southbury Road, Enfield, Middlesex, made a special feature of the new No. 34 cooker, this being the first time that the unit has been exhibited. The oven has a clear cooking space of 12 in. wide by 13 in. high by 12 in. deep and a loading of 2 000 W. It is made in one piece with rounded corners and finished in vitreous enamel inside and outside. Lagging is 1½ in. thick. Runners, shelves and heating elements are all removable. A thermometer is fitted as standard and a special type of ventilator is fitted at the back of the oven, allowing steam to escape without loss of heat. The oven attains a temperature of 400° in 20 minutes. The oven elements are of a new plug-in type, fitted top and bottom. The hob is 22 in by 17 in. and is finished in mottled blue and white vitreous enamel. The inside of the hob is free from all electrical connections, and the simplicity of the method of wiring used in the contruction of this cooker is one of its most commendable features. The new boiling plate is 7½ in. in diameter and loaded to 1 200 W. It is totally enclosed and made of a special alloy. It is a particularly fast and efficient boiler and has proved exceedingly reliable over a series of prolonged life tests. The boiler-griller is 8½ in. square and has a loading of 1 800 W. This is similar in construction to the boiling plate, except that a special nickel alloy sheet is fitted underneath, which becoming red hot, provides an excellent griller and toaster. A new method of indicating the heat control has been adopted with a view to simplifying this subject and the wording used on the switch panel is familiar to every housewife. A large warming cupboard is provided, and amongst the standard equipment which is included in the price of the cooker is a thermometer, ventilator, enamelled back plate, grill pan and grid, baking tin, three oven shelves, etc. Side extensions can be fitted to the hob at small extra cost. The standard finish is blue and white mottled enamel, with white enamel door panels, but the cooker can also be supplied in a de luxe all-enamel finish at small extra cost. The vertical model is easily converted into a horizontal model. The oven door is easily reversible and the switch panel can be fitted on either side of the splash plate or on the wall as a separate unit. The cooker is suitable

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for families of 4-6 persons. This firm also made a special display of pipe heaters giving practical demonstrations of the Parmotor relay and thermostat, controlling both air and water temperature. A new series of three-heat enclosed type boiling rings was also shown.

MARCO REFRIGERATORS (1929), LTD., Manor Works, Streatham Vale, London, S.W.16. The most interesting feature on this stand was the 1930 range of "all-steel" refrigerators. These cabinets are constructed with a white cellulose enamel exterior and the linings are of one-piece steel, porcelain enamelled, with all corners rounded. The refrigerators are made in four sizes. The comprehensive range of Marco equipment was illustrated by a 75 c. ft. sectional cold room. This is operated by automatic electrical refrigerating equipment and is fitted with a new type cooling unit.

Time Switch Control.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, London, S.W.1, this year made a special point of apparatus for the control of electric water heating during off-peak periods of the day. The exhibit included a "W" relay, capacity 10 A a.c., designed to control electric water heating in conjunction with street lighting. When the street lights come on, the water heaters in adjoining houses are switched off. The heating supply is resumed from one to four hours later, after the evening load peak is over. The "ewNZX" switch, capacity 10 A a.c., is fitted with a standard electrically wound clock and has three pairs of hands, this giving three switchings on and off per day. Venners also exhibited a range of thermostats for controlling electric water heaters. Four sizes were shown, of 6, 10, 15 and 20 A capacity, fitted with specially high grade mercury tubes. Another exhibit was the OZM switch for two-rate tariff and maximum demand indicator purposes. It is designed to operate the resetting coils of Merz type demand-indicators.

The REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, had a comprehensive display consisting of cookers, fires, washboilers, water heaters, etc. The cooker has been considerably improved since last year, a special feature being the enclosed heating elements used in the oven. These are of the plug-in type, with a new patented plug and socket so arranged that perfect contact is given, and at the same time they are so easy to fit that a smooth action is obtained. Some of the new vitreous enamelled finishes, as shown on the fires, were very attractive, especially the rainbow finish. The "Matchless" fire, one of the latest designs, has a new element, which illuminates the reflector evenly, even when switched on to "low." The new chromium-plated iron was also exhibited, together with washboilers, water heaters, and various other domestic appliances.

RADIOVISOR PARENT, LTD., 26, Coventry Street, London, W.1. In addition to displaying their lighting unit automatically controlling a street lamp, the company gave a separate demonstration of the a.c. lighting unit working in conjunction with a contactor switch, breaking a current of 15 A. They also gave an acoustic demonstration, specially arranged to show the response of the Radiovisor light-sensitive bridge to variations of light at sound frequencies, and demonstrated the quality of reproduction obtained by talking-picture equipment employing the Radiovisor bridge. For the demonstration the Radiovisor bridge was connected, according to ordinary talking-picture practice, to an amplifier and loud speaker, but instead of being operated by a sound film record, as it normally would be, it was, for the sake of simplicity, operated by a fluctuating beam of light from a Neon lamp, which was controlled by a gramophone pick-up.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C., was represented at two stands, one of which was devoted to water heating equipment. A model was shown of an installation incorporating a general hot water supply to a home by means of a Magnet electric storage water heater; and a range of standard Magnet water heaters from 1½ to 30 gallons all thermostatically controlled, was staged in close juxtaposition—some of them in actual operation. Electric low temperature radiators, both of the tubular and convector types, were also shown, in conjunction with thermostatic control equipment. The second stand was aligned with the E.L.M.A. stand, and was adjacent to the stand of the Eastbourne Corporation. It was subdivided, one section being devoted to illuminating engineering, and street lighting in particular, and the other to household electric appliances. It is interesting to note that the Illuminating Engineering Department, of the G.E.C. was responsible for the floodlighting of the Institute and the interior lighting of Devonshire Park Hall during the week of the Convention.

ELECTROLUX, LTD., 153-155, Regent Street, London, W.1, again showed suction cleaners and refrigerators, together with floor polishers, all of which have been previously described.

The BRITISH ELECTRIC TRANSFORMER CO., LTD., Wellington House, Strand, London, W.C., had two stands, one devoted to cookers, fires, electric irons, Kye electric lamps, etc., while the second stand was a "Sunray" lounge. At the cooker stand were introduced two new cookers, comprising a "baby" size cooker called the "Tricity Tot" and an intermediate size (i.e., a little larger than the baby size, a little smaller than the standard domestic size), called the "Tricity Tweeny." The company also exhibited a new design of an average domestic size cooker with a third boiling plate and other modifications. There were also exhibited several attractive models of coal and reflector type fires, together with other domestic appliances, including the new "Sunray Tricity" iron, etc. Both stands were lighted with Kye electric lamps. The second stand, the "Sunray Lounge," included the well-known Tricity Sunrays, and several new models were exhibited to the trade for the first time.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., Upper Thames Street, London, E.C., included in their exhibit a representative range of "Xcel" cookers, "Cosyglo" fires, etc. Among the fires not of the imitation coal type is the new series of "Homely" fires. Water heating was represented by samples of the new Xcel hot water storage tanks, fitted with strong copper water cylinders, the inside surfaces of which are well tinned. All internal units, i.e., the immersion heater, thermostat, inlet and outlet pipes, are mounted on a strong, easily removable gun-metal baseplate. Xcel immersion heaters were also shown, together with tube heaters and a range of domestic appliances.

The HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, London, W.1, showed the well-known "Falco" cookers, "Maytag" washers, "Premier-Duplex" cleaners, in addition to a complete range of domestic electric appliance of the smaller type.

The SLOAN ELECTRICAL CO., LTD., 8/12, Golden Lane, London, E.C.1, showed, among other things, an electric hot and cold water tap. An advantage of this apparatus is that no special pipes need be fixed, as it is screwed direct on to the cold water pipe. Hot water is obtained by turning the handle to "hot," and when sufficient hot water has been supplied for immediate use, the handle is turned back and the current is automatically cut off. Exclusive features are: (*a*) A valve which can easily be adjusted to any pressure of water; (*b*) No possibility of lime deposits, the current being cut off before the water stops running, consequently the following flow of cold water immediately disintegrates any deposit; (*c*) The inside of the tap is specially nickelled, which, it is claimed, keeps it clean.

SIGG, LTD., 469, Holloway Road, London, N., exhibited their well known range of specially constructed cooking utensils for electric cookers, descriptions of which were given in these columns recently.

J. H. CONNOR AND SON, LTD., Fenton House, Fenchurch Street, London, E.C.3, made a special display of their well known model 21 thermo-electric washer and wringer, suitable demonstrations being given.

S.W. ENGLAND AND S. WALES ELECTRICITY SCHEME.

Scheme now Adopted by the Board—New 240 000 kW Stations.

THE Central Electricity Board adopted, on May 23, the South West England and South Wales Electricity Scheme submitted by the Commissioners on January 15 last, and explained in THE ELECTRICIAN for January 17. The scheme in its adopted form is substantially the same as that submitted by the Commissioners, except that the number of selected stations has been increased from eight to nine, the addition being the Lydney station of the West Gloucestershire Power Co., Ltd. The sites for the two new selected stations suggested by the Commissioners have been determined at Fawley, on Southampton Water (Wessex Electricity Co.) and Tir John North, Swansea (Swansea Corporation). Both these units will comprise installations of 60 000 kW and will be so designed as to be subsequently extended to 240 000 kW.

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MARINE ELECTRICITY.

Important New P. & O. Orders Rumoured—Electrical Equipment of the White Star Motorliner "Britannic"—A Complete Cooking Outfit.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types." etc.)

WHILE one of the outstanding events of the month as regards the application of electricity to ships is, unfortunately, only a rumour, if this rumour materialises, it will place electric ships in a position of paramount importance as far as large passenger liner types of ships are concerned. It is rumoured that several shipbuilding firms have been invited by the P. & O. Co. to submit tenders for a total of five twin screw turbo-electric vessels. These are, it is rumoured also, to have a power of 50 000 shaft horse power, and their turbo-alternators will take steam from Yarrow water tube boilers at 400 lb. pressure. A length of about 550 ft. and a beam of about 66 ft. is mentioned in this connection. The P. & O. Co. has already pioneered the electric passenger liner in this country with its "Viceroy of India," and in the new larger ships which it has under construction for Australian service. Here again advantage has been taken of high pressure water tube boilers and by a clever arrangement of side firing, the total space required for the machinery has been reduced to a minimum. Once more we may therefore reiterate the fact that the "come-back" of steam for marine purposes seems more and more to be a matter of electric propulsion and less and less a matter of direct drive. There are, of course, one or two notable exceptions to this, particularly in the highest powers for transatlantic mammoths and in the 10 to 27 000 H.P. passenger liner group, the electric ship has as its most dangerous stone in the path of progress, the motor-driven liner whose chief claim to merit is a big and undoubted fuel economy which at the moment does not appear to have been reached by any electric ship. The advantages and economy of the electric ship in fact lie in different directions and the economies are not so apparent on grounds of fuel consumption alone, but rather upon grounds of machinery flexibility. No electric ship has yet been long enough in service for the total life of the machinery to be judged, but it does not seem unreasonable to suggest that this, if not at least as long as that of existing types of machinery, may probably be longer. As a result of the operation of such ships as the "Viceroy of India" it has been found, too, that for an entirely new type of marine machinery, the upkeep and repair bill have been gratifyingly low. It has been mentioned that in the 10 to 27 000 H.P. group of tonnage, the motorliner is the chief rival of the electric ship at the present moment, and yet such a rivalry should not be taken too seriously, because the motorliner in itself as a modern propelling unit provides a deal of work for the electrical industries.

The "Britannic."

The eyes of the shipping world are this month turned upon the completion of the new White Star motorliner "Britannic" which with a total power output of some 20 000 H.P. is at once the largest British motorliner and one of the largest motorliners in transatlantic service. As might be imagined, a ship which has a gross tonnage of 26 840 and accommodation for 1 550 passengers has very high electrical loads, not only for the "hotel" part of the ship but also for the many auxiliary services for which electricity is required on a modern vessel. The power station part of the machinery is arranged in a special compartment and comprises four Diesel-driven generators with a combined capacity of 2 000 kW. Each of these generators is driven by a 6-cylinder 4-cycle single-acting trunk piston unit and these generators supply in normal operation, current for lighting, heating, cooking, refrigeration, operation of water-tight doors, driving of pumps, steering gear, winches, capstans and windlass, and, in addition to all this work, there is, of course, the usual low voltage circuit for auxiliary hotel purposes. In case of emergency, either due to a complete breakdown of the main electric generating sets or to a flooding of the engine room, there is situated above the waterline a deck generator set of 75 kW output driven by a 4-cycle Diesel engine. The engine room auxiliaries, which are driven by electric motors, amount to over 60 in number, the individual horse-power ranging all the way from 100 of the larger units down to 2½ H.P. The refrigeration installation is also electrically driven. It is arranged to operate on the CO_2 system and the machinery consists of two horizontal twin compressors each coupled direct to an electric motor. There are the usual condensers and evaporators and all the brine and water pumps are electrically driven. An ice-making tank is provided with rocking gear, also driven by an electric motor. The deck machinery includes 38 electrically-driven winches, four large capstans and two large warping winches. Ventilation takes about 79 electric motors driving fans ranging in size from 10 in. to 55 in. diameter. Over 40 of these fans are fitted with heating elements by means of which the "Britannic" can be kept comfortably warm in the coldest weather which may be experienced on her transatlantic run. These air heating fan units are supplemented by electric heaters distributed throughout the accommodation and this is an important point because it is believed that it represents one of the first, if not the first, transatlantic ship in which electricity has been used for heating. It is supplemented, of course, to a certain extent by steam, as would only be natural on a route like the North Atlantic, where very severe cold is encountered in winter, but it is rather a compliment to electrical heating and an indication of the confidence which shipowners now place in the use of electricity for such matters, that the "Britannic" should use so much electricity for matters of this sort. For ships trading to the tropics, the electric heater is a very useful asset because it can be switched on and off so easily, but for work in the North Atlantic, where in winter the heater must be going "full bore" for the whole passage, there has been a current feeling among shipowners that it is asking too much of the heater. It would appear that many of these objections have now been overcome.

Electric Cooking Facilities.

Particular interest centres around the cooking appliances of the "Britannic." These have been supplied by Henry Wilson and Co., of Liverpool, and are of ample capacity to deal with the large number of passengers carried on the ship. As a matter of fact, it represents one of the largest marine electrical cooking installations that has yet been fitted. For the cabin class passengers there are two island type ranges, each with a length of 8 ft. and a breadth of 6 ft. 6 in. They have three ovens on each side and total loading of 145 kW for each range, thus giving a total loading of 290 kW for the galley. Tourist and third class passengers are also carried on this ship and here again the galley which is common to both these classes is equipped with an island type range, this time with a total length of 15 ft. 6 in. and a width of 5 ft. 6 in. There are five ovens on each side with a total loading of 22 kW. There is also a special Hebrew galley and this contains a single-fronted range with a loading of 22 kW, whilst the crews' galley has a similar range with a total loading of 72 kW. In the bakers' shop the ovens are electrically heated and the principal bake oven has two chambers, each 6 ft. by 4 ft. with a 24 kW loading, while the confectioners' oven has two chambers, each 4 ft. square with a loading of 16 kW. A great number of the hot presses distributed throughout the ship are also electrically heated, while it is of somewhat novel interest to note that a special electric roaster for poultry and game is provided. This has a loading of 18 kW and is both driven and heated electrically. Whisking machines, dough mixing machines, potato peelers, dish washers, choppers and slicers, etc., are also electrically driven. Finally, it should be noted that the "Britannic" has a length between perpendiculars of 680 ft., a moulded breadth of 82 ft. and a moulded depth of 43 ft. 9 in.

One of the most recent electric liners to be completed on the other side is the turbo-electric "Santa Clara" built for Grace Lines, Ltd., at Camden, New Jersey, for service between New York and the West Coast of South America. Additional interest is lent to this ship because she will be running alongside two very similar motor-driven vessels completed in this country a year or so ago. The "Santa Clara" has a displacement of 16 000 tons on a 25 ft. load draft. She has two propelling motors of synchronous induction type, each rated 6 300 shaft H.P., 50-pole, 3-phase, 3 000 V and 120 revolutions. These take their current from two turbo alternators rated 4 800 kW 3-phase, 3 000 V and 3 000 revolutions. It is interesting to note that the turbines are of downward exhaust type mounted directly above their respective condensers. The generators are directly connected to their turbines and are provided with a closed system of ventilation which both makes for noiseless operation and prevents a deposit of dust on the windings.

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UNEMPLOYMENT AND WORK—VI.

Political Poison.

By SIR ERNEST J. P. BENN.

WHEN the intelligent person reads an advertisement he generally brings all his critical faculties to play upon it. If the advertiser is at pains to explain the merits of, say, some brand of whiskey, the reader will not usually take the statement at its face value, but will ask himself what else the advertiser might say, what are his limitations, and what is there to be said that he cannot say? For instance, the whiskey advertiser would not be expected to discourse upon the dangers of over-indulgence in spirits; he is not likely to mention the health-giving qualities of cocoa or meat extract, neither will he be found explaining that there are better whiskies to be had at higher prices. The man is simply obliged to say that his particular whiskey will suit you better than any other. All of which is understood, right and proper, as applied to advertising.

But when we listen to a political advertisement it seems as if we give our critical faculties a rest. We are told that there is an unemployment trouble and we must, therefore, alter the Empire, or adopt a big scheme of road repairs or double the dole. We choose between these various suggestions, take the advertiser at his word, squander our money upon him and preserve him immune from the healthy benefits of the sort of intellectual analysis that we always bestow upon the commercial advertiser. The difference is the more stupid and striking when we remember that the tradesman who falls below the quality of his own words loses his business and pays a natural penalty, while the politician runs no such risks.

The Political Market.

When we hear a politician say "I can conquer unemployment," we ought, merely as a matter of self-protection, to ask what else can the fellow say. We should remember that he has previously talked about Ireland, disestablishment, non-provided schools, the House of Lords, land values and quite a number of other things, and would gladly go on talking about any of them but for the fact that political fashions have changed. We should also have in the back of our minds our politician's personal point of view. He cannot very well say "I want to be Prime Minister"; indeed, he will generally pretend that he is reluctant to assume the burdens of office. Neither can he say "£400 a year in Westminster will suit me better than a minor trade union job in the country." He is equally debarred from explaining that having made a success of business he would like to become a public figure and perhaps get a knighthood, or that business at the Bar being slack and barristers being unable to advertise, the letters "M.P." would be helpful in getting briefs. The would-be politician must take the political market as he finds it, and talk the stuff that leaders have put upon the programme. No other course is open to him. To-day it must be unemployment, to-morrow it will be India, and after that probably Russia, and in a couple of years' time, when there are three million dole-drawers, we shall hear no more about unemployment than we do to-day about housing or temperance reform. One day he must explain that the Coal Bill is the work of the devil, and a week later from the same platform he must tell us that he has changed his mind in the interests of peace.

Such is politics. Imagine the plight of all three parties if unemployment disappeared. In the meantime, however, the effect of the activities of our politicians upon the psychology of a newly enfranchised proletariat is something more than merely dangerous, it is highly demoralising. Every party in the political field is explaining to people on whose personal efforts the continuance of civilisation depends that they need do nothing, that as individuals they are the helpless victims of somebody else's mistakes, and that the State and the Government will put matters right. All the details of unemployment and insurance fade into insignificance beside this one great big political lie, repeated with varying emphasis by every party. Instead of making our citizens to feel that each of them has his share of responsibility for the State, we have developed a whole generation of pauper-minded people; for a millionaire after a tariff or a subsidy is as much of a pauper as the servant girl who finds it easier to call for the dole at eleven than to light the kitchen fire at seven-thirty.

Unemployment will never be cured by politics. It is a disease which is only susceptible to the purge of personal endeavour. Most of the other nations of the world understand this; we are alone in our marked preference for politics to the facts of life. America provides the most striking contrast with ourselves, a contrast which can be emphasised by summarising the public opinion of the two countries. On this question the public opinions of England and America are exact opposites. John Bull is, day by day, chanting to his children some such story as this:—

"You are a good fellow; do the best you can. Don't kill yourself at it. You were not made to work. A happy life is what you came here for. If you find things too hard for you, there is an insurance fund and a dole and an old age pension at your service. If at all times our arrangements for your well-being and comfort do not in every way meet with your approval, you can rely upon the Government or the Universities or the Trade Unions, or some other highly intellectual bodies or persons, to devise new ministries or new legislation for your perfect comfort."

While Uncle Sam may be heard through every responsible utterance in America to be preaching the opposite theories. Here are his words:—

"You are a man. You are as good as any other man. Anything which any other man can do, you can do, if you will try. Life is not a bed of roses; it's a struggle with the forces of Nature. The world depends upon work, effort, endeavour on your part and on the part of everybody else. If you succeed, you help to lift others up; if you fail, you help to push others down. So get out and get on and be quick about it. Above all, remember that America is destined to lead mankind and that you are an American citizen."

While we in this country seem determined to encourage our people to lean, America is concerned to maintain in the breast of each of her citizen the spirit of push, and the difference is very serious—for us.

If there is even an element of truth behind this general sketch, it would appear to be hardly worth while to discuss the details of the present-day situation. With a heart and mind which are all wrong other things are of no account. It becomes easier to understand the monstrosity of a Conservative Party which is Socialist to the core. Some people seem to imagine that Socialism means giving something to the workers, and they call themselves anti-Socialists because they are in favour of robbing the State in the supposed interests of other classes. They have not the brains to see that Socialism is a principle which embodies two deadly errors—the first, that producers should be considered before consumers; and secondly, that the State is more important than the citizen. Any man who is guilty of the suggestion that political action can take the place of constructive individual work is a Socialist, and when he calls himsslf a Conservative he is a much greater danger than when he speaks under the shadow of the Red Flag.

Parliamentary Auctioneers.

We have drifted into a degraded political auction simply because we have all become infected with the malaria of the State idea. All parties tell us that a few more Acts of Parliament and a few more forms and officials will do the trick.

When I walk down the Strand and see a big notice on a derelict shop "Sale now proceeding: PREMISES COMING DOWN," I get, or so it seems to me, a perfect picture of our political situation. The auctioneer is appealing to the ignorant with worthless, gaudy imitations, but not quite so worthless as the benefits displayed a little further on at Westminster. He does at least deliver some sort of a clock, even if the gilt is spurious and the works unreliable, while at Westminster all one gets is a form of dope which does exactly the opposite of what the label claims. Some reader may perchance regard this statement as too sweeping, and the sincere believer in some new kind of social legislation may look upon it as unkind and cynical. But I am relieved of the necessity of arguing the matter by the fact that, whatever the particular economic blessing offered by one party, two other parties full of experts will expose its dangers for me.

Wealth cannot be made from votes, and it is wealth we want. Wealth requires producers, and politics multiplies the non-producers. We must separate our politics and our economics; they are getting into a disastrous muddle. All our politicians talk about economics without, for the most part, the faintest conception of what the word means; and, on the other hand, some of our economists are becoming politicians, hoping thereby to be able to leave the secluded quiet

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and poverty of a scientific life for the delights of big business and bank directorships.

Meantime, all of them are multiplying the non-producers and building up the burdens upon genuine industry. We have suffered in the past from landlords and profiteers, but none of these parasites ever secured for himself so large a share of the products of real work as our new masters. They get in between a man and his job and erect such barriers as to make the job itself easy by comparison with the work of getting at it. Money is their medium—other people's money. It will not be long, however, before even the poor understand that we cannot cure poverty with money. The distribution of the pieces of paper that we call money, whether by taxation, pensions, doles, fiscal arrangements or other allowances and devices may move wealth about, but it cannot make wealth, it adds nothing to the possessions of society considered as a whole. It is some years since Professor Bowley exposed the folly of the dividing-up idea, and yet our politicians continue to pretend that there is something in it. The best that we can hope is that another subject may some day soon attract their attention, and then men and women whose personal force and qualities are the only real assets we possess will quickly resume the beneficent processes of improving the standard of life for all of us.

BOOK REVIEWS.

Die Fernsprechanlagen mit Wählerbetrieb. (Automatische Telephonie). By Dr. F. LUBBERGER. Fourth Edition. (Munich: R. Oldenbourg.) Pp. 316. Price, bound, 15 marks.

The author of this specialist's treatise on automatic telephony is a chief engineer at Messrs. Siemens and Halske and an Extraordinary Professor at the Technische Hochschule, Berlin. The work has now reached its fourth edition, and the mode of treatment used in the earlier editions has been retained. The fundamental principles of automatic telephony are first dealt with, and then the construction of the apparatus. Then follow all the other problems concerning selector currents, circuit connections, tariffs, traffic peaks, description of representative systems, etc. There are 191 figures, and these are reproduced in a separate booklet—a sensible, if not essential, arrangement for a treatise of this kind.

For anyone not conversant with the subject, the reading of this book will be found rather tough; for the expert and the student of automatic telephone systems the treatise will probably be indispensable. The preparation of text and diagrams is excellent—indeed, the interested reader could not ask for more.

S. PARKER SMITH.

Eiserne Gittermaste für Starkstrom-Freileitungen. By W. TAENZER. (Berlin: J. Springer). Pp. 65. 13·5 marks.

With giant steel towers springing up all around, there is no need to dwell on the importance of their design. The author gets to work at once with his subject, which he divides into two parts—the first, the general principles of design; the second, examples.

To begin the section on design, an excerpt of the German regulations on the construction of overhead lines is given. This is followed by the necessary data on span, sag, foundations, etc. The second section, occupying three-fourths of the book, comprises four worked examples. These designs deal almost exclusively with mechanical details and appear to include all details from the foundations upwards. The first two designs refer to a 50 kV line, the one with rigid, the other with non-rigid arms. The third design is a 220 kV line and occupies nearly one-third of the book; and lastly, two lattice poles are worked out.

The book has only 65 pages, but the size of page—about 12 in. by 8 in.—has been chosen to suit the purpose. There are 209 figures, mostly line diagrams. Nearly every page is taken up with calculations and diagrams. For anyone concerned with the design and construction of steel towers for transmission lines, the book is invaluable—we had almost said indispensable.

It is the most complete treatise on the mechanical design of transmission-line towers we have seen, every part of the structure receiving proper consideration.

S. PARKER SMITH.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Safety in Domestic Electrification.

[TO THE EDITOR.]

SIR,—The writer is very much interested in the articles which have appeared in THE ELECTRICIAN from time to time covering the "earthing" question. I have just read page 363 of your March 21 issue.

Some four years ago I wrote a letter to the "Electrical News," Toronto, along the same lines, under the nom-de-plume of "Grounding Crank." My letter was such a drastic change from the orthodox way of looking at this matter that a shower of criticism followed in a subsequent edition.

I do not believe "earthing" or "grounding" as it is termed in North America is by any means all it is cracked up to be, even if it could be practically effected as required by a complicated and well ignored set of rules.

By all means thrash this question out to a "knock-out." I am glad I am not such a crank as I received credit for being and am undoubtedly in good company with some of your correspondents—Yours faithfully,

"GROUNDING CRANK."

Toronto.
May 15.

Rural Electrification.

[TO THE EDITOR.]

SIR,—When I wrote my article on "Safety in Rural Electrification," I hoped to persuade technical men carefully to study this rather difficult problem; so that if "Shocked" believes that I wish to add rules and regulations additional to those already existing, he has entirely misread and misunderstood my article.

My desire is, really, that certain of the somewhat severe regulations of the I.E.E., in regard to earthing, might be dispensed with, and that it should be left to the responsible engineers in charge of rural electric undertakings thoroughly to recognise the electrical risks to persons and to cattle, and to take such simple precautions as suggest themselves.

"Shocked" gives a very good example in his letter of the necessity of such precautions. He proposes as a precaution against such dangers to use linoleum mats in front of cookers, etc., whenever these are installed on stone floors. I do not consider that such precaution would be satisfactory as, in such a kitchen, there may be an electric cooker connected between one phase and the earthed neutral, and, quite near to it, an electric iron connected to another phase and the earthed neutral. Should both get voltage due to leakage this may not be discovered when these appliances are operated separately, that is to say, if fairly good insulating linoleum is used; but instead of the dangerous voltage of 230 one of 400 may be reached if the cooker and the iron be touched simultaneously. Further, if the floor be damp a linoleum mat would not give sufficient insulation.

I agree that education is of great importance and I admire the way in which "Shocked" has been able to train his dog to look right and left when crossing a road, but I do not see how this applies to the use of electricity. I think your readers would thoroughly enjoy watching "Shocked" educating a row of cows to look to their right and left before drinking water slightly activated by leakage of say $\sqrt{-y}$ voltage before they can drink with perfect safety. Or what would he teach a child, having a bath, when the water pipe has, through leakage, obtained a voltage making it dangerous to touch the water tap?

The purpose of my article, as well as that of a pamphlet which Mr. Vidar Ekstrom and I are about to publish, is certainly not to make the users of electricity nervous, but to show to those who are technically educated how best to face the dangers which may arise, especially in rural areas, where great electrical development is about to take place. I believe that the dangers from electricity supply could be reduced to a low point and at small cost, and I think that in such cases it is desirable to study all such dangers as may possibly occur and not be satisfied with the pious hope that they may not occur at all.—Yours faithfully,

ALFRED EKSTROM, D.Sc., M.I.E.E.

London.
June 2.

(*A number of letters are unavoidably held over.*—ED.)

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NEWS IN BRIEF.

Sixth Annual Convention of the Advertising Association—Electrical Trading at Guildford—Wrexham and Electric Boilers—The "Exide" Convention.

A 120 000 V X-ray set has recently been installed in the Victoria Memorial Jewish Hospital, Manchester.

Bangor Lighting Committee has appointed a sub-committee to submit proposals for a publicity campaign to promote development of the electricity undertaking.

A public telephone service between Great Britain and Estonia was commenced on Monday, June 2. The service is limited, for the present, to calls between the London telephone district and Tallinn (Reval).

The Board of Trade announces that it has made a direction to the effect that electric incandescent lamps of ornamental design which, on account of their uneven surface, cannot be marked on the bulb, may bear an indication of origin indelibly stamped, embossed, incised or impressed on the cap.

Croydon Electricity Committee recommends the acceptance of a tender amounting to £634 for the erection of a chemical laboratory at the power station.

The Isle of Ely County Surveyor is to obtain estimates on the installation of electric lighting at the County Hall, March.

Alterations to the front of Aberdeen Corporation's electricity showrooms in Union Street are to be carried out at a cost of £1 487.

Ald. Tweedale recently suggested to Oldham Lighting Committee that one department should purchase the whole of the lamps required by the Corporation.

Doncaster T.C. has decided to apply to the Ministry of Transport for powers to convert the Balby and Warmsworth tram routes to the trackless trolley system.

The Dawson Turner memorial tablet was placed in the radiological department of the Edinburgh Royal Infirmary on June 2. Dr. Dawson Turner was medical electrician, and subsequently head of the radium department at the Infirmary, and he suffered for many years with dermatitis, until his death in 1928.

The Institution of Mechanical Engineers is to visit the works of Messrs. R. A. Lister and Co., Ltd., Dursley, Glos, during its annual summer meeting, which is being held in Bristol during the first week of July. The visit takes place on July 3. The visitors will be shown the new cold-starting Diesel engines, both small and large, which Messrs. Lister are now making on mass production lines.

The "Telegraph and Telephone Journal" announces that the number of telephone stations on the Post Office system at the end of February last was 1 867 500. Inland trunk calls during 1929 numbered 116 488 568, an increase of 8·3% over the previous year. Outgoing international calls in 1929 were 752 896, increase 25·1%, and incoming international calls 570 085, increase 25·2%.

"The Cold Shoulder" was the title of a talk on refrigeration which Mr. J. W. H. Penrose gave to the members of the Plymouth and district branch of the Electrical Association for Women at the May meeting. Mr. Penrose pointed out that food could be bought when it was inexpensive and kept until it was required. He also reminded his audience that flowers could be kept much longer if they were placed in the refrigerator every night.

Lord Lamington will preside at the last of the Individualist Luncheons for this session, which will take place at the King Edward VII Rooms, Hotel Victoria, Northumberland Avenue, London, on June 18, when the Bishop of Durham will speak on "The British Lazzaroni—A Present-day Phenomenon." A vote of thanks will be proposed by Lady Benn, and seconded by Sir Hugh Bell. Tickets (5s. each) can be obtained from the Individualist Bookshop, 53, Victoria Street, S.W.1.

Dover Corporation is buying tramway rolling stock which has previously been used at Birmingham.

Croydon Electricity Committee recommends the purchase of apparatus for hire up to the amount of £15 000.

An electrically operated and illuminated clock, with two 3 ft. dials and a solid bronze case, has been erected in the portico of the Wesleyan and General Assurance Society's premises in Steelhouse Lane, Birmingham.

Remarkable results have been achieved in the culture of plants by the aid of ultra violet ray lamps in an underground garden at Cumberland Lodge, Windsor Great Park. It is stated that strawberries have been ripened there by March 12, and that hardy plants can be grown from vegetable marrow seeds in 36 hours.

LOOKING BACKWARD.

FIFTY years ago, in THE ELECTRICIAN *of June 5, 1880, the electrocution of a workman at Lyons was recorded.*

Mr. J. C. Cuff, of Singapore, suggested that the name of the Society of Telegraph Engineers should be changed to the "Electrical Society."

A polo match was played at Ranelagh with the aid of electric light thrown on to the players by means of reflectors.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of June 2, 1905, printed an abstract of a paper by Mr. W. B. Esson, discussing the merits of aluminium as a rival to copper for overhead line construction, in which Mr. Esson expressed the opinion that "the case for the employment of aluminium wire for overhead power lines was extremely weak."*

The first of the original ten 50-ton electric locomotives for the Metropolitan Railway had just been supplied by the British Westinghouse Co.

The stream in York Gardens, Dawlish, is to be illuminated electrically, on the initiative of the Dawlish Chamber of Trade.

On May 29, telephonic conversation was carried on over a distance of 7 500 miles, between Berlin and an aeroplane flying over Los Angeles.

Trading at Guildford Corporation's electricity showroom for the year ended March 31, 1930, shows a gross profit of £584, and a net profit of £143.

Wrexham T.C. is building 57 houses, each of which will have an electric boiler. Tenants will pay 1s. weekly on account of electricity consumption.

Plymouth Electricity Committee seeks sanction to borrow £20 000 for the purpose of the Council's scheme for free and assisted wiring and hire purchase of cookers and other domestic appliances.

The Glasgow police authorities are preparing plans for a new system of road traffic signals showing three lights in each direction of the traffic flow, and an experimental installation will be erected shortly at the junction of George Square and Vincent Place.

The tenth Exide Battery Service Agents' Convention was held at Edinburgh on May 27 to 29. The number of persons present exceeded the attendance at any of the preceding Conventions, and comprised battery experts from all over the country, and from Europe, Africa, India, Australia and the Far East. Several interesting papers were read and discussed and motor coach drives and a number of social functions, were included in the programme.

The second birthday number of "Distribution," issued by W. T. Henley's Telegraph Works Co., Ltd., is a very attractive publication, containing many excellent illustrations and much interesting reading matter. Amongst its features are articles by Mr. P. Dunsheath, Mr. W. H. Nichols, Mr. J. F. H. Colyer, Mr. J. Stapen Hill, Mr. W. A. Moore, Mr. E. Bawtree and Mr. C. Grover, portraits of prominent members of the staff, snapshots taken at the recent I.M.E.A. Convention, and coloured pictures of the Antrim company's transmission lines and towers. Copies of the issue can be obtained for 6d., post free.

Lord Riddell will preside over the Sixth Annual Convention of the Advertising Association which will be held at Hastings on June 23 and 24. Over a thousand delegates and members will attend the 15 sessions, at which more than 50 speakers will take part. Following his presidential address, Lord Riddell will inaugurate a discussion on "Increasing Trade by Advertising." Lord Luke of Pavenham, Lt.-Col. Sir Stanley Reed, and Sir Ernest Benn will also speak. "Selling British Goods" will be the subject for the Trade Press Session presided over by Mr. E. A. Gatehouse. Addresses will also be given by Mr. C. Pinkham, publicity manager of the General Electric Co., on "The Service Expected from a Trade Journal."

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PERSONAL.

THE Postmaster-General announced on Tuesday that the Prime Minister had nominated Mr. J. H. Whitley to be the new Chairman of the British Broadcasting Corporation in succession to Lord Clarendon, who recently resigned.

Mr. T. H. U. Aldridge wishes it to be known that, having resigned from the position of vice-president and general manager of the Shanghai Power Company, he expects to be permanently resident in this country, with headquarters in London. He arrived in England a few weeks ago.

The Electricity Commissioners have suggested that Mr. W. C. P. Tapper, consulting engineer and manager of the Stepney (London) electricity department, should serve on the committee which is being appointed to consider measures for obviating the risk of nuisances which may be caused by electricity generating stations. The General Purposes Committee of Stepney Council recommends that Mr. Tapper be permitted to carry out the suggestion.

Mr. H. Brotchie, who for 14½ years has been on the staff of the Battersea Borough Council Electricity Department, has severed his connection with that undertaking, having secured the appointment of power station superintendent at Letchworth Garden City, Herts. As a mark of esteem and appreciation the staff and employees of the Department presented Mr. Brotchie on May 28 with a handsome gold wrist watch, suitably inscribed, and a wireless battery eliminator.

Mr. W. J. Medlyn was gazetted O.B.E. on Tuesday, on his retirement from his position with the Post Office as superintending engineer of the South Lancashire District, after a period of service extending over more than forty years. The South Lancashire District includes both Manchester and Liverpool, and for the past 17 years Mr. Medlyn has been in control of the provision, development and execution of the works involved in the continuous extension of telegraph and telephone services. In 1926-27, Mr. Medlyn was chairman of the North Western Centre of the Institution of Electrical Engineers. In consequence of his official position, he has also served as Chairman of the Institution of Post Office Electrical Engineers. The staff of the district assembled to the number of over 400, at the Manchester Limited, on the evening of May 31, which was the last day of Mr. Medlyn's service, in order to make presentations as tokens of personal appreciation. It is announced that Mr. Medlyn will be succeeded by his assistant, Mr. T. E. Herbert, who is also the present chairman of the North Western Centre of the I.E.E.

Obituary.

MR. JAMES WM. SPEIGHT, on May 27, aged 64 years. He had been managing director and consulting engineer of the Ormskirk Electric Supply Co. for 18 years and retired at the end of last year. He had been concerned with important undertakings in Lancashire, Westmorland and Yorkshire, and before coming to Ormskirk was managing director and consulting engineer to the Penrith Electric Supply Co.

BIRTHDAY HONOURS.

THERE are few electrical recipients of Honours conferred by the King on the occasion of his 65th birthday. Amongst the names which may have some interest for our readers are the following :—

BARONETS.—Mr. Basil Mott, consulting engineer, past-president of the Institution of Civil Engineers; Mr. F. H. Royce, M.I.E.E., consulting managing director of Royce, Ltd.

KNIGHT.—Mr. Herbert Wright, chairman of the Executive Committee of the Governing Body, Imperial College of Science and Technology, South Kensington.

MEMBER OF THE ORDER OF THE BRITISH EMPIRE.—Mr. P. H. Burns, superintendent of telegraphs, Bahamas.

OFFICERS OF THE ORDER OF THE BRITISH EMPIRE.—Major W. S. Mulvey, T.D., 108th (Essex) Electrical and Mechanical Company, R.E. Supplementary Reserve; Mr. J. A. B. Horsley, M.I.E.E., electrical inspector of mines, Mines Department, Board of Trade; Mr. W. J. Medlyn, M.I.E.E., late superintending engineer, Manchester Engineering District, General Post Office; Mr. Walter Meakin, professor of mathematics, Royal Artillery Academy, Woolwich; Mr. F. B. Young, D.Sc., principal scientific officer, Admiralty Research Laboratory.

MEMBER OF THE ORDER OF THE BRITISH EMPIRE.—Mr. Wm. Davis, superintendent (telegraphs), London Postal Service, General Post Office.

COMPANION OF THE ORDER OF THE INDIAN EMPIRE.—Mr. George Rutherford, M.C., manager, Calcutta Tramways Co.

BUSINESS ITEMS.

ON April 15, members of the ELECTRIC LIGHT FITTINGS ASSOCIATION advanced their prices by 5% owing to the rise in the costs of copper and other raw materials. We

Dealers' assistants at work in the "H.M.V." mechanics' training school at Hayes, Middlesex..

are informed that this advance has now been withdrawn in consequence of the fall in the costs of raw material.

The BELGRAVE ELECTRIC CO., 24, Belgrave Road, London, S.W.1, would be glad to receive manufacturers' catalogues and publicity matter, relative to lamps, domestic and industrial heating and lighting supplies and neon signs.

HOLOPHANE, LTD., Elverton Street, London, S.W.1, have secured the contract for the street lighting at Sao Paulo. This is claimed to be one of the largest contracts yet placed, and about 16 000 street lighting units will be used. Other street lighting installations secured by Holophane, Ltd., in South America include Buenos Ayres, where more than 30 000 units are installed, and Santiago, Chile, where over 11 000 units are used.

The EDISON SWAN ELECTRIC CO., LTD., 123/5, Queen Victoria Street, London, E.C.4, announces that arrangements have now been made whereby the wiring supplies, lighting engineering and radio business of METRO-VICK SUPPLIES will be taken over and carried on by them at the address given. Cosmos lamps will not be included in this arrangement but will be marketed by the lamp sales department of METROPOLITAN VICKERS ELECTRICAL CO., LTD., of Trafford Park, Manchester.

THE SOCIAL SIDE.

THE annual excursion of the electrical trades in Belfast, comprising contractors, manufacturers, factors and agents, took place on May 21. A party of about 60 travelled by special railway coach to Portstewart, and the series of golf competitions arranged were thoroughly enjoyed.

For the "Dr. Wright" Golf Prize, the first of the annual competitions held by the staff of Siemens lamp works, Preston, the prize winners were Messrs. J. N. Aldington, L. W. Smith and W. G. Creasy. The competition took the form of 18 holes medal play, and was played on the links of the Dick Kerr Club at Ashton Park.

The Liverpool and District Electro-Harmonic Society held its fourth annual golf tournament last week at the West Derby Golf Clubs' course. There was keen competition for the premier award, the Allied Electrical Trades Golf Challenge Cup and replica, which was carried off by Mr. J. Mc Kenzie of Birkenhead, with a net score of 80. Amongst the other prize winners, was Mr. T. W. Whyte (British Insulated Cables, Ltd.), who received a golf bag. Mr. E. G. Pulford, junr., secretary of the society, intimates that the annual bowls competition will be held at the Half Way House, Woolton Road, Liverpool, on June 17. The chief award will probably be a challenge cup, which will be open for competition amongst members of the society only. Non-members of the society who are engaged in the Merseyside electrical and allied trades will be able to enter the competitions for the other prizes.

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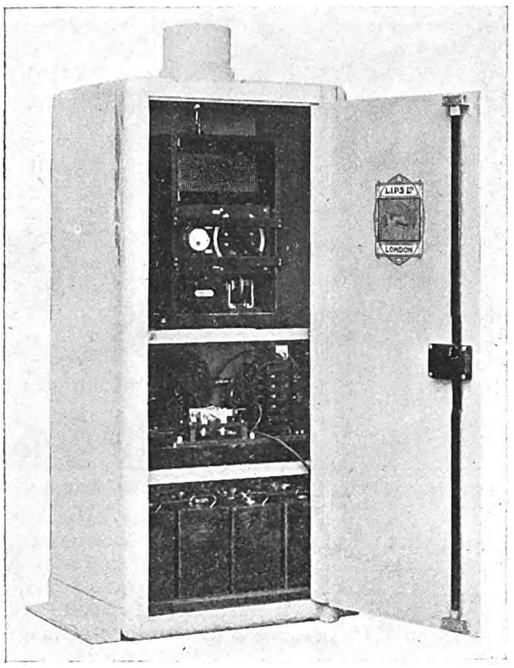
WIRELESS AND PIRACY.

Ingenious Arrangement for Outwitting the Pirates of Bias Bay.

THE danger of an attack by pirates on ships is one which has to be ever in the mind of those responsible for ships sailing in Chinese waters, as many experiences during the last few years have shown. Armed guards have for some time



The "Marconi" ¼ kW transmitter with automatic key, fitted in fireproof safe for use in ships subject to attack by pirates.

been carried on ships likely to be raided and the presence of this guard is, undoubtedly, a deterrent to pirates concealed among the passengers, but nevertheless piracy still occurs. To obtain further assistance when an attack takes place, reliance must be placed on wireless communication, and, in order to do this, adequate protection must be forthcoming for the operator and the wireless installation. An effective and practical solution to this problem has been supplied by the Marconi International Marine Communication Co., Ltd., by the development of an automatic transmitter fitted in a fireproof safe and equipped with the necessary power supply for immediate use. By the mere closing of a switch the transmitter is set in operation and the safe is then locked, leaving the apparatus secure from attack, while it radiates automatically the ship's call sign and the request for assistance. This transmission continues uninterruptedly until either the necessary assistance arrives or until, after some hours of continuous working, the batteries lose their charge.

It has been found in practice that pirates only attack the coastal and river steamers and not deep sea ships, and as the position of these ships is known practically from hour to hour it is unnecessary to transmit the position of the ship in any wireless message sent out when the vessel is attacked. The simple transmission of the ship's call sign and the distress call is sufficient information for the local coast stations, and a telephone call to the owners will soon determine the position of the ship. The installation only requires the safe to house a standard ¼ kW quenched spark transmitter fitted with an automatic key in place of the ordinary hand key, and no elaborate safety devices are necessary to protect it.

A NOTABLE BI-CENTENARY.

Extensive preparations are being made to celebrate the bicentenary of W. and T. Avery, Ltd., the Birmingham manufacturers of weighing and testing appliances. The full programme of events has not yet been completed, but the commemoration will extend over several days at the beginning of July, and many people prominent in industrial, commercial, professional and political circles have already promised to attend. The business was opened in a small steel-yard maker's shop at No. 11, Digbeth, Birmingham, in 1730 by a Mr. Ford, and has grown steadily until it has reached its present dimensions.

IN PARLIAMENT.

Torquay Railway Trolley Vehicles Scheme Approved by House of Lords Committee.

A SELECT Committee of the House of Lords had under consideration last week the Torquay and Paignton Tramway Co.'s Bill for authority to abandon its existing tramways and substitute railless trolley car services; to carry out extensions; and to secure protection from indiscriminate competition on the existing routes. Torquay Corporation supported the Bill. After hearing evidence, the Committee passed the Bill for third reading, and decided that it be left to the licensing authority to determine what was unfair competition and how it should be prevented, with an appeal to the Minister of Transport by either party. The Committee declined to instruct the licensing authority to impose a condition that competing vehicles must charge higher fares.

London United Tramways.

Opposition to the Bill of London United Tramways, Ltd., seeking power to convert its routes from trams to trolley cars, was withdrawn, and the House of Lords Select Committee which had the Bill under consideration found the preamble proved, and ordered the Bill to be reported to the House. The Bill authorises the abandonment of certain tramways and the substitution of railless trolley traction on 20 miles of routes in Twickenham, Teddington, Hampton, Kingston, Surbiton, Malden and Wimbledon.

Replies to Questions in House of Commons.

A scheme in reference to the electrification of the London and North Eastern Railway at Liverpool Street has been submitted to the Government authorities and is now being examined.

The electricity schemes for Palestine are not Government schemes, and, therefore, it is not possible for the Government to take steps to ensure that the water turbines and dynamos used are ordered in this country.

In reference to a request by Mr. H. T. Muggeridge for a return showing the names of electricity supply companies which have capitalised reserves or issued shares to shareholders at less than market price, or "adopted any other method of rendering abortive the statutory limitation of dividends," the Minister of Transport says there is no general statutory limitation of dividends, but he has power to revise from time to time the maximum prices which the companies are authorised to charge. He is keeping under observation the whole question of the procedure for controlling prices.

Rural party telephone lines are provided for not less than three and not more than 12 subscribers. At exchanges with fewer than eight subscribers the rentals are assessed on the costs involved. The Postmaster-General is unable to give preferential treatment to any particular locality.

Telephone subscribers may have their accounts for trunk and toll calls and phonograms rendered monthly on payment of a charge of 1s. a quarter.

The scheme for electrification of the Wirral Railway is being reconsidered by the L.M. & S. Railway Co.

The gross revenue received from wireless licences during the 12 months ended April 30, 1930, was about £1 550 000, against about £1 370 000 for the previous year.

THE "JOHN BENN" FERRY-BOAT.

Thames Ferry Service Increased by Addition of Boat named after "Benn's" Founder.

THE London County Council's new ferry-boat, "John Benn," made her maiden trip across the River Thames from the South Pontoon, Woolwich Free Ferry, on May 30. Many of the relatives of Sir John Benn, including the present baronet, Sir Ernest Benn, were present, and a party of boys from the John Benn Hostel in Stepney also made the journey. The vessel has been named after the late Sir John Benn, Bt., the former Chairman of the London County Council. Mr. F. Bertram Galer (Chairman of the L.C.C. Highways Committee, spoke on board on the inauguration of the increased service and welcomed Sir Ernest Benn and Sir Henry Maybury, G.B.E. (Chairman of the London and Home Counties Traffic Advisory Committee), who briefly replied. Those present included grandchildren of Sir John, and Mrs. Wedgwood Benn (wife of the Secretary of State for India) and Mrs. C. E. Hughes.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

ISLE OF THANET JOINT HOSPITAL BOARD.—Electric light installation at Thanet Isolation Hospital, Haine, near Ramsgate. Specification from Mr. Sidney Shea, solicitor and clerk, 19, Cecil Square, Margate; deposit £2 2s.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL, June 6.—Supply of l.t., paper insulated cables, cab tyre sheathed cable and v.i.r. cables, during period ending March 31, 1931. Specifications, etc., from the Engineer and Manager, Electricity Offices, 11, Staines Road, Hounslow.

Automatic Telephone Equipment.

LIVERPOOL CORPORATION, June 6.—Installation of automatic telephone exchange at Central Police Station, Dale Street, Liverpool. Specifications from Mr. Walter Moon, town clerk, Municipal Buildings, Dale Street, Liverpool.

CLYDE NAVIGATION TRUST, June 7.—Six or 12 months' supply of electrical stores. Form of tender (list No. 8) from the Stores Superintendent, 1, Graving Dock, Govan.

HINDLEY EDUCATION COMMITTEE, June 7.—Electric light installations at Moss Lane and Argyle Street Schools. Specifications from Mr. O. P. Abbott, Council Offices; deposit £2 2s.

WEST RIDING EDUCATION COMMITTEE, June 7.—Electric light installations in Scholes, Holme and Holmfirth Council Schools. Specifications from Mr. W. Heeley, 4, Macaulay Street, Huddersfield.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., June 9.—Supply of electrical accessories. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, S.W.1.

GLASGOW CORPORATION, June 9.—One year's supply of l.t. and e.h.t. cables, small insulated cables and flexibles, electric cookers, meters and electric kettles. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow, C.2.

ATHERTON URBAN DISTRICT COUNCIL, June 10.—Supply of 2 600 yards of 0·2 h.t., concentric, paper insulated, lead sheathed, served, steel tape armoured and compound cable, suitable for pressures up to 2 500 V, centre point earthed, and made in accordance with the latest B.E.S.A. specification. Tenders to Mr. A. E. Hope, clerk to the Council.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., June 10.—Supply of fuse boards and switches. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, S.W.1.

ERITH URBAN DISTRICT COUNCIL, June 10.—Electric light installation at Belvedere Boys' School. Particulars from the Surveyor; deposit £1 1s.

CENTRAL ELECTRICITY BOARD, June 11.—Construction of site works, foundation works and buildings in the area of the North-West England and North Wales Electricity Scheme. Specification (N.W.E.-P.F.2) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 11.—Supply and erection of 33 000 V and other cables, in connection with the South-East England Electricity Scheme. Specification (No. S.E.E.-G.C.2), etc., from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 11.—Supply and erection of 33 kV transformers. Specification (No. S.E.E.-G.T. 1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.1; deposit £2 2s.

NOTTINGHAM CORPORATION, June 11.—Supply of 300 tons of steel tramway rails of British manufacture. Specification, etc., from Mr. T. Wallis Gordon, city engineer, Guildhall, Nottingham; deposit £1.

SLEAFORD URBAN DISTRICT COUNCIL, June 11.—Supply and laying of about 500 yards run of l.t., double steel tape armoured, lead covered cable, with necessary boxes, for new housing site off Grantham Road, Sleaford. Specification, etc., from Mr. W. H. Wilson, electrical engineer, West Banks, Sleaford.

DUNDEE CORPORATION, June 12.—Supply of e.h.t. and l.t., paper insulated, lead covered and double steel tape armoured cable, to B.E.S.A. specification for working pressures up to 6 600 V and 660 V respectively. Specifications, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

LEYTON CORPORATION.—June 13.—Re-wiring electric light installation at Farmer Road school. Particulars from the architect, Mr. J. H. Jacques, 61, West Ham Lane, Stratford, London, E.; deposit, £1.

STONE URBAN DISTRICT COUNCIL, June 13.—Re-wiring sewerage works. Specifications from the surveyor, Mr. W. R. Harlow, Stone, Staffs.

OSWESTRY CORPORATION, June 14.—Supply, erection, etc., of 3 core, 11 000 V, paper insulated, underground cable; l.t. 3 core, 4 core and 2 core, 400 V, paper insulated cable, service material, and link disconnecting boxes (specification No. 1A); e.h.t. 11 000 V, oil immersed, truck type switchgear, and 400 V, ironclad, air break switchgear (specification No. 2A); and one, two or three oil immersed, self-cooled, three phase, step down (11 000 V to 400 V) transformers (specification No. 3A). Specifications from Mr. H. W. Edwards, borough electrical engineer, 28, Oswald Road, Oswestry; deposit £2 2s. for each. All apparatus and materials to be of British manufacture and cable to be C.M.A.

WALLASEY CORPORATION, June 14.—Electric lighting work at New Brighton Ferry, including supply of switches, lamps, etc. Specification from the Ferries General Manager, Seacombe Ferry.

IRVINE CORPORATION, June 16.—Electric lighting work in connection with erection of (1) four blocks, each of four houses, and (2) 16 blocks, each of four houses, on Springbank Farm, Irvine. Specifications from Mr. A. R. Wilson, town clerk, Council Chambers, Irvine; deposit, £1 1s. for each.

EAST HAM EDUCATION COMMITTEE, June 18.—Electric light installations at Monega and Sandringham Schools. Specifications, etc., from Mr. F. R. Thompson, Education Office, Town Hall, East Ham, London, E.6; deposit 10s.

MANCHESTER CORPORATION, June 18.—Heavy a.c. equipment, cables and lighting at new Children's Sanatorium, Abergele, North Wales. Specification from the City Architect, Town Hall, Manchester; deposit £1 1s.

RICHMOND (SURREY) CORPORATION, June 18.—Borehole pump, with 35 B.H.P. electric motor; two horizontal pumps, with 80 B.H.P. electric motors; two ditto, with 65 B.H.P. electric motors; and two ditto, with 10 B.H.P. electric motors. Specification, etc., from the Water Engineer, Hotham House, Heron Road, Richmond; deposit £5 5s.

SCUNTHORPE AND FRODINGHAM URBAN DISTRICT COUNCIL, June 18.—Wiring for electric lighting and power at Public Baths to be erected at Doncaster Road, Scunthorpe. Specification (D) from Mr. W. Farrar, engineer, Council Offices, Scunthorpe; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 19.—Supply and laying of 33 kV and other cables in connection with Central England Electricity Scheme. Specification (C.E.-G.C.3) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

OLDHAM PUBLIC ASSISTANCE COMMITTEE, June 20.—Supply of electric lamps and fittings, for the Poor Law Institution. Tender forms from the Public Assistance Officer, Town Hall, Oldham.

BENFLEET URBAN DISTRICT COUNCIL, June 23.—Three vertical spindle centrifugal pumps, with electric motors and automatic control, etc. Specification from Mr. W. E. Blezard, 9, Victoria Street, Westminster, S.W.1; deposit £2 2s.

E.H.T. and Pilot Cables.

CENTRAL ELECTRICITY BOARD, June 23.—Supply and erection of 66 000 V and other cables in connection with Mid-East England Electricity Scheme. Specification (M.E.E.-G.C.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, June 27.—Supply and laying of pilot cables in connection with the Central England Electricity Scheme. Specification (C.E.-S.C.1), etc., from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

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CENTRAL ELECTRICITY BOARD, June 30.—Supply and erection of metering equipment required in the area of the Central England Electricity Scheme. Specification (C.E.-G.M.1) from Mr. R. H. FOX, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

METROPOLITAN WATER BOARD, June 30.—Twelve months' supply of electric lamps. Form of tender (No. 24) from the Chief Engineer (Room 155), 173, Rosebery Avenue, London, E.C.1. Stamped, addressed envelope to be sent.

CARDIFF CORPORATION, July 1.—Supply of h.t. switchboard (Contract No. IV); h.t. switchboard (No. V); transformers (No. VI); and battery and charging plant (No. XV), for the Llandough Hospital, now in course of erection. Specifications from Messrs. Plevin and Jenkins, 4, Working Street, Cardiff; deposit £2 2s. for each. Only manufacturers on the King's National Roll are invited to tender.

SUNDERLAND CORPORATION, July 7.—Manufacture and supply of (1) paper insulated, lead sheathed cable for general main-laying requirements; (2) rubber insulated wire; (3) consumers' meters; and (4) gasfilled and vacuum lamps, for 12 months. Specifications, etc., from the General Manager, Electricity Department, Dunning Street, Sunderland; deposit 10s. for each.

DUNDEE CORPORATION, July 12.—Supply of six 300 kVA outdoor type transformers. Specification from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

INDIAN STORES DEPARTMENT, June 9.—Supply and erection of oil engine and alternator set, with switch and protective gear and connecting cables, for Public Works Department's power station, Jaipur (order No. N. 11 096). (Reference B.X. 6 445.)

AUCKLAND HARBOUR BOARD, June 10.—Supply of submarine cable (contract No. 902). (Reference B.X. 6 354.)

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, June 10.—Supply and installation of transformers, for Chats Falls transformer station. (Reference B.X. 6 436.)

MELBOURNE CITY COUNCIL, June 11.—Supply of paper insulated, lead sheathed cables, suitable for use on three-phase, 50 cycle system at 6 600 and 420 V. (Reference B.X. 6 415.)

COPENHAGEN LIGHTING DEPARTMENT, June 12.—Two electrically driven gas compressors, with minimum hourly capacity of 20 000 cu. metres of gas at pressure of 1 metre water column. (Reference A.X. 9 598.)

MADRAS GOVERNMENT, June 15.—Complete electrical equipment of three 66/110 kV outdoor sub-stations, in connection with Pykara hydro-electric scheme. Specification (No. E.26) (price 30s.) and general conditions of contract (price 3s. 6d.) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4, on payment of the respective fees (not returnable).

CAPE TOWN MUNICIPALITY, June 18.—Supply of 1 000, steel tubular poles (specification No. 500/1930). (Reference A.X. 9 622.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, June 30.—Supply and maintenance of an electric generating unit, with motors, transmission lines, etc., at Tor Quarantine, on the Gulf of Suez. (Reference B.X. 6 466.)

POWER SECURITIES CORPORATION, LTD., July 1.—Supply of (*a*) 4—3 000 kVA transformers (specification E.28, price 15s.); (*b*) indoor 11 kV switchgear (E.23, price 22s. 6d.), for Pykara, Madras, hydro-electric scheme. Specifications (on payment of above fees and 3s. 6d. for general conditions of contract) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

EGYPTIAN MINISTRY OF THE INTERIOR, July 26th.—Supply and erection of cooling tower, construction of concrete well and basin and supply of electrically-driven and centrifugal pumps, electric motors, switchgear, etc., at Assiout electric power station. (Reference A.X. 9 627.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 12.—Supply of 11 000 V metal-clad switchgear and accessories, for Manghao power scheme—section 239. (Reference B.X6 455.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 2—. Supply of 110 kV switchgear, steelwork and controlling equipment, for Mangahao power scheme. (Reference B.X. 6 452.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 9.—Supply of 110 kV switchgear and controlling equipment, for Mangahao power scheme—section 217. (Reference B.X. 6 454.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 50 kV switchgear and steelwork, for Arapuni power scheme—section 276. (Reference B.X. 6 451.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 110 kV and 50 kV switchgear and protective system, for Arapuni power scheme (section 273). (Reference B.X. 6 450.)

Tenders Accepted.

CENTRAL ELECTRICITY BOARD.—Contracts placed in connection with North-West England and North Wales and Mid-East England schemes: British Thomson-Houston Co., Ltd., Brush Electrical Engineering Co., Ltd., English Electric Co., Ltd., Ferranti, Ltd., and C. A. Parsons and Co., Ltd., 66 kV 33 kV, and lower voltage transformers. Super-Centrifugal Engineers, Ltd., oil filtering and storage equipment for outdoor transforming stations in area of Central England scheme. Total amount of contracts approximately £326 000.

LONDON COUNTY COUNCIL.—W. H. Gaze and Sons, electric fittings and wiring in connection with erection of new elementary school at Henwick Road. Also tendered: T. Clarke and Co., Ltd., £803; A. Hawkins and Sons, £829; Woolwich Metropolitan Borough Council, £835; L. G. Tate and Co., Ltd., £845; Electrical Installations, Ltd., £851; Eastern Armature Winding Co., £862; J. Briggs (Electrical Contractors), Ltd., £920; A. Dean and Co., Ltd., £929; Burdette and Co., Ltd. £1 050; Malcolm and Allan (London), Ltd., £1 236

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.—Mitchell Conveyor and Transporter Co., Ltd., coal handling plant for new Ironbridge power station, consisting of Mitchell patent side-discharge weighing type tipplers for unloading colliery wagons up to 20 tons capacity; Mitchell ball bearing type belt conveyors for placing coal into boiler house bunkers or into store; and a travelling store bridge, spanning coal store, fitted with two special type elevators for reclaiming coal from store. Ultimate capacity of store yard will be over 80 000 tons.

TRADE JOURNALISM.

Memories of the "Good Old Days."

SIR ERNEST BENN, chairman of Benn Brothers, Ltd. (publishers of THE ELECTRICIAN), and Miss Betty Benn were entertained to luncheon at the Criterion Restaurant, London, on Tuesday, by the Trade, Technical and Scientific Branch of the London District of the Institute of Journalists, in order to mark the jubilee of Benn Brothers. Lady Benn was to have been present, but her unavoidable absence abroad prevented her from attending, and Miss Benn deputised for her. Mr. Hugh B. Philpott, the chairman of the Branch, who presided, proposed the health of the guests.

Sir Ernest Benn, in reply, said that he could go back 40 years into those days when the firm possessed one letter book and a copying press. It was his duty to write the letters and do the copying. They were days before the arrival of the accountant and cost accountancy. Business accounts then, some of which were preserved to-day, showed nothing which would be recognised as accounts in these times. Estimates were "guesstimates," and the only costing system was the other man's catalogue. Those were days before the arrival of all those extravagantics so strangely called economics. His father's first election circular in 1889 set it out that: "He has had a thorough business training fully fitting him to deal with those economical interests which are most important to business men, who, like himself, have to pay heavy rates." He had searched and failed to find the figure, but he had the profit and loss account of 1881, in which they would find the staggering item of "rates: £3 10s.," and, "if you please," said Sir Ernest, "he went into public life to get rid of that intolerable burden!" Could they wonder that he sang with fervour the line in the old hymn, "Change and decay in all around I see"? There was no net sales stunt in those days. Journalism was a serious occupation, even outside the trade and technical Press. Indeed, he thought that the trade and technical section ought to recognise more definitely than they did the responsibilities that they carried, for they were almost the sole remaining depository of the old and best traditions of journalism.

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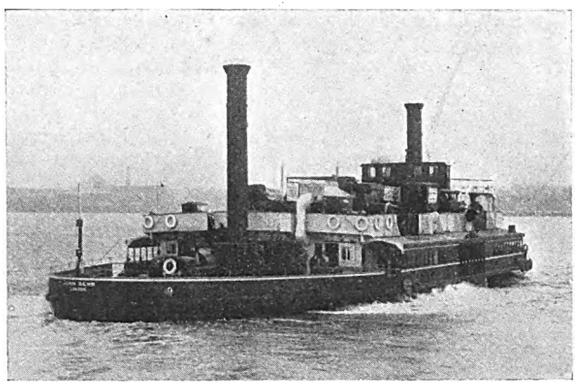
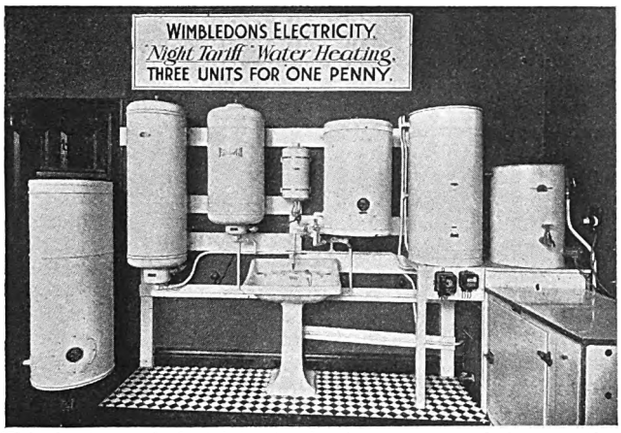
ELECTRICAL PICTURES OF THE WEEK.

Mr. W. N. C. Clinch, superintendent of power stations to the North Metropolitan Electric Power Supply Co., who has been appointed to succeed Mr. John Christie as borough electrical engineer, Brighton.

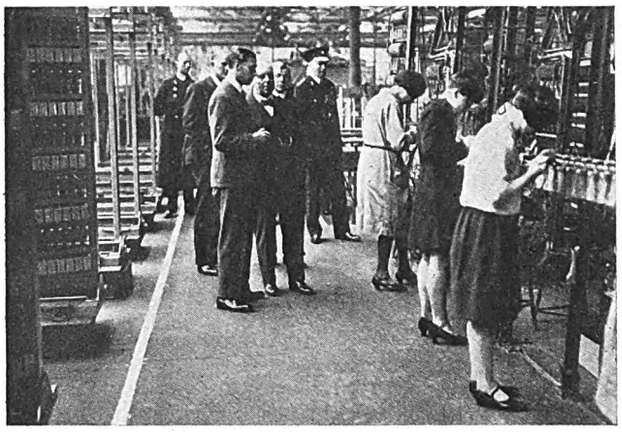


The new London ferry-boat, "John Benn," which was put into service on May 30. She was given her name by the L.C.C. as a tribute to the late Sir John Benn, the founder of Benn Brothers, Ltd., publishers of THE ELECTRICIAN. See page 740.

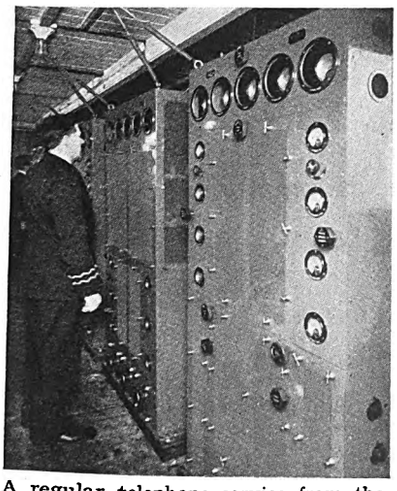
Mr. A. J. Fuller, borough electrical and consulting engineer, Fulham, who was elected President of the I.M.E.A. for the ensuing year, at the annual meeting held at Eastbourne on Friday, May 30. See page 730.



This battery of electric water heaters, connected for practical demonstration purposes in the showrooms of the Wimbledon Corporation Electricity Department, is of special interest in view of Mr. A. E. McKenzie's remarks at Eastbourne last week.



The Duke of York at the Strowger Works of the Automatic Telephone Co., Ltd., Liverpool, where, under the ægis of the Industrial Welfare Society, on May 20, he made a thorough tour of inspection of all the departments.



A regular telephone service from the "Homeric" to the United States and Great Britain was announced by the Post Office last week. This is the first vessel of the Mercantile Marine to be fitted with the new short wave gear similar to that used by Marchese Marconi when he spoke to Australia from the Mediterranean some few weeks ago.

The past few weeks have seen the conclusion of an intensive indoor propaganda campaign amongst rural areas by the Shropshire, Worcestershire, and Staffordshire Electric Power Co. This has included exhibitions and demonstrations in halls at Kinver, Moreton-in-the-Marsh, Redditch, Craven Arms, Bidford-on-Avon, Evesham, Ludlow, Hereford, Kidderminster, Banbury, Weobley, Whitchurch, and Wellington. An exhibition has also been held at Dudley. The company has now commenced its outdoor propaganda campaign, which will continue until the autumn, with the same object in view, namely, convincing the rural areas of the advantages of electricity. For these exhibitions a large marquee is used and demonstrations are given. A start was made at the Oxford Agricultural Show, held at Banbury on May 20 and 21.

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ELECTRICITY SUPPLY.

Biggar Street Lighting Contract—Lighting on Bury Housing Sites—Rothesay Rural Supply—Wimbledon's Electricity Propaganda—Diesels at Southend.

GLASGOW electricity department is to extend mains at a cost of £6 000.

Shipley Electricity Committee has received sanction to borrow £9 969 for mains.

Sanction has been received by Bexhill T.C. to a loan of £3 959 for sub-station equipment, etc.

Coventry Electricity Committee recommends application for a loan of £10 168 for mains and switchgear.

The Edinburgh Collieries Co. has under consideration a scheme to erect electric light standards in Wallyford streets.

Ilford Electricity Committee has obtained permission to supply electricity to additional premises in the rural district of Epping.

Plymouth Electricity Committee has sanctioned extensions of cable in 18 streets in Plymouth and Devonport, at a cost of about £1 200.

Biggar T.C. has accepted an offer by the Clyde Valley Electric Power Co. to supply all fittings and light the streets at a cost of £1 500.

Barking Electricity Committee has authorised the Electrical Engineer to proceed with the laying of a main in Longbridge Road at a cost of £1 482 5s.

The Borough Electrical Engineer of Bury (Lancs) has been instructed to arrange for house and street lighting by electricity on the Woolfold and Walmersley housing sites.

An inquiry which was to have been held at Rothesay by the Ministry of Transport has been cancelled, the Bute Estate having withdrawn objections to an application by the Burgh of Rothesay for powers to erect an overhead line to farmhouses.

The chairman of Wimbledon Electricity Committee and the Borough Electrical Engineer were making arrangements for the use of a shop window for advertising the advantages of water heating by electricity, and also for the erection of an illuminated sign on land belonging to the Corporation abutting upon the Southern Railway, for the same purpose.

Maidstone T.C. is to carry out the public lighting by electricity at East Malling at £4 7s. 6d. per lamp per annum, at Ditton at £3 2s. 6d. per lamp, and at Linton at £4 7s. 6d. per lamp. It has also been arranged to supply electricity for lighting Malling Rural District Council's Isolation Hospital for a minimum revenue of £43 per annum for seven years.

The Shawinigan Water and Power Co., Ltd., is seeking the approval of the Minister of Lands and Forests of Quebec for the plans of the proposed Rapide Blanc station, the first of six new developments along the Upper St. Maurice river contemplated by the company for execution during the next few years. The plans contemplate the installation of 160 000 H.P. at a cost of $13 000 000.

Poplar (London) electricity department is to extend mains, at a cost of £3 914, in connection with the h.t. supply to the Blackwall Tunnel, considerable extensions to the electrical installation of Messrs. J. Kidd and Co., Old Ford Road, and the additional supply of 100 H.P. to Messrs. W. Lusty and Sons, Ltd., Bromley. The Electricity Committee has sold land in Weston Street, Bromley, to the Central Electricity Board for the erection of a transformer sub-station.

At a meeting of Portishead U.D.C. last week an alleged nuisance from fumes and smoke emitted by the Portishead generating station was discussed at the instance of the Portishead Ratepayers' Association. The chairman, Mr. Hedley Stevens, said the Surveyor had written to the County Medical Officer of Health with regard to the ill-effects of the coal dust and fumes from the works. It was stated that Bristol Corporation was taking this matter seriously and was searching for a remedy.

In reply to requests by residents in Cark, Flookburgh, and Ravenstown, for a revision of the maximum charge by the Cark and District Electricity Supply Co., the Minister of Transport states that he understands that the company is now prepared to make an offer to reduce the flat rate for lighting to 9d. per kWh, and to offer consumers an alternative two-part tariff, under which the average price per unit will be considerably lower. The Minister has therefore deferred further consideration of the matter for the time being.

Consent has been given by Abergavenny T.C. to the application of the Shropshire, Worcestershire and Staffordshire Electric Power Co. for a Special Order to supply electricity to the town. The company proposes an agreement for 21 years, and undertakes to reduce the flat rate for lighting from 6½d. to 6d. within a year of the commencement of the supply. Alternative tariffs include one for residential premises for lighting, heating and cooking at 1d. per kWh, in addition to 2s. 6d. per room per quarter for six months of the year, and 3s. 6d. per quarter for the other six months.

Manchester Electricity Committee has been asked by the Minister of Transport and the Electricity Commissioners to carry out electrical developments in such a manner as to preserve the beauty and character of the countryside. Mr. H. C. Lamb, engineer and manager of the electricity department, states in his monthly report that before any sub-station is erected in the area, consideration is given to the amenities of the district. Alterations are introduced, if desirable, to keep the building in conformity with the surrounding architecture. Evergreen shrubs are also planted in many cases round sub-stations.

The West Kootenay Power and Light Co., which was recently conceded authority for the development of hydro-electric power from the waters of the Pend d'Oreille river in southern British Columbia, is amending its application to the Provincial Water Board. The company's revised application proposes the construction of a 165-ft. dam at Sevenmile Creek and a 150-ft. dam at Cedar Creek. The dam of over 350 ft. at the mouth of the river, planned by the company some months ago, is not mentioned in the application. From this it is presumed that the company has come to the conclusion that the water powers of the river can be best harnessed by two separate developments, rather than by a single dam and power house. The output planned is 350 000 H.P. at a cost of about $18 000 000.

Newbury Corporation has recently had under consideration a suggestion that it should appoint an electrical inspector for the borough for the purpose of testing doubtful meters. In regard to this subject, the Urban Electric Supply Co. has informed the Corporation that when a meter is suspected of being wrong, the consumer is given notice that it is to be removed for testing. If he objects to the meter being removed the company fixes another new certified meter alongside, and take frequent check readings. If the consumer still refuses to have the meter changed, it is dispatched to one of the recognised meter testing institutions. It is only in very few cases that it is necessary to send a meter away. The Committee has decided to take no action in reference to the suggested appointment of an inspector.

After an interview with an official of the Electricity Commissioners, the chairman of Ripon Electricity Committee reports that there is no possibility of the Government carrying out the suggested line from Boroughbridge for some time. It is suggested that Harrogate Corporation put up an alternative line in the direction of Boroughbridge and that Ripon Corporation connect thereto. An assurance has been given that if the Government or Harrogate Corporation devises a scheme for a duplicate line on an alternative route, Ripon Corporation will be consulted in the matter.—The Committee has agreed to the principle of assisted wiring, and inquiries are being made as to the extent to which local electrical contractors will co-operate in working it. A loan of £2 000 for assisted wiring and £1 000 for showroom appliances is being applied for.

In reference to the decision of Southend T.C. to apply to the Electricity Commissioners for permission to purchase a new 3 000 kW Diesel engine set for £28 000, Coun. J. Le Masurier, chairman of the Electricity Committee, said, in a recent interview, it had now been possible to reduce the capital cost to about £9 per kW, and it was idle to argue that the proposal for peak loads was better served by bulk than by Diesel generation. He had always felt that local authorities would some day throw over the yoke of all bulk supply by long distance transmission. The advent of the high-powered oil engine must of necessity call for a revision of the original grid scheme of 1925 as regards local load stations. Even at the unusual, if not entirely unknown, load factor for bulk supply of 60%, it would be noted that cost per unit for the nine months was 0·58d. The combined costs were: Local generation and bulk, 0·80d. for 1930, against 0·84d. for 1929. London Road Diesels had generated at 0·73d., against bulk at 0·58d., with the advantage of the high load factor.

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FINANCIAL INTELLIGENCE.

Profits of Electricity Supply Companies for Last Financial Year—Dividends and Other Appropriations, and Percentages of Same to Capital.

By "AUDITOR."

THE following table gives the balance of profit realised by 20 electricity supply undertakings during the last financial year or accounting period; together with the sums distributed in the form of dividends; the amounts allocated to reserves, etc.; and other appropriations, where applicable. The percentage which each total in the final appropriation of profit account bears to the total capital invested in the undertaking, is also shown, with recent prices of the different stock and share issues, and the yield in each case :—

TABLE SHOWING PROFITS REALISED BY CERTAIN ELECTRICITY SUPPLY COMPANIES DURING LAST FINANCIAL YEAR; DIVIDENDS, RESERVES, &c. (WITH PERCENTAGES IN RELATION TO INVESTED CAPITAL), AND RECENT PRICES AND YIELDS.

	Capital Invested.	Brought Forward.		Profit.		Total.		Dividends Distributed.		Reserves, etc., Allocated.		Other Appropriations.		Carried Forward.		Total.		Ann. Div.	Par. Value.	Recent Price.	Yield.
	£	£	%	£	%	£	%	£	%	£	%	£	%	£	%	£	%				
Bournemouth and Poole Elec. Sup. ..	720 000	6 268	0·65	151 610	15·63	157 878	16·28	95 880	9·89	54 200	5·59	—	—	7 798	0·80	157 878	16·28	15	£1	57/4	5·23
,, 4½% Cum Pref. ..	75 000	—		—		—		—		—		—		—		—		4½	£1	17/6	5·14
,, 6% Cum. Pref. ..	175 000	—		—		—		—		—		—		—		—		6	£1	22/-	5·45
	970 000																				
Brit Power and Light Corp. (1929) ..	1 602 500	—		20 535	1·28	20 535	1·28			—	—	—	—	20 535	1·28	20 535	1·28	Nil	£1	14/4	—
Calcutta Elec. Sup. Corpn.	1 503 381	41 130	1·73	628 118	26·35	669 248	28·08	239 442	10·05	349 997	14·68	38 188	1·60	41 621	1·75	669 248	28·08	12 plus bonus	£1	47/9	5·03
,, 5% Pref.	800 000	—		—		—		—		—		—		—		—		5	£1	20/7	4·86
	2 383 381																				
Cawnpore Elec. Sup. Corpn.	200 000	3 824	0·96	68 117	17·03	71 941	17·99	34 000	8·50	30 000	7·50	1 700	0·43	6 241	1·56	71 941	17·99	10	£1	29/-	6·90
,, 7% Cum. Pref. ..	200 000	—		—		—		—		—		—		—		—		7	£1	21/3	6·59
	400 000																				
County of Durham Elec. Power Dis...	535 000	1 224	0·23	32 423	6·06	33 647	6·29	23 100	6·00	—	—	—	—	1 547	0.29	33 647	6·29	6	£1	—	—
County of London Elec. Sup.	4,427 179	364 210	4·71	982 377	12·68	1346587	17·39	558 022	7·21	343 528	4·43	—	—	445 037	5·75	1346587	17·39	11	£1	47/6	4·63
,, 6% Cum. Pref. ..	3 321 517	—		—		—		—		—		—		—		—		6	£1	23/10	5·04
	7 748 696																				
Elec. Distrib. of N. Wales and Dist. ..	5 500	2 310	1·12	9 113	4·44	11 423	5·56	10 786	5·25	—	—	—	—	637	0·31	11 423	5·56	Pref. only	1s.	—	—
,, 6% Cum. Partg. Pref. .	200 000	—		—		—		—		—		—		—		—		6	£1	—	—
	205 500																				
Isle of Thanet Elec. Sup.	150 000	6 204	1·43	59 074	13·68	65 278	15·11	22 920	5·30	30 000	6·95	4 000	0·93	8 358	1·93	65 278	15·11	4	£1	31/-	2·60
,, 6% Cum. Partg. Pref. .	282 000	—		—		—		—		—		—		—		—		6	£1	24/-	5·00
	432 000																				
Kalgoorlie Elec. Power & L. Corpn. ..	50 000	623	1·25	3 808	7·61	4 431	8·86	3 000	6·00	—	—	—	—	1 431	2·86	4 431	8·86	6	10/-	8/7	7·00
Llanelly and Dis. Elec. Sup.	200 000	3 327	0·70	31 395	6·61	34 722	7·31	16 600	3·49	15 000	3·16	—	—	3 122	0·66	34 722	7·31	2½	£1	15/10	3·16
,, 6% Cum. Pref. ..	275 000	—		—		—		—		—		—		—		—		6	£1	18/-	6·66
	475 000																				
Notting Hill Elec. Light	1 352	28 978	14·39	46 402	23·04	75 380	37·43	27 617	13·71	19 534	9·70	—	—	28 229	14·02	75 380	37·43	1665·14	1/-	—	—
,, 6% Cum. Pref. ..	200 000	—		—		—		—		—		—		—		—		6	£10	10·8	5·55
	201 352																				
Oxford Elec.	200 000	6 449	1·84	72 380	20·68	*80 802	23·08	23·000	6·57	15 000	4·28	—	—	42 802	12·23	80 802	23·08	7	£1	—	—
,, 6% Cum. Pref. ..	150 000	—		—		—		—		—		—		—		—		6	£1	20/-	6·00
	350 000																				
Richmond (Surrey) Elec. L. & P. ..	200 000	4 281	2·14	45 421	22·71	49 702	24·85	22 000	11·00	22 907	11·45	—	—	4 795	2·40	49 702	24·85	11	£1	44/-	5·00
River Plate Electry.	450 000	7 403	1·23	55 745	9·29	63 148	10·52	45 000	7·50	12 500	2·08	—	—	5 618	0·94	63 148	10·52	10½	Stock	205·5	5·11
,, 6% Pref. Stock. ..	150 000	—		—		—		—		—		—		—		—		6	Stock	105	5·71
	600 000																				
South London Elec. Supp.	494 000	95 397	18·21	124 380	23·74	219 777	41·95	43 790	8·36	77 126	14·72	—	—	98 861	18·87	219 777	41·95	8½	£1	27/6	6·18
,, 6% Cum. Pref. ..	30 000	—		—		—		—		—		—		—		—		6	£1	—	—
	524 000																				
South Metro. Elec. L. and P. ..	600 000	152 076	17·89	194 983	22·94	347 059	40·83	70 500	8·29	128 529	15·12	418	0·05	147 612	17·37	347 059	40·83	9	£1	31/-	5·81
,, 7% Cum. 1st Pref. ..	150 000	—		—		—		—		—		—		—		—		7	£1	25/6	5·49
,, 6% Cum. 2nd Pref. ..	100 000	—		—		—		—		—		—		—		—		6	£1	21/3	5·65
	850 000																				
South Wales Elec. Power Distrib. ..	152 530	—	—	29 597	10·65	29 597	10·65	6 266	2·26	15 000	5·39	8 331	3·00	—	—	29 597	10·65	Pref. only	Stock	—	—
,, 5% Pref.	125 320	—		—		—		—		—		—		—		—		5	£10	—	—
	277 850																				
South Waless Power	540 740	21 182	2·67	20 954	2·65	42 136	5·32	16 250	2·06	—	—	1 532	0·19	24 354	3·07	42 136	5·32	Pref. only	Stock	67	—
,, 6½% Cum. Pref. ..	250 000	—		—		—		—		—		—		—		—		6½	£1	19/-	6·84
	790 740																				
Urban Elec. Supp.	444 975	22 953	2·88	102 224	12·86	125 177	15·74	52 148	6·56	47 000	5·91	—	—	26 029	3·27	125 177	15·74	7	£1	32/-	4·38
,, 6% Cum. Pref. ..	350 000	—		—		—		—		—		—		—		—		6	£1	22/6	5·33
	794 975																				
West Gloucestershire Power	235 000	40 640	6·06	11 351	1·69	29 289	4·37	—		—		—		29 289	4·37	29 289	4·37	Nil	Stock	49	—
,, 6½ Partg. Pref. Stk. ..	435 000	(Debit)		—		(Debit)		—		—		—		(Debit)		(Debit)			£100	77	—
	670 000																				

*Including £1 973 (0·56%) Interest.

SUMMARY OF APPROPRIATION ACCOUNTS OF 45 SUPPLY UNDERTAKINGS.

The capital invested in the above companies, and upon which dividends were declared, aggregates £20 060 994, while the totals of the different items on the debit and credit sides of the appropriation are as summarised below :—

Brought Forward ..	£727 199	Dividends Distributed ..	£1 319 321
Profits	2 690 007	Reserves, etc. Allocated ..	1 160 321
Other Income	1 973	Other Appropriations ..	54 169
		Carried Forward	885 368
	£3 419 179		£3 419 179

The amount of dividend actually distributed on ordinary and preference capital averages 0·58% of the total invested capital, while the percentage of profit in relation to capital is 13·41%. On the same basis the percentage allocated to reserves, etc., was 5·78% and other appropriations accounted for 0·27%. The total amount brought forward from the previous appropriation is 3·62% of invested capital, and the sum carried forward to the next appropriation is 4·41%. "Other Income" was 0·01% of capital.

Below is reproduced the summary of the two sides of the appropriation accounts relating to 25 supply companies whose final figures were analysed last week :—

Brought Forward ..	£692 018	Dividends Distributed ..	£2 651 904
Profits	3 897 544	Reserves, etc., Allocated	1 228 567
Other Income	79 672	Other Appropriations ..	68 313
		Carried Forward ..	720 450
	£4 669 234		£4 669 234

The capital invested in the 45 undertakings aggregates £60 844 005, and the combined summary of results, with the percentage of each item in relation to total capital, is shown below :—

	£	%		£	%
Brought Forward ..	1 419 217	2·33	Dividends Distributed	3 971 225	5·52
Profits	5 587 551	10·83	Reserves, &c., allocated	2 388 888	3·93
Other Income ..	81 645	0·13	Other Appropriations	122 482	0·20
			Carried Forward	1 605 818	1·64
	£8 088 413	13·29		£8 088 413	13·29

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COMPANY NEWS.

Depreciation of Cables and Wireless Stocks—Chloride Electrical Storage Co.'s Continued Development—Ever Ready Co.'s Increased Sales—Directors' Reports.

DIVIDEND fears have caused persistent selling of Cables and Wireless stocks during the past week, the 7½% "A" ordinary stock changing hands at nearly 40 and the "B" ordinary stock at 17½. The legal action being taken in America, under the Anti-Trust Act, against the Radio Corporation of America and its associated undertakings is thought likely to be prolonged and at present is having little effect upon prices. The shares of the Radio Corporation have retained the higher level of just over 53 reached last week, American Telephone and Telegraph capital stock remains steady at $240, and General Electric ordinary shares at 50s.

The ordinary shares of the Underground Electric Railways Company of London have dropped from 23s. 6d. to 23s., the explanation being that the holders of the some four millions worth of six per cent. income bonds have the right until the middle of this year to convert into the ordinary shares at 21s. This, of course, will materially add to the amount of the ordinary share capital, but not enough to interfere with dividend prospects.

The ordinary shares of the Urban Electric Supply Company have risen this week to 32s. 6d., ex dividend. The company supplies, either directly or through its controlled companies, electricity in a number of districts as far apart as Cornwall and Scotland. Kensington and Knightsbridge shares are 1s. up, from 26s. to 27s., as also are St. James' and Pall Mall at 28s. 6d. Charing Cross shares have also been bought, the ordinary improving from 27s. 6d. to 28s., and the 4½ per cent. cumulative preference from 17s. to 18s. Both Newcastle companies' shares have been weak, Newcastle and District Electric Lighting ordinary falling 1s. 3d., from 26s. 3d. to 25s., and Newcastle-upon-Tyne Electric Supply shares to a less extent from just over 23s. 1½d. to 22s. 6d. Calcutta issues are unchanged. Victoria Falls are down 1s. 3d., to just under 62s.

Manufacturing shares have been unusually quiet. Telegraph Construction £12 shares at 19½ are a couple of points lower.

Last Annl. Divd.%	Description.	This Week.	Last Week	1926 to 1929 Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98¾
6½	" " "C" 6½% Cm. Pf. Stk.	106	106	117½	98¾
15	B'mouth & Poole El. S. Ord. ..	57/6	57/6	78/-	29/9
6	" " " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stk.	81	81	81	77½
4	Central Elec. Sup. 4% Deb. ..	93½	93½	95¾	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	28/-	27/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	18/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	" " " 6% C.P.	23/-	23/-	24/3	21/6
8	Clyde Valley Electl. Power Ord. .	38/1½	38/1½	44/6	26/6
8	" " " 8% Pref.	28/6	28/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/-	23/-	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	47/6	47/6	68/6	25/9
6	" " " 6% C.P.	23/-	23/-	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/6	24/6	27/-	21/6
(*g*)	Electric Supp. Corp. Ord.	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	22/-	22/-	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord.	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	90	90	92	80½
—	Hydro Electric Securities ..	47¾	47¾	87	20
—	International Holdings	6¼	6¾	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	27/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	28/-	28/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	29/6	29/6	37/6	23/-
5	London Power Co. 5% Deb. Stk...	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	170	170	182	150
10	Metro. Elec. Sup. Ord.	41/3	41/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	27/6	28/6	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	25/-	26/3	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord.	22/6	23/1½	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10¾	10¾	11¼	9¼
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	28/6	27/6	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds..	94	94	98½	86½
7	Urban E.S. Ord.	32/6	27/6	46/6	18/-
5	Victoria Falls Power Ord. ..	61/10½	63/1½	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	94½	94½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	" " " 6% Pf. Stk.	132½	132½	133	103½
6	Calcutta Trams Ord.	12/6	12/6	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)	77	77	74¾	54
4½	" " " 4½ Pf.	80½	80½	85½	78
4	" " " 4% Deb. ..	79	79	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	78½	78	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb..	79	79	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95	95	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	78	78	75½	62
5	" " 5% Deb. ..	82½	82½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	66	66½	81	54½
3½	" " 3½% Pf. Stk. ..	64	64½	76	60½
3½	" " " 3½% Deb. ..	71	71	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77	77	81½	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	89½	89½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
(*i*)9	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/-	23/6	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	87	87	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb.	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	27/-	27/-	58/6	26/3
8	" " " 8% C.P.	50/7½	50/7½	56/9	49/6
4	" " " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	99/4½	56/-
6	" " " 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref.	23/6	23/6	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	120½	120½	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref.	26/10½	26/10½	28/3	25/-
12	Consolidated Signal Ord. ..	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	24/4½	24/4½	27/-	14/-
6	" " 6% Cum. 2nd Pf.	19/-	19/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	13/1½	13/1½	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	20/-
4	" " 1st Mt. Deb...	69½	69½	75	68
20	Enfield Cable Works Ord. ..	85/-	85/-	112/6	60/-
7½	" " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P. ..	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	89	89	103½	86
6	" " Conv. Deb. ..	67½	67½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	19/-	92/3	17/10½
10	" " 7% Partic. Pref. ..	29/6	29/6	34/2	23/9
6	Ferranti 6% Pref.	19/6	19/6	19/4½	16/9
10	General Elec. Ord.	50/-	50/-	81/3	26/6
6½	" " "A" C.P. ..	24/3	23/9	26/-	22/-
7½	" " "B" C.P. ..	26/6	26/6	27/9	22/9
7	" " 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	125/-	125/-	136/10½	69/3
12½	International Auto. Telephone Ord	32/6	32/6	50/6	35/-
10	Johnson & Phillips Ord. ..	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref. ..	23/9	23/9	25/6	22/3
12½	Nat. Elec. Construction (10/-) ..	23/1½	23/1½	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	24/4½	24/4½	36/6	23/6
10	" " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " Deb. Stk.	92½	92½	95	88½
10	Telegraph Const. Ord. (£12) ..	19½	21½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph.				
9	Amer. Tele. & Teleg. Cap. Stk. .	$240	$240	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk	103½	103½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo-Portuguese Tele. Ord. ..	21/10½	21/10½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	44½	50½	90½	73½
—	"B" Ord. Stk.	19½	23½	104	33
—	5½% Cum. Pref. Stk. ..	91½	93½	99	90
3½	Eastern 3½% Pref. Stk. ..	64½	64½	70½	58½
4	" 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	78	78	80½	73
22	Great Northern Telegraph (£10)	30	32	43½	20
—	International Teleph. & Teleg. ..	$65½	$65½	161½	43½
15	Marconi Int. Mar.	38/9	38/9	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	99½	102½	95
12	Oriental Telephone Ord.	55/-	55/-	65/-	41/-
—	Radio Corporation of America ..	53½	53½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
	Western Tel. 4% Deb. Stk. ..	78	78	82	75

(*a*) 19$\frac{5}{16}$d. per share. (*b*) 1s. 9·2d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·477d. per share. (*e*) 1s. 7·18id. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2$\frac{3}{8}$d. per share. (*h*) 88s. 2·136d. (*i*) 9%, plus special bonus of 30% from sale of omnibus company's shares. * Ex dividend.

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Directors' Reports, etc.

ROYCE, LTD.—Net pft. for past year, £293. No. div. proposed on ord. or pref.

HYDRO-ELECTRIC SECURITIES CORPORATION. Qrtrly. div. on common stk. of 50 cents p. sh. will be payable on June 14.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.—Fin. div. of 10%, less tax, recommended, again makg. 15% for year.

PENNSYLVANIA WATER AND POWER CO.—Div. of $\$\frac{3}{4}$ p. sh. on common stk. for qrtr. ending June 30, 1930, will be payable on July 1.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Div. on new common shs. 38 cents p. sh. for qrtr. ending June 30, 1930, is announced.

SHEERNESS AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Credit blce. £14 626, plus £3 490 brt. in. To res., £7 500. Ord. div., 10% for year. Fwd., £3 115.

DUNDEE, BROUGHTY FERRY AND DISTRICT TRAMWAYS CO., LTD.—Pft. for 1929, £2 504, agst. £2 780 for 17 months. Deb. stk. int. £1 116, agst. £1 611. Fwd., £1 388.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—The common shs. are to be split into two for one, and from now on the common stk will consist of 5 000 000 shs. of no par value.

MANSFIELD AND DISTRICT TRAMWAYS, LTD.—Pft. for 1929, £8 283, includg. £3 366 brt. in. Deb. int., less tax, and loan int. required £3 986, and deb. stk. redemptn., £3 108. Fwd., £1 189.

GREAT NORTHERN TELEGRAPH CO., LTD.—Fin. div. and bonus for 1929, £1 10s. per £10 sh., less tax, are now payable by Messrs. Hambros Bank, Ltd., 41, Bishopsgate, London, E.C.2.

RANGOON ELECTRIC TRAMWAYS AND SUPPLY CO., LTD.—Gross pft. for 1929, £181 139, agst. £180 019; net pft. £62 828, agst. £58 058. Div. for year R.1$\frac{3}{4}$ p. sh. Fwd. £25 817 agst. £20 942.

CANADIAN GENERAL ELECTRIC CO., LTD.—Qrtrly div. on common stk. of 75 cents p.sh., being at rate of 6% p.a. and qrtrly. div. of 1$\frac{3}{4}$% on pref. shs., being at rate of 7% p.a., will be payable on July 1.

ALTRINCHAM ELECTRIC SUPPLY, LTD.—Pft. for 1929, £28 120, agst. £31 757, plus £2 000 brt. in. Fin. divs. 2% on ord., and 14% on dfd. Fwd., £2 236. Assessmt. for local rates increased from £3 500 to £10 000.

PENARTH ELECTRIC LIGHTING CO., LTD.—Net. rev. for 1929, £12 065, agst. £11 341. After provisn. for exes., income tax, and int., blce. is £5 520, plus £3 022 brt. in. To res., £4 000; div. on ord., 7$\frac{1}{2}$%; fwd., £2 317.

WEMYSS AND DISTRICT TRAMWAYS CO., LTD.—Pft. for 1929, after provisn. for administratn. exes., taxatn., etc., and includg. £56 brt. in and £2 000 transferred from res., £7 283. Int., £7 061; to deb. stk. redemptn., £200. Fwd. £22.

POWER INVESTMENT CORPORATION.—Net pft. for year ended March 31, 1929, £85 169, agst. £75 787. Pref. div. requires £26 819, agst. £25 909, and ord. div. of 5%, £20 786, agst. £25 910. Fwd. £39 746. Investmts. and participatns. shown in blce. sheet as £1 573 872, agst. £1 424 570.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON, LTD.—Hldrs. of 6% income bonds are reminded that offer of company to convert bonds into fully-paid ord. shs. expires on June 30, 1930. Conversion is at rate of one ord. sh. for every £1 1s. of total principal amt. in sterling of all the income bonds exchanged.

HYDRO-ELECTRIC SECURITIES CORPORATION.—Qrtly. div. of 50 cents p. sh. on issued common shs. of no par value will be payable on June 14 by Finance Trust and Agency, Ltd., 4, Crosby Square, London, E.C., or by the Corporation's representatives in Brussels.

GENERAL GAS AND ELECTRIC CORPORATION.—Consolidated net income for 1929 $6 086 052, an increase of more than 60% over 1928 consolidated income, amtg. to $3 791 150. Blce. sheet as at Dec. 31 last showed total assets $209 822 069, and total surplus $61 168 820. Corporation owns or controls public utility concerns supplying over 44 000 customers in South Carolina and Florida and has made large investmts. in Associated Gas and Electric Co. and other public utility enterprises.

L. M. ERICSSON TELEPHONE CO.—Directors propose to ncrease cap. from £3 360 000 to £5 600 000 by issuing 806 650 new B shs. at 110% on par, or 55 kronor. Of this sum £2 240 000 will be added to sh. cap., and remaing. £230 000 to res. Subscriptn. began on May 19. Hldrs. of old shs. are entitled to take up to two new "B" shs. for every three old ones. New shs. will be entitled to div. from Jan. 1, 1931, but int. at 6% will be paid on amt. paid in from date of payment up to Dec. 31, this year.

AEONIC RADIO, LTD.—Accts. for 15 months ended Jan. 31, 1930, state that net pft. was £2 370, after carrying to develop-mt. acct. advertising and wages and materials totalling £30 000, and providg. debtors' reserve of £10 000. Directors now propose to reconstruct company, and shhldrs. will be given right to take up three shs. of 2s. 6d. ea. in the new company, credited with 2s. p. sh. paid up, in respect of every five 2s. shs. held, blce. of 6d. per share being payable as to 1d. p. sh. on applicatn., 2d. on allotmt. and 3d. one month after allotmt.

ELECTRAMONIC CO., LTD.—For period from March 26, 1928, to Oct. 31, 1929, loss on tradg. was £67 679. Loss on sale of plant, motors and a lease amtd. to £9 878; deficiency owing to transfer from the company of shs. in Electramonic (Foreign Rights), Ltd., was £33 413; and directors' fees absorbed £2 402, makg. total of £113 389. After takg. credit for transfer fees, £250, and underwritg. commission, £730, there remained a debit of £112 389. A scheme of reconstructn., under which the company will be liquidated and the assets sold to a new company to be called Electramonic (1930), Ltd., will be submitted at the annual gen. mtg. on June 11.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Gross earngs. for 1929, $49 351 215, agst. $42 774 813; net earngs., $28 052 961, agst. $24 869 330; miscellaneous rev., $281 998, agst. $145 933; total charges of subsidiaries, $11 150 325, agst. $10 631 269; blce., being rev. to Brazilian Traction Co., $17 184 634, agst. $14 383 994; gross rev. Brazilian Traction Co., $17 605 179, agst. $14 762 619; total charges Brazilian Traction Co., $744 083, agst. $641 015; net rev. Brazilian Traction Co., $16 861 096, agst. $14 121 604. Total assets, $368 956 552; total reserves, $125 529 728. Liabilities include cap. stk. $170 563 338 and funded debt $60 184 200.

BRITISH ELECTRIC TRACTION CO., LTD.—Gross pft. for year ended Mar. 31, 1930, £396 261, agst. £330 822. After deductg. £63 701 for gen. exes., directors' fees, income tax and staff endowment fund, and £79 479 for deb. stk. int., blce. is £253 081. Divs. recommended: pref., 6%, pfd. ord., 8%, and def. ord., 5%. Surplus, £95 832. Directors recommend that £16 768 (equal to 10% on def. ord.) be capitalised and distributed to def. ord. stkhldrs. in fully paid def. ord. shs. of £1 each, to be converted subsequently into def. ord. stk. Subject to this being approved, pref. stkhldrs. are entitled to further div. of 1·89%, (makg. 7·89% for year), leavg. blce. £65 547 to be added to undivided pfts. acct., makg. that acct. £251 798. Amt. to credit of res. acct. remains at £520 000.

INTERNATIONAL HYDRO-ELECTRIC SYSTEM.—For first year of operatn. ended March 31, 1930, net income was $21 550 801, after deeductn. of depreciatn., taxes, etc. Int. on funded debt and div. on stk. of subsidiaries $18 606 183, leavg. $2 944 617 as blce. added to surplus. This amt. was equal to 1·9 times div. requiremts. on class A stk. After additn. of paid-in surplus and surplus adjustmts. amtg. to $12 360 238, total gross surplus was $15 304 856, from which div. on class A stk., aggregatg. $1 246 317, were deducted, leaving net surplus $14 058 539. Blce. added to surplus during first qrtr. of 1930, $1 107 076, was at substantially better rate than average for whole year, due principally to increased deliveries by subsidiaries of Canadian Hydro-Electric Corporation and to normal growth of New England Power Association.

Company Meetings.

LISKEARD GAS AND ELECTRICITY CO., LTD.—At the half-yearly meeting, May 26, a resolution was passed assenting to the disposal of the undertaking to Edmundson's Electricity Corporation, Ltd. It was stated that the offer was to purchase the £1 ordinary shares at 35s. each and the 7% preference shares at 27s. each, the Corporation also accepting responsibility for debentures amounting to £8 000 and agreeing to pay off loans of £2 450.

SHANGHAI ELECTRIC CONSTRUCTION CO., LTD.—Mr. J. S. Haskell, presiding at the meeting of May 28, said the accounts showed a satisfactory financial position, inasmuch as they had been able to increase the reserve for renewals to £96 000 and the general reserve to £62 000. They held £75 000 of 5% War Loan and they had also a reserve of £7 000 made up of guarantee premiums received from the Singapore Traction Co. The true test of the vitality of the business was the number of passengers carried, which had risen from 123 000 000 to 137 000 000. The effective receipts, expressed in Mexican dollars, showed an increase of almost exactly 10%, compared with the preceding year. The report and accounts were adopted, and a final dividend of 7$\frac{1}{2}$%, making 12$\frac{1}{2}$% for the year, was declared.

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RICHARD JOHNSON AND NEPHEW, LTD.—At the meeting on May 29, Lt.-Gen. Sir Walter Campbell, chairman, said he was glad to announce that they had been successful in obtaining a share of the work initiated by the Central Electricity Board for the electrification of Great Britain. The high cost of copper throughout the past year had no doubt stayed the hand of many consumers. It was an artificial price, maintained by the American Exporters' Association, who, they believed, controlled approximately 90% of the world's supply. Since the close of the financial year the price had broken, and it remained to be seen whether this "ring" had not done itself more harm than good by driving potential consumers to use some other material where possible. On the subject of safeguarding, he said 72 000 tons of steel wire and 6 500 tons of copper wire were imported into this country last year, and it could easily be realised what a help it would be to the wire industry of this country if they could share this tonnage between them. He was satisfied that safeguarding would not raise prices against the consumer, as standing expenses would be spread over a larger output, and so reduce costs of production. The report was adopted.

South American Progress.

COMPANIA HISPANO AMERICANA DE ELECTRICIDAD S.A., BARCELONA (C.H.A.D.E.).—At the meeting on May 28, Señor Don Juan Ventesa, vice president, said the increase in consumption of electricity in the city of Buenos Aires and the favourable development of the province of the same name induced the board some time ago to endeavour to concentrate in this zone the activities of the various undertakings controlled by the company. In 1923 and 1924 they purchased the businesses of the concerns supplying electricity to the districts of General Sarmiento, Moreno, and La Plata. Later they took over the business of the Magdalena district, and finally, in 1929, attained direct control of the production and supply of power in Buenos Aires and in a zone of 100 km. around the Federal capital. Besides acquiring the power companies of General Rodriguez, Las Heras, Pilar, Coronel Brandzen, San Vicente, Canuelas, Echeverria, Marcos Paz, and Escobar, they had obtained control of the Compania de Electricidad de la Provincia de Buenos Aires. During the past year they also acquired an interest in the Primitiva Gas Co. of Buenos Aires. The increase in the consumption of power produced by the power stations of Buenos Aires had been 15·2%. The total current consumed had reached 625 559 198 kW. During the months of 1930 that had already passed the increase in consumption had been maintained at a higher level (17%). As announced in October, the directors decided to purchase immediately a new turbine of 52 500 kW, which would be installed in the super-power station of Buenos Aires. The balance of net profits available for distribution was 52 718 514 gold pesetas, against 50 884 560 pesetas, equivalent to 42 993 752 gold pesetas, for last year. This enabled the board to propose the payment of a total dividend of 17% gold, free of Spanish taxes, against 15% gold last year.

EVER READY CO. (GREAT BRITAIN), LTD.—Mr. Magnus Goodfellow, presiding at the meeting on June 2, said the sales for the past year showed an increase of 22½% over those for the previous year, and the increase in profit, £34 388, would have been at least proportionate to the increase in sales but for the fall in the values of materials and commodities during February and March, which necessitated their writing down stocks to the lower market values, but they had been enabled to effect reductions in price to the consumer of a number of their productions which would, he thought, still further stimulate the popularity and sale of their products. The reserves had been increased by £30 000. The balance on profit and loss account to be carried forward after payment of the dividend amounted to £34 000—roughly £3 300 more than it was a year ago. The increase of approximately £10 000 in the item "subsidiary companies" was due to the acquisition of a controlling interest in the capital of two small companies. It would be seen from the directors' report that no subsidiary company had made a loss. Every subsidiary company had made a profit, and the aggregate of profits exceeded the dividends they had received from these companies during the year. It appeared to be generally accepted that the present world-wide trade depression might continue during the coming year and might even grow worse than at present. The cause of the depression appeared to be excessive production and lower consumption, due to the fall in spending power in a number of countries. The report was adopted and final dividends of 5% on the preference shares (making 10% for the year) and 25% on the ordinary shares (making 35% for the year) were declared. At an extraordinary meeting which followed, resolutions were passed authorising the increase of the capital to £1 000 000 by the creation of 1 000 000 ordinary shares of 5s. each to rank *pari passu* with the existing ordinary shares.

LANCASHIRE ELECTRIC LIGHT AND POWER CO., LTD.—Mr. Alfred Shepherd, presiding at the meeting on June 2, said the trading profits of the parliamentary company, which was generally referred to as the power company and from which the Lancashire Electric Light and Power Co. derived practically the whole of its revenue, showed an increase of nearly £20 000 over those of the previous year, and, after deducting amounts for income tax and depreciation, there was a net balance of £201 357. This sum had been paid to the Lancashire Electric Light and Power Co. by way of dividends and interest, and, with the management fee, enabled the board to bring into the profit and loss account £209 892, an increase of approximately £22 000. Referring to the developments in the Power company's business, the principal event of the year had been the bringing into commission of the Kearsley station in October. During the year the units delivered to feeders were from Radcliffe 103 742 000, from Padiham 67 325 000, and from Kearsley 27 308 000, and 54 221 887 were purchased in bulk. The generating plant in the three stations had a maximum continuous rating of 162 000 kW. Units sold were 226 618 000, against 206 608 000, an increase of 9·7%, and the average price per unit sold was 0·655d., against 0·677d. Mains were being laid this year to deal with a large area between Preston and Chorley. The Commissioners had approved their application for a Special Order covering the districts round about Ormskirk. As regards the revenue account of the Lancashire Electric Light and Power Co., there was a balance, after payment of directors' fees, management expenses, and debenture interest, of £173 108, compared with £150 885. After payment of preference fixed dividends there was a balance of £90 605. It was proposed to pay a dividend at the rate of 7%, less income tax, on the ordinary shares, and to carry forward £3 805, against £3 308 brought in. The report was adopted and the dividends were approved.

Accumulators and The Grid.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—At the meeting on May 30, Mr. W. S. Naylor, chairman, said they were in the gratifying position of being able to report a continuance of development and prosperity, and that, as a consequence of additional business, the profits for the year showed a satisfactory increase. They had the largest storage battery factory in the British Empire. They had sales depots in London, Bristol, Birmingham, Manchester, Glasgow, Dublin, and Belfast. These supplied the requirements of the trade and that large organisation of 500 to 600 Exide service agents, whose distinguishing "Exide" sign could be seen in all parts of the United Kingdom. They were also obtaining important business in the highly protected Continental countries. The "Keepalite" system, which they had designed and patented, automatically switched on emergency lamps if for any reason the regular lighting was interrupted. It was already in use in hospitals all over the country. In the cinema the "Keepalite" system ensured light in an emergency, and by so doing might avert a panic. Their principal raw materials were lead and oxides of lead, and there was the ever-present danger of lead poisoning to the workpeople. In the past the accumulator industry had figured far too prominently in the Home Office records of cases of lead poisoning. Some three years ago the directors decided to appoint a fully qualified doctor to devote his whole time to the study of the problem and take charge of its prevention in their works. The appointment, made in the autumn of 1927, had met with such gratifying success that they had had no case of lead poisoning during the years 1928, 1929, and so far in 1930. A resolution which was to be shortly submitted dealing with the disposal of profit referred to an appropriation of £11 500 for the benefit of employees. He was sure this item would receive hearty approval. In recent times it looked as if the stationary battery business were doomed by reason of the spread of the use of alternating current, and the proposed electrical transmission to every remote village. This development, by the complicated nature of its arrangement and the newness of the engineering problems involved, introduced new risks of interruption of the supply, and it was obvious that they opened out a new field for the standby or emergency battery on the premises of the user of electricity. They were proposing to double their ordinary capital by the issue of a 100% share bonus. The report and accounts were unanimously adopted.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ALBANY RADIO CO, Norfolk Mews East Praed Street, W., wireless dealers. £13 3s. 10d, April 8, and £11 15s. 6d., April 15.

BORDER ELECTRICAL FACTORING CO., LTD., Collier Lane, Carlisle, electrical engineers. £11 4s. 8d. April 10.

BROSAN, Rudolph, 267, High Road, Willesden Green, N.W., wireless and electrical dealer. £11 8s. 8d. May 1.

DOE, E., trading as WIRELESS MART, 578, Oxford Road, Reading, wireless dealer. £13 2s. 3d. April 10.

IBBOTSON BROS., LTD., Doncaster Road, Rotherham, electrical contractors. £25 3s. 9d. April 11.

KERR AND CO., 3, The Crescent, Fisher Street, Workington, electrical dealers. £16 5s. March 28.

LENT, Gordon C., 24, London Road, Dover, wireless dealer. £14 18s. 8d. March 25.

MARTIN AND CO., 71, Darville Road, Stoke Newington, electrician. £17 6s. 1d. April 14.

RADIO AND ELECTRICAL ACCESSORIES CO., 25a, Paradise Street, Birmingham, radio dealers. £21 18s. March 17.

SMITH (VERNON) AND SONS, LTD., 123, High Road, Chiswick, electrical engineers. £20 16s. 4d. April 16.

SOUTHALL, Mr. T., 29, High Street, Welshpool, general and electrical engineer. £11 8s. 3d. April 3.

STEADMAN, Mr. F. S., trading as ELTHAM RADIO SUPPLIES, 3, Marlewood Parade, High Street, Eltham, wireless dealer. £30 16s. 2d. March 17.

UNIT ELECTRIC SERVICES, 34, Aldermanbury, Bradford, electricians. £21 18s. 5d. April 10.

WEST LEIGH RADIO, 1337, London Road, Leigh-on-Sea, radio dealers. £17 13s. March 24.

WESTON ELECTRICAL CONTRACTS CO., 17, George Street, N.W., engineers. £17 12s. 4d. April 15.

WHITE, Mr. E., trading as NORBITON ELECTRIC SERVICE CO., 190, London Road, Kingston. £20 6s. 6d. April 24.

WILLOUGHBY, Mr. B. J., Strathcona, Polgooth, St. Austell, electrical contractor. £19 17s. April 7.

WORRALL, John, 87a, Marmion Road, Southsea, wireless dealer. £18 3s. 11, April 17, and £17 15s. 2d., March 28.

Deeds of Arrangement.

HOLT, George Frederick, 13, Hibel Road, Macclesfield, wireless apparatus dealer. Dated May 27, filed June 2. Trustee, J. R. Atkins, 14, St. Ann's Square, Manchester. Liabilities unsecured, £258; assets, less secured claims, £84.

JACKSON, Thomas, Hewitt Vincent, trading as SHEFFIELD WIRELESS DEPOT, 178, Norfolk Street, late 95, Rustlings Road, Sheffield, wireless dealer. Dated May 27, filed May 30. Trustee, T. A. Stoker, 71, Albion Street, Leeds. Liabilities unsecured, £598; assets, less secured claims, £315.

SIMKINS, Frederick William, trading as BROADWAY RADIO SUPPLIES, Roxeth Corner, Harrow, wireless dealer. Dated May 23, filed May 29. Trustee, E. H. Hawkins, 4, Charterhouse Square, E.C. Liabilities unsecured, £244; assets, less secured claims, £169.

TURNOCK, George, 41, High Street, Aston New Town, Birmingham, and 25, Havelock Road, Handsworth, electrical engineer. Dated May 26, filed June 2. Trustee, F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham. Secured creditors, £1 614; liabilities unsecured, £3 540; assets, less secured claims, £801.

WEBB, Ralph Neville, trading as WEBB CONDENSER CO., 42, Hatton Garden, E.C., wireless condenser maker. Dated May 16, filed May 23. Trustee, E. H. Hawkins, 4 Charterhouse Square, E.C. Liabilities unsecured, £1 069; assets, less secured claims, £489.

Receivership.

LEADING LIGHT SYNDICATE, LTD. W. B. Hall, C.A., of National Provincial Chambers, Silver Street, Hull, was appointed Receiver on May 23, 1930, under powers contained in debenture dated June 22, 1923.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ALPHA MANUFACTURING AND ELECTRICAL CO., LTD., London, S.W. Registered May 13, mortgage to Bank; charged on 26, High Road, Balham, etc. *£1 000. July 30, 1929.

FOSTER (W. D.) AND CO., LTD., London, N.W., manufacturers of magnetos, etc. Registered May 13, £1 600 deb. to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on land in London, also general charge.

NEWFIELDS, LTD., London, S.E., radio engineers. Registered April 16, £1 000 debentures; general charge.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

COCHRANE, S. K. Y., trading as POPULAR WIRELESS STORES, 26, Moorfields, Liverpool, and 267A, Wallasey Village, Wallasey. A meeting of the creditors was held on May 27, at the offices of Mr. Parkin S. Booth, accountant and auditor, Exchange Chambers, Bixteth Street, Liverpool. The statement of affairs showed liabilities of £227. The assets comprised stock £150, estimated to realise £70; and fixtures, etc. £70, valued at £35; making a total of £105, which was the amount of the preferential claims. Mr. Booth reported that the debtor commenced business in April, 1929, when he purchased the stock and fixtures at No. 26, Moorfields, from the trustee of the estate. The money was advanced by friends. The turnover at Moorfields had averaged £33 a week, whilst the expenses included £180 rent and £105 rates a year. Last November, the debtor opened a further business at Wallasey. Mr. Booth added that it was obvious that the business had not been carried on at a profit owing to the heavy overhead expenses. A resolution was passed confirming the deed of assignment already executed to Mr. Booth, and the debtor was requested to obtain the assistance of friends with a view to making an offer of at least 2s. in the £.

London Gazette, etc.

Company Winding-up.

"K.N." ELECTRICAL PRODUCTS, LTD. Winding-up order May 26.

Companies Winding-up Voluntarily.

CHEMICO-ELECTRIC CO., LTD. By special resolution, May 26, A. J. Bennell, 7 and 8, Norfolk Street, Strand, London, W.C.2. appointed as liquidator.

KINGS INVENTIONS (ELECTRIC), LTD. By reason of its liabilities, May 28. G. H. Ashworth, appointed as liquidator.

ROLYAT TRUST, LTD. By special resolution, May 23. C. E. Taylor, 11, Poultry, E.C.2, appointed as liquidator.

Bankruptcy Information.

ATACK, Handel Arthur, 442, Borough Road, Birkenhead, Chester, electrician and dealer in wireless accessories. Receiving order, May 26. Debtor's petition. First meeting, June 6, 11 a.m., Official Receiver's Office, Government Buildings, Victoria Street, Liverpool. Public examination, July 2, 10.30 a.m., Court House, Pilgrim Street, Birkenhead.

DAVIES, Daniel James, 36, Cambrian Street, Aberystwyth, wireless engineer, lately Market Place, Newcastle-Emlyn, Cenarth, Carmarthen. Receiving order, May 30. Debtor's petition.

HANSON, Thomas Stanley, 26, Nether Hall Road, Doncaster, Yorks, electrical contractor. Receiving order, May 26. Debtor's petition.

Notice of Dividend.

AUSTIN, Clifford, 97, Domestic Street, Leeds, trading as C. AUSTIN AND SON and AUSTINS ACCUMULATOR AND RADIO SERVICE, wireless accessories dealer. First and final dividend, 3s. 6d. per £, payable, June 20, Official Receiver's Office, 24, Bond Street, Leeds.

Notice of Intended Dividend.

SHEPHERD, Cyril, 69, Micklegate, previously 73, Acomb Road, formerly Coffee Yard, Stone Gate, York, radio engineer and dealer in wireless accessories. Last day for receiving proofs, June 18. Trustee, D. S. Mackay, Duncombe Place, York, Official Receiver.

Application for Discharge.

EDGHILL, Harry George, 13, Wembley Hill Road, Wembley Middlesex, electrical and wireless engineer. Hearing, June 24 10.30 a.m., Court House, St. Albans.

Partnerships Dissolved.

FAIRLOP MOTOR WORKS (Francis Joseph MACEY, and Irene Isabel HARVEY), motor, general and electrical engineers, Fairlop Motor Works, Barkingside, Essex, by mutual consent as from May 23, 1930. Debts received and paid by F. J. Macey, who continues the business.

TREBLA SERVICE CO. (Albert Edward ARUNDALE and Albert WAITE), cycle and wireless dealers, 146, Town Street, Bramley, Leeds, and High Street, Upton, near Pontefract, Yorks, by mutual consent as from May 21, 1930. Debts received and paid by A. E. Arundale.

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NEW COMPANIES.

JAXONS, LTD.—Cap., £300. Electrical engineers, etc. Reg. Office: 10, Kensington Square, Kensington, London, W.8.

BULLARCH IGNITION CO., LTD.—Cap., £2 000. Auto electrical engineers, etc. A director: R. A. Bullock, 6, Beaufort Villas, Rathfarnham, Dublin.

A. AND C. EDELMAN, LTD.—Cap., £400. Electrical suppliers, engineers and lighting and heating contractors, etc. Reg. Office: 76, Stockwell Street, Glasgow.

HEADLEY AND EDWARDS (CAMBRIDGE), LTD.—Cap., £10 000. Ironfounders, electrical engineers, etc. Reg. Office: 11 and 12, Corn Exchange Street, Cambridge.

PRECISION TOOL AND INSTRUMENT CO., LTD.—Cap., £3 000. Electrical consulting and scientific engineers, etc. Reg. Office: 72, Newington Butts, London, S.E.11.

SILVEX SIGNS, LTD.—Cap., £2 000. Manufacturers of, and dealers in, apparatus for publicity, electricians, etc. A director: R. Pulford, 4, Pattison Road, Finchley Road, London, N.W.

THOMAS A. ROSE AND SON, LTD.—Cap., £3 000. To acquire business of electrical engineer and dealer in electrical novelties now carried on by T. A. Rose at 25, Milton Street, London, E.C.

STROMBO ELECTRIC CO., LTD.—Cap., £500. Manufacturers of, and dealers in, electric lighting apparatus, wireless apparatus, etc. Reg. Office: 8, Compton Passage, Clerkenwell, London, E.C.

TONEX, LTD.—Cap., £500. Factors, vendors and manufacturers of, and dealers in, electrical instruments, apparatus, machines, accessories and goods, etc. Reg. Office: Walmer House, Regent Street, London, W.1.

SPENCER RADIO, LTD.—Cap., £2 000. **To acquire from K. S. S. Spencer working models of mechanical and scientific inventions appertaining to wireless receiving sets, etc. Reg. Office: 136 to 142, Clerkenwell Road, London, E.C.**

NORTHAMPTON RADIO, LTD.—Cap., £100. Importers, exporters and manufacturers of, and dealers in, electrical and wireless goods, electric light and electrical engineering tools, etc. Reg. Office: 28, St. Giles' Street, Northampton.

LONDON DISPLAY GUILD, LTD.—Cap., £400. Manufacturers and factors of shop window display fitments, advertising signs, electric lamps and fittings, electrical engineers, etc. Reg. Office: 7, Juxon Street, Lambeth Walk, London, S.E.11.

MUTTER, SANDERS AND CO., LTD.—Cap., £1 500. To acquire business of electrical and mechanical engineers, etc., heretofore carried on by T. D. Mutter and C. E. Sanders at Royal Stuart Works, East Canal Side, Cardiff, as "Mutter, Sanders and Co."

ZENITH AUTO ELECTRICAL SERVICES, LTD.—Cap., £300. To acquire the business of Leonard A. Wicks Davis, trading as Zenith Auto Electrical Services, of 31A, St. Jude Street, Dalston, London, N. 16, and to carry on business of electrical and motor engineers, etc.

RADIO BY-WIRE (BEVERLEY), LTD.—Cap., £2 000. To construct, work and maintain wireless signal and receiving stations, to carry on the business of electricians, wireless, radio, electrical, and general engineers, etc. Reg. Office: Exchange Court, Bowlalley Lane, Hull.

IBEX MANUFACTURING CO., LTD.—Cap., £500. To acquire goodwill of business carried on by C. E. Stacey and L. G. Floyd, together with trade mark "Ibex," and to carry on the business of manufacturers and importers of and dealers in lamp shades. Reg. Office:—Ibex Works, Radcliffe Road, Winchmore Hill, London, N.

TUBE TURNS, LTD.—Cap., £100. To carry on exploitation of chemical or electro-chemical processes, to acquire interests in patents relating to the production, treatment, storage, application, distribution and use of electricity, electro-chemicals and other electric products, to carry on business of manufacturers of electric and mechanically operated plant, etc. Reg. office: 34, Victoria Street, London, S.W.1.

BARBIERI ORGANS (GREAT BRITAIN), LTD.—Cap., £15 000. To adopt an agreement with D. A. Barbieri, Corvi and Semeraro Societa Accomandita and N. Hall, G. Palmer, J. W. White and F. R. Ward (for the company), and to acquire patents granted to said D. A. Barbieri in the British Empire and the U.S.A., for invention relating to improvements in the manufacture of electrically controlled organs and piano players, etc. Reg. Office: 14, Queen Victoria Street, London, E.C.4.

W. E. CHAPPELL, LTD.—Cap., £1 000. To acquire business of dealer in electrical and wireless equipment and accessories carried on by W. E. Chappell at 160 and 167, Young Street, Sheffield.

POWER CONTRACTS (BATWIN), LTD.—Cap., £10 000. To acquire undertaking, or part thereof, of Power Contracts, Ltd., to carry on business of electricians, electrical and mechanical engineers, importers and suppliers of electric motors, dynamos, etc. Reg. Office: 138, Southwark Street, London, S.E.1.

THE LEAD MARKET.

A quiet tone prevailed in the market last week, and, according to James Forster and Co., though the opening was a little firmer, prices have since eased and closed a little lower on the week. Closing prices on May 20 were: £17 16s 3d. for June, £17 18s. 9d. for July, £18 for August and £18 1s. 3d. for September, about 2s. 6d. per ton lower on the week.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

WAC.—509 729. Class 8. Battery charging apparatus. Charles Edgar Dansie, 90, Berners Street, Ipswich, Suffolk; merchant. January 23, 1930.

SUMMIT.—511 600. Class 18. Electric fires. H. Frost and Co., Ltd., 35, Fieldgate, Walsall; manufacturers. March 28, 1930. (By consent.)

HELECO.—501 440. Class 8. High tension batteries, dry batteries, aerials, low frequency transformers, variable condensers, and high frequency chokes, all being apparatus for use in wireless telephony and telegraphy. Michael James Wass, trading as Heleco Radio Co., 19–20, High Street, Shoreditch, London, E.1; manufacturer.—April 3, 1929.

AEROFICIENT.—505692. Class 8. Wireless telephonic and telegraphic instruments and parts thereof. Graham Farish, Ltd., 153, Mason's Hill, Bromley, Kent; manufacturers.—August 30, 1929. To be associated with No. 500 220 (2 663) and another.

ELECTROFICIENT.—505693. Class 8. Wireless telephonic and telegraphic instruments and parts thereof. Graham Farish, Ltd., 153, Mason's Hill, Bromley, Kent; manufacturers.—August 30, 1929. To be associated with No. 500 220 (2 663) and another.

LYRIC.—508 868. Class 8. Radio and television receiving sets and component parts thereof, namely—loud speakers and fixed and variable condensers. All-American Mohawk Corporation, 4 201, Belmont Avenue, Chicago; manufacturers.—December 17, 1929. (By Consent.)

VOICE OF THE AIR.—508 892. Class 8. Sound amplifying apparatus and parts thereof, amplifying and rectifying tubes or valves, wireless telephonic apparatus and parts thereof, phonograph records and wireless telephonic apparatus in combination with phonographs. Grigsby-Grunow Co., 5 801, Dickins Avenue, Chicago; manufacturers and dealers in radio, phonographs and accessories.—December 17, 1929.

AGILE. 510 324.—Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Otto Simonis, 16, Upper Hamilton Terrace, St. John's Wood, London, N.W.8; engineer. —February 12, 1930. To be associated with No. 510 325 (2722) xiii.

STERNET.—511 247. Class 8. Wireless telephonic apparatus, gramophones and parts thereof and gramophone records. The British Homophone Co., Ltd., 67–69, City Road, London, E.C.1; manufacturers.—March 18, 1930. To be associated with No. 506 570 (not yet advertised).

LISSEN.—512 103. Class 8. Electrical accumulators and batteries, not for medical purposes. Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex: manufacturers.—April 15, 1930. To be associated with No. 493 682 (2 651) and others.

PILOT (sign).—511 281. Class 8. Batteries for use in small flash lamps. William Twist and Sons, 19 to 27, Market Street, St. Helens, Lancashire; merchants.—March 19, 1930.

METAL AND CHEMICAL PRICES.

TUESDAY, June 3.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£60 0 0	—	—
Electro Wirebars	,,	£61 10 0	—	—
H.C. Wire, basis	per lb.	9 1/32d.	—	—
Sheet	,,	9 3/8d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0 1/32d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	8 1/4d.	—	—
Sheet ,,	,,	8 1/4d.	—	—
Wire ,,	,,	9 3/8d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 5 0	—	5s. od.
Foreign or Colonial	,,	£17 15 0	—	7s. 6d.
Tin—				
Ingot	per ton	£138 17 6	—	£3 2s. 6d.
Wire, basis	per lb.	1s. 11 1/4d.	—	1/4d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£16 12 6	—	2s. 6d.
Mercury	per bottle	£22 10 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £32 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2 1/2d.
Sodium Bichromate—Per lb., 3 1/2d.

Rubber—Para fine, 7 1/4d.; plantation, 1st latex, 6 1/2d.

*** The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

COMING EVENTS.

Monday, June 9.

ELECTRICAL CONTRACTORS' ASSOCIATION (LIVERPOOL BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (HASTINGS BRANCH).—Lewcock's Restaurant. Ordinary meeting.

Tuesday, June 10.

ELECTRICAL CONTRACTORS' ASSOCIATION (LEICESTER BRANCH).—Corridor Chambers. Ordinary meeting. 2.30 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (BOURNEMOUTH BRANCH).—Ordinary meeting. 7.30 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (SWANSEA BRANCH).—Ordinary meeting.

Wednesday, June 11.

ELECTRICAL CONTRACTORS' ASSOCIATION (EASTBOURNE SUB-BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (SHEFFIELD BRANCH).—Ordinary meeting 5.30 *p.m.*

Thursday, June 12.

ELECTRICAL CONTRACTORS' ASSOCIATION (BIRMINGHAM BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (NOTTINGHAM BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (EAST YORKS BRANCH).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS.—Natural History Museum, Cromwell Road, South Kensington. Annual Conversazione. 8.30 *p.m.*

Friday, June 13.

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. Papers by Mr. E. J. Williams on "The Induction of Electromotive Forces in a Moving Liquid by a Magnetic Field, and their Application to the Investigation of the Flow of Liquids," Prof. E. V. Appleton on "Wireless Methods of Investigating the Electrical Structure of the Upper Atmosphere," and a demonstration by Dr. H. R. Lang on "A Modified Calendar Recorder for the Automatic Control of a High Temperature Oil Bath." 5 *p.m.*

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THE ELECTRICIAN

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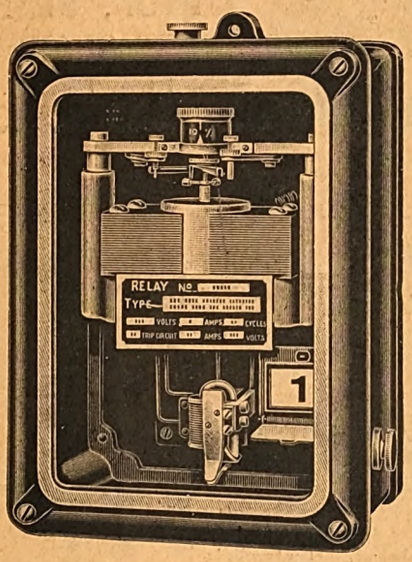

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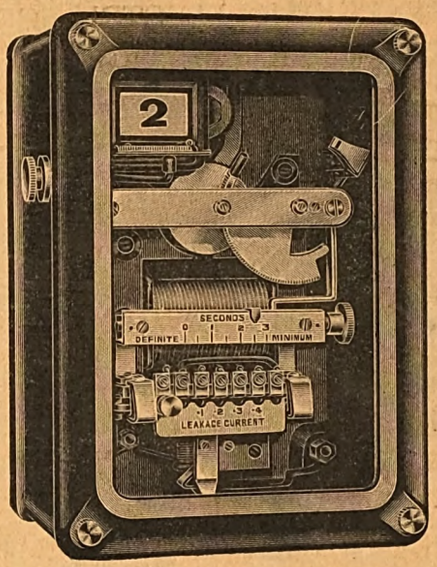

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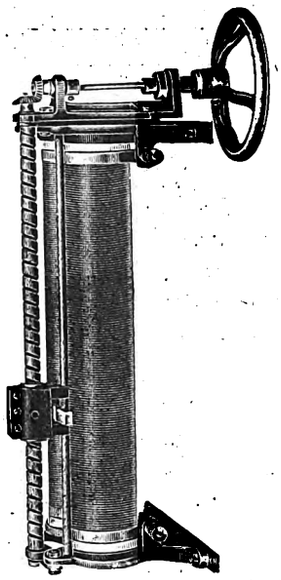

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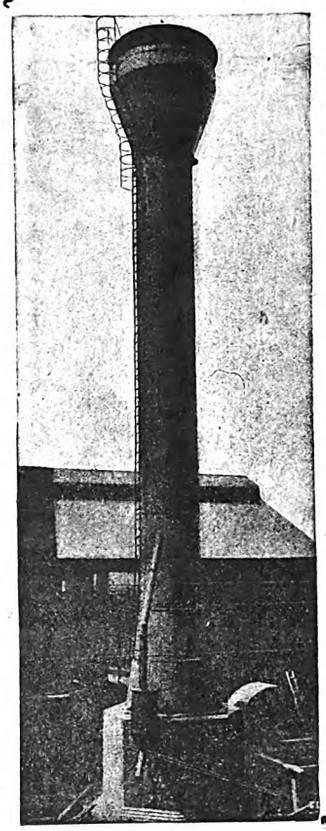

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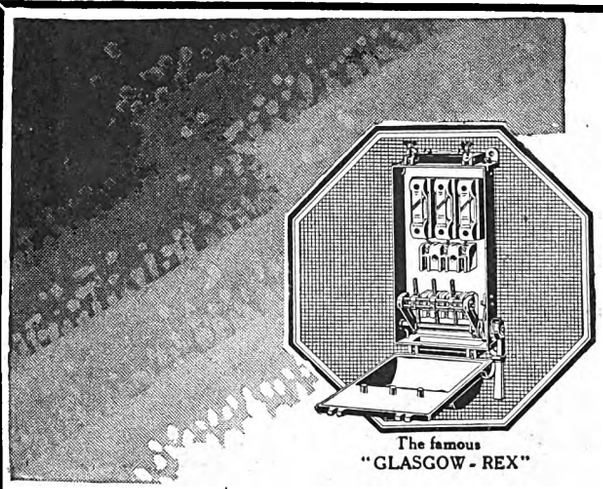

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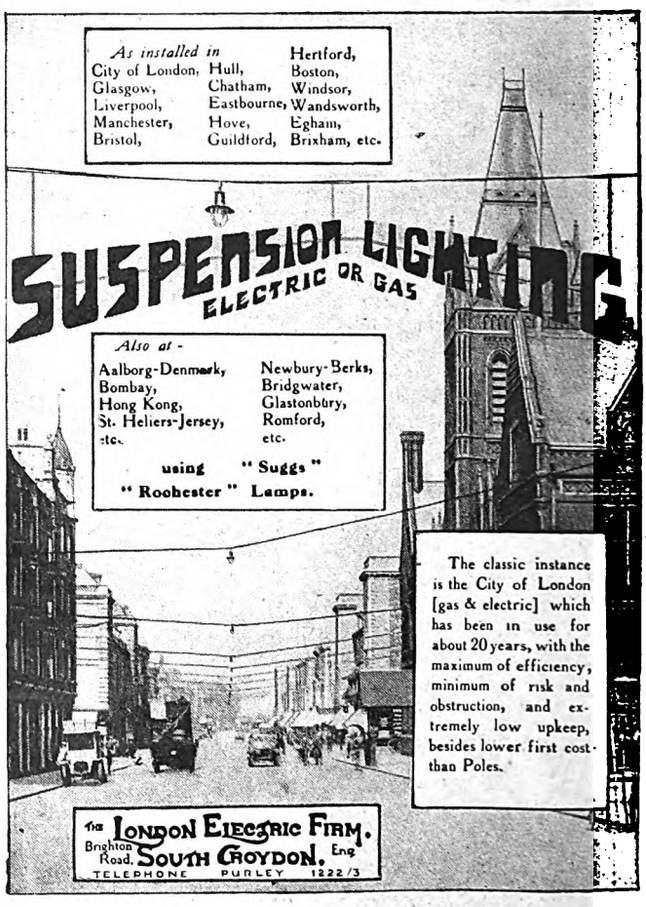

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An Eye to the Future.

FOR any kind of public utility undertaking which sells its service to householders, the task of forcing the initial entry into the consumers' premises is very much more than half the battle. Persuade Mr. and Mrs. Everyman to allow a lighting cable or a telephone circuit to pierce the wall of their dwelling and you have not only secured a customer but, in most cases, a customer whose quarterly payments will tend to rise (subject to seasonal variations) slowly but inexorably. Efforts at economising will be made, but few there will be who can maintain the unequal struggle for very long. The increased bill is paid with grumbles, sometimes after an acrimonious argument between the treasurer and the manager of the home. Threats are uttered to have the service cut off if the bills continue to mount up, but they are seldom carried out. More often some new current consuming appliance is added, either because the domestic labour situation is acting as a powerful form of propaganda for house service mechanism, or because of the deadly struggle to "keep up with the Jones's," which keeps Mr. Brown's and Mr. Robinson's hands forever dipping into their pockets.

This is a very pleasant state of affairs for electricity and gas undertakings, and also for the Post Office. For, unlike most manufacturers, who find that it costs more to sell goods than to make them and that it is necessary to beat the drum loudly and at heavy expense in order to keep their wares prominently before the public, the utility services benefit from a gradual increase of income which is independent of any efforts of their own. The result has been a disinclination to look ahead and to take risks which would seem to be gambling on certainty to the average business man. This is an almost inevitable consequence of the possession of a monopoly. In the circumstances which have hitherto prevailed and will continue to exist for some time to come, more than ordinary vision and courage are required to ensure the pursuit of an aggressive policy which involves the use of part of a sure and apparently certain income that is increasing by a steady annual percentage, in order to secure future advantages that appear in the slightest degree problematical.

Those undertakings which have recognised the importance of doing something more than wait for the unearned annual increment to fall into their laps are the more deserving of commendation in that they are often the most sure of continuous growth with little present effort on their part. It is not merely a matter of contributing on the appropriate scale to E.D.A. and supporting the Research Association. Individualist action to build up an efficient sales department, equipped with up-to-date showrooms and the initiation or extension of assisted wiring schemes are even more necessary now that future progress in the attraction of fresh consumers must depend very largely on the success with which people of small means can be induced to take a supply of electricity. In the case of new dwellings builders, eager to add to the saleability of their houses, are giving electric supply undertakings a large amount of gratuitous assistance. There remains a much larger reservoir of older houses, for the most part lighted by gas or oil, which is open to attack. Even so, the reservoir is not limitless, and with the population tending to become stationary—a condition that is likely to be reached in ten, fifteen or twenty years—it is advisable to look ahead to the time when all possible consumers will have been connected. Further development will then depend on a cheapening of both current and appliances, which will encourage those who begin by using electric light to add irons, vacuum cleaners, fires, cookers, water heaters and washing machines to their electrical equipment. The supply industry will then be compelled to adopt a much more vigorous publicity and sales policy than general to-day and those undertakings which make thorough preparations for the new conditions well in advance of their arrival, will reap the reward of the wise virgins.

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Current Topics.

Hiding their Light.

THE Postmaster-General, Mr. H. B. LEES SMITH, in the course of his outline of the overseas and Imperial services carried on by the Post Office, at the first technical session of the Imperial Press Conference last week, remarked that "it was an example of the exceeding modesty of this country in general and the British Post Office in particular, and its aversion from self-advertisement, that there was very little knowledge of the fact that the country possessed at Rugby the largest and most powerful wireless station in the world." Mr. LEES SMITH might well have omitted the word "self" for the commercial side of the Post Office does very little to advertise what it has to offer in the way of communication facilities. It might well take to heart the wisdom contained in a few lines of doggerel which we saw in an American newspaper some years ago:

"The man who whispers down a well
About the goods he has to sell
Won't swell his bank account with dollars
Like he who climbs a tree and hollers."

Newspaper Possibilities.

SIR BASIL BLACKETT, who followed Mr. LEES SMITH, characterised the attempt to separate overseas telegraph and telephone services as "entirely irrational and economically and scientifically wasteful," a view with which we have previously expressed agreement. The chairman of the I. and I.C. Co. foreshadowed a reduction of cable rates to the same level as wireless telegraphy rates as soon as negotiations now in progress with India, Australia and South Africa for amalgamating cables and wireless in those countries had been completed. He also made an interesting reference to facsimile transmissions, and said that a whole page of "The Times" had been experimentally transmitted across the Atlantic in half an hour; full-page American newspaper advertisements had also been transmitted commercially for publication in European newspapers simultaneously with their appearance in America. Developments in this direction may radically affect the technique of newspaper production in the near future, especially in the case of newspapers which publish editions in several different cities.

Space and Time.

ACCORDING to Dr. E. F. ALEXANDERSON, consulting engineer to the General Electric Co. of America, television combined with wireless will one day enable an unoccupied bombing aeroplane to be safely steered until it is right on the top of its target. There is nothing new in this idea, for visionaries have for a long time pictured such events, but Dr. ALEXANDERSON'S other prophecy is noteworthy. He suggests that theatre audiences will be enabled to see and hear "news" as it is happening, by the simple expedient of having a corps of reporters equipped with aeroplanes, wireless and television. Certainly there is nothing impossible about these forecasts for though the progress of television may be slow, it will also be sure. Dr. ALEXANDERSON himself is now using a screen 6 feet square in place of the 14 in. screen which he employed last autumn. One wonders sometimes where the ultimate limits of electrical achievements lie. Distances are continually becoming shorter, and one day, perhaps, they will be almost annihilated—from Mankind's relative viewpoint. As a direct consequence more and more time is being saved. Sooner or later there may appear a super-civilised being who never needs to leave his home—his world-wide business will be transacted and his amusements will be supplied at the domestic hearth. Or will human nature recoil from the prospect and deliberately reject a line of development which could only lead to structural modifications that might eventually transform him into a creature resembling the Martians as imagined by H. G. WELLS?

Electric Incubators.

PARTICULARS are given in "Electrical News and Engineering" of the results of operating six electric incubators each of 15 000 eggs capacity on a poultry farm in Ontario. The electric incubators are said to give no trouble and to produce large, vigorous and fluffy chicks with an average hatch of 80 per cent. The cost of operation is given as about $9.00 (£1 17s. 2d) a month for each incubator. Heat is supplied by four coil elements, each with its own thermostat control. Air and moisture are distributed by a four-bladed reel rotating slowly round the egg drum and driven by a $\frac{1}{4}$ H.P. motor with a loading of 500 W. Current consumption is 15 to 20 units per 24 hours for each incubator. A ten hour stoppage of current has been experienced without serious effect. Electric brooders for 50 to 1 000 chicks are also giving satisfaction.

Muscle Shoals.

A BILL has now been approved by the American House of Representatives Committee on Military Affairs dealing with the future of the great Muscle Shoals power development. This bill rejects the idea of government ownership and provides for private leasing though, in order to satisfy those who fear "power trusts," power companies are not to be permitted to bid. It empowers the President to appoint a board of three, one of whom is to be identified with agriculture, which is to appraise the property and then lease it on the best terms obtainable for fertilisers, ferro-alloys, and other electro-chemical production. Whether this Bill will be passed, and if so, whether it will lead to definite exploitation of the plant, remains to be seen, but a certain amount of scepticism is permissible in view of the past history of the enterprise.

Large Storage Dams in Brazil.

SOME large water storage works are in hand in Southern Brazil in connection with the Brazilian Traction, Light and Power Company's installations. There are now in the Serra reservoirs 150 000 000 kWh reserve storage capacity, and the completion of the Rio Grande reservoir, as planned, in the next two or three years, will provide a further 1 500 000 000 kWh of reserve storage. In addition to the two generating units of 40 000 H.P. each at the Serra (São Paulo) development, a third of 60 000 H.P. is on order and should be in service early in 1932. A third 40 000 H.P. unit was ready for service at the end of last year at Ilha dos Pombos (Parahyba development—Rio de Janeiro). Operation of the 132 kV transmission line to Cascadura was begun early in February last. Transmission line circuits were increased by 143 miles in 1929. Including the business of the City of Santos Improvements Company there was an increase in the sale of current of 95 121 385 kWh, or 13 per cent., over the sales in 1928.

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WITH THE I.E.E. IN IRELAND.

Memorable Summer Meeting—Superb Weather—Excellent Organisation by the Irish Centre and Well Planned Tours—The Shannon at Work.

(By THE EDITOR.)

SMILED upon by weather that put into the shade even the glorious three days with which the I.M.E.A. Convention at Eastbourne was favoured, the summer meeting of the I.E.E. in Ireland last week will long be remembered by those who had the good fortune to take part in it. We left London on the Monday morning in gloomy conditions and with none too optimistic expectations as to climatic conditions in the other island. But by the time the train reached the coast in North Wales the sun was beginning to disperse the mists and the "Cambria" left Holyhead in bright sunshine for a millpond crossing to Dun Laoghaire—better known on this side of the Irish Sea as Kingstown. Very efficient transport arrangements for people and baggage had been made by the committee of the Irish Centre, and throughout the tours of the succeeding days the smooth working of the programme, coupled with the wonderful sunshine and soft air, added very greatly to the enjoyment of the party.

On the Monday evening there was an informal gathering at the Gresham to allow us to get together and to meet the members of the Irish Centre. Tuesday began with a reception at the Mansion House by the City Commissioners of Dublin. The chairman, Mr. Seamus Murphy, who was supported by Mr. Hernon, welcomed the party, specially mentioning the President, Col. Sir Thomas Purves, whose achievements as chief engineer of the British Post Office he described as sometimes seeming to border on the miraculous. He had heard of nothing more striking and more indicative of recent progress than the joint meeting of the British Institution and the American Institution through the medium of the Atlantic telephone. He looked forward to the Irish chairman, Mr. Monaghan, emulating Sir Thomas's achievements in the Irish Free State. Mr. Murphy said that he also wished to welcome in a special way Sir Archibald Page, who, on his visit as President of the Institution, endeared himself to all who met him. Dublin had also had the honour of visits in recent times from Col. Edgcumbe and the great de Ferranti, whose death they deplored as a personal loss. He also extended a special word of welcome to Mr. Rowell, the Secretary of the Institution.

Mr. Murphy pointed out that Dublin was well in the forefront in the matter of electrical supply. It was the first city in the world to instal the system of generation and distribution which had now become the standard for the whole world. This was done on the advice of a former Treasurer of the Institution, Mr. Robert Hammond. The Dublin electricity supply had been a great credit and asset to the city under the management of the past chairman of the Irish Centre, Mr. L. J. Kettle. It had now become merged in the national scheme, and he was glad to say that the work done in Dublin would contribute very substantially to the success of that scheme. In Ireland they had not yet achieved electrification on any large scale, but now that the national scheme was spreading its network all over the country they looked forward to great things in the future. He was sure that Sir Archibald Page, who had so many difficult problems to deal with, must envy them the simplicity of their problem, and the degree of electrical unification which had been so easily secured. After expressing the hope that we should enjoy every moment of our stay—a hope that was abundantly fulfilled—Mr. Murphy asked the President to convey Dublin's greetings and good wishes to the Lord Mayor and City of Belfast.

Sir Thomas Purves's Silver Tongue

Sir Thomas Purves, who has the great gift of always being able to say the right thing in the right way, in a silver-tongued speech which delighted all who heard it, said that we had not expected that we should receive the signal honour of a civic welcome. We looked forward with keen anticipation to our visit to the hydro-electric scheme on the Shannon, which was a remarkable example of progressive enterprise, and also anticipated with keen pleasure renewing acquaintance with the beauty and glory of Ireland in early June. After a happily phrased reference to the deep affection for their motherland felt by Irishmen who had penetrated throughout the world, Sir Thomas Purves said that if this visit could do anything, however small, to increase and cement the friendship between these little islands between the Atlantic and the North Sea all the other results of the visit would be relegated to the background.

Then followed a drive, to which no adjectives could do justice, through the southern suburbs of Dublin to beautiful Wicklow mountains, flaming in old gold with gorse and broom. The outward route lay past the Sugar Loaf mountain and the Roundwood reservoir, which supplies Dublin with water, to the fairyland of Glendalough. On the way a number of overhead h.t. transmission and l.t. distribution routes were to be seen, giving quite a Continental or American appearance to the otherwise very English looking countryside. After lunch at Glendalough the party was conducted round the antiquities of the "City of the Seven Churches," whose existence as an ecclesiastical centre terminated more than five centuries ago. Mr. E. M. Stevens proved a charming guide, and his short but entirely adequate talks brought the dead past of this lovely glen vividly before us. We returned to Dublin by a different route, following the Avonmore river seawards for a time and passing the outskirts of Bray.

Tuesday ended with a reception and dance at the Gresham Hotel, and although the temperature was a trifle elevated, nearly everyone seemed to be taking part in the dances.

Mr. L. J. Kettle and Mr. P. F. Rowell at Glendalough.

Motor coaches took us to Kingsbridge station early on Wednesday. We left at 9 o'clock by special train for Limerick, passing Kildare, Maryborough and Thurles on the way, with glimpses of the great peat bogs of the central plain. The hedgerows were white rows of hawthorn blossom, and the distant mountains on the horizon formed a hazy background to the small towns and pastures of a lush countryside that was at the height of its early summer glory. It was Derby Day, and the occasion could not be allowed to pass without a sweepstake. The Irish halfcrown has a horse on the obverse, so that coin naturally became the basis of the sweep. Another fleet of motor coaches took us from Limerick to Ardnacrusha, where we sat down to lunch, as the guests of the Irish Free State Electricity Supply Board, in the imposing turbine hall of the great hydro-electric station that is now supplying light and power to the greater part of Southern Ireland. Dr. T. A. McLaughlin, managing director of the Electricity Supply Board, to whose efforts the inception and realisation of this impressive undertaking are mainly due, sat down with Sir Thomas and Lady Purves. He said half a sentence of welcome, but the generator was constitutionally "agin" public speaking and he gave up the attempt with a gesture. Sir Thomas Purves, by making a megaphone of his hands, succeeded in shouting "Thanks" loudly enough to be heard, and that ended two of the shortest speeches on record.

We were then taken through the power house, with its three Francis type turbines of 30 000 H.P. each, and inspected the gigantic penstocks, dam and the canal locks, which raise or lower barges in two lifts of 50 ft. each between the head and tail races. At the foot of the dam millions of tiny

(*Continued on page* 756.)

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elvers were endeavouring to climb the footwall, where a small trickle of water was pouring down from the dam face.

Another journey of seven or eight miles by motor coach brought us to within walking distance of the weir at the upper end of the head race. This head race resembles a ship canal in width and depth. At the weir there is a fish pass, which is said to have proved quite successful, but as it is not the season for salmon to run, we were unable to confirm this statement by observation. Some technical details of the Shannon undertaking and the transmission and distribution systems must be reserved for a subsequent issue.

There was tea at Limerick, where great demonstrations of affection between some of the party and the hotel proprietor and his wife were witnessed. Then we rejoined our special train and travelled back to Dublin, having dinner on the way. So ended a most enjoyable and interesting experience.

For Thursday morning alternative arrangements had been made. The majority elected to visit the Guinness brewery, where they were royally entertained to lunch by the company. A smaller contingent, whose thirst for technical information outweighed the temptations of the rival attraction, inspected the Dublin sub-station of the Shannon transmission system at Inchicore, where the 110 kV line from Limerick and several 38 kV secondary lines terminate. Returning to Dublin, we were taken through Phœnix Park before visiting the new Fleet Street station, where Metropolitan Vickers isolating switches and panels and British Thomson-Houston transformers and tappings are installed in contrast to the completely German equipment at Ardnacrusha and Inchicore. After lunch at the Gresham Hotel the smaller party rejoined the "stout" contingent, and then left by special train for Belfast. Two of us, to our great regret, had to return direct from Dublin to London that evening, and were consequently unable to visit Northern Ireland.

G. H. L.

* * *

The concluding part of the meeting began with a reception, dinner and dance at the Grand Hotel, Belfast, where the visitors were the guests of the Irish branches of the electrical manufacturing companies. On Friday morning the programme began with a tour of the harbour on the s.s. "Musgrave." Two groups were then formed, one of which inspected the harbour power station and the Harland and Wolff shipyard, while the other remained on the steamer for a trip down the Lough. In the afternoon one group visited the York Street mills, and a second party went to the Sirocco engineering works of Davidson and Co., Ltd., where ventilating plant is made, the visitors being given tea by the two companies. A third group enjoyed a motor coach excursion through Antrim and Ballymena to Glenariffe and back by the coast road, taking tea at Larne.

The meeting ended with a reception by the Lord Mayor, Councillor Sir William Frederick Coates, Bt., at the City Hall, followed by dancing. During the dance Sir Thomas Purves presented pieces of plate to Mrs Monaghan, Mrs. Whysall and Mrs. Eaton, and took the opportunity of conveying the message from the City Commissioners of Dublin. This was warmly reciprocated by the Lord Mayor of Belfast.

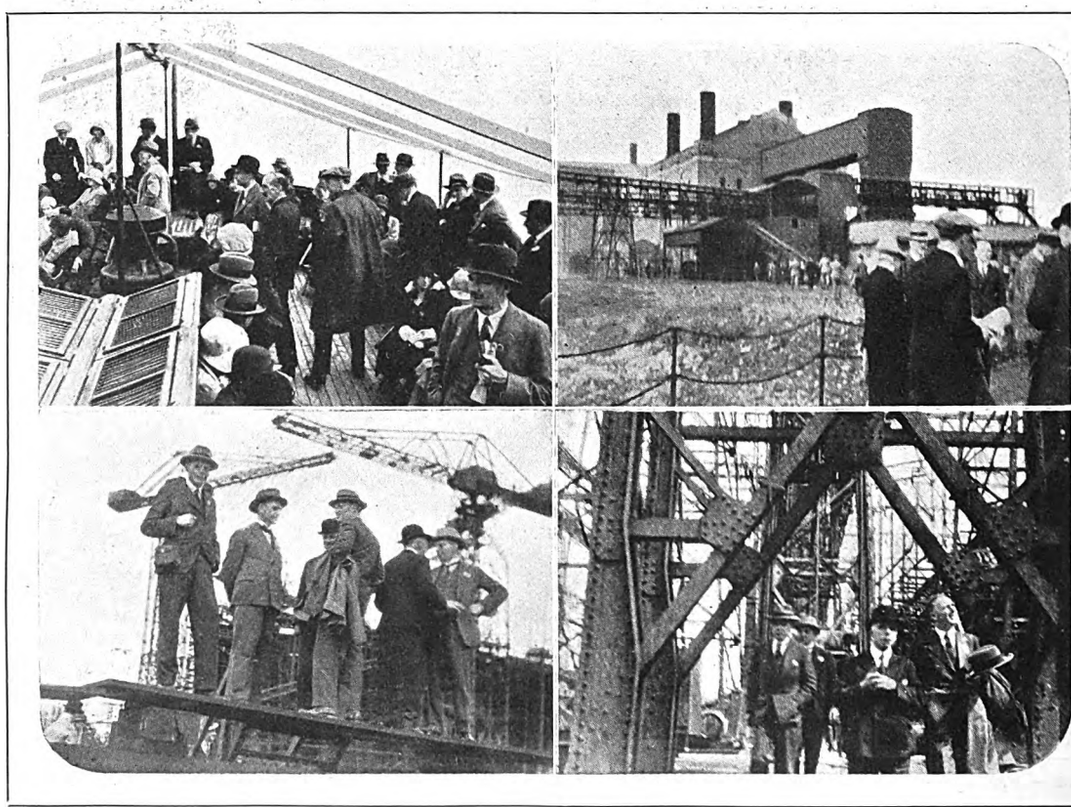
* * *

A correspondent who accompanied the visitors to Belfast writes:—

"The railway to Belfast traverses more varied scenery than the line from Dublin to Limerick—pastoral country alternated with glimpses of coastal towns, such as Drogheda at the mouth of the Boyne. A pleasant surprise awaited us at the terminus, where about 40 private motor cars were waiting to take the party for a drive round the shores of Belfast Lough, before leaving us at our hotels. In the evening, with Mr. A. E. McConnell occupying the chair, the President made another of his inimitable speeches in response to the toast of "The Institution and Visitors," proposed by the chairman. Mr. Monaghan also replied with a good speech. Sir Archibald Page, who described himself as an "extinct volcano," being a past-president, in a witty speech, returned the thanks of the gathering. During the dinner, a charming feminine incursion took place in the form of a group of Irish girls, in the national costume, bearing a present of Belfast linen handkerchiefs for each lady.

"Friday was cooler, and not so sunny, but formed rather a welcome change from the brilliance of the previous days. The Harland and Wolff yards seemed fully occupied with ships of many varieties and sizes, and we were shown the construction of vessels ranging from ships' lifeboats to the new 35 000 motorship, the largest yet begun, of which the keel plate has been laid. The York Street mills were a telling example of Belfast enterprise. The success of this undertaking, the largest of its kind in the world, is obviously due to the employment of constantly improved methods of preparing, spinning and weaving the yarn, most of the machinery being the product of Belfast designers and manufacturers."

By the courtesy of the Dublin United Tramways Co., Ltd., all those taking part in the meeting were carried free of charge on all the trams of the company's system while staying in the capital, and this privilege was very much appreciated.



IN NORTHERN IRELAND.

On board the s.s. "Musgrave," cruising in Belfast Harbour.

The Harbour Power Station, Belfast.

Some of the visitors standing on the keel of the 35 000 ton motorship which will be the largest in the world. The group includes Mr. Lawson, Mr. Burgess, Mr. Allen and Sir A. Page

In the Harland and Wolff shipbuilding yards, Belfast.

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VARIETIES AND USES OF MICA—II.

Hand-built and Tower-built Micanite—A New Synthetic Bond—Flexible Micanite—Mica Fabrics—Mica Tubes—A New Vitreous Product.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

THE first part of this article reviewed the different varieties of mica used for insulation, their properties and applications, chiefly with regard to the material in its block form and in splittings. With regard to some brief historical notes given in the introduction, it may be of interest to quote some particulars which have since been received from Messrs. Attwater and Sons, of Preston. It is pointed out that as long as thirty years or more ago mica was supplied in large quantities for the early work of the Brush Company, the English Electric Company, the British Westinghouse Company and the British Thomson-Houston Company, the mica referred to being principally Canadian amber mica, imported in cob form or in thumb-trimmed slab, and being split and cut at Preston. The first electric tramcars of London, Manchester, Birmingham, Liverpool and Glasgow and the electric trains of the L. and Y. Railway and the North Eastern Railway had their motors insulated with such mica. It may be noted that in this early work the mica was mainly used bonded to paper with black plastic varnish forming flexible cells and not in the present forms of micafolium and micanite. Soon afterwards large imports of Indian and Madagascar mica were developed and are still maintained. One variety of Madagascar amber mica is stated to have exceptionally good electric strength, tests made recently at works of the English Electric Company giving an average breakdown value of 11 500 V on 0·005 in. thickness and 16 700 V on 0·007 in. thickness.

Passing now to the consideration of mica as used bonded with adhesives, one of the most important applications is that of micanite for the segment insulation between commutator bars and for commutator V rings. This service involves not only electrical stresses but also very severe compression as the copper assembly is clamped up, and developments which have taken place in this work are of great importance.

Bonding with Shellac and Resins.

It was at one time considered essential that the insulation between commutator bars should consist of pure mica, amber block mica being preferred because of its softness allowing the insulation to wear down with the copper. The high prices caused by growing demand, and the necessity for larger sizes, drove electrical machinery manufacturers to seek cheaper alternatives, and, fortunately for the industry, it was found possible to bond mica with shellac to form sheets which could be used as commutator segment insulation. Two difficulties were found—first, the hardness of the material; and, second, a tendency of the mica splittings to creep, causing the insulation to grow above the copper level. The hardness difficulty is overcome by undercutting the insulation to a depth of about $\frac{1}{16}$ in. below the copper surface. The creepage troubles have been overcome by scientific control of process, involving the use of higher baking temperatures.

For many reasons synthetic resins of the phenol-formaldehyde class are not suitable for micanite manufacture, but an important development of distinct merit has recently been made by the use of a new bonder known as glyptal, a complex synthetic resin which is formed by the reaction of glycerol and phthalic anhydride. The commercial development of this resin was carried out by the General Electric Company of America and by the British Thomson-Houston Company in this country. Glyptal resins and varnishes are now manufactured and sold exclusively in this country by Imperial Chemical Industries, Ltd., and glyptanite, a micanite bonded with glyptal resin is made and sold exclusively in this country by the Micanite and Insulators Company, Ltd. Normal glyptal is described as an almost water-white transparent resin which, like bakelite resins, changes from the fusible and soluble state into a relatively infusible and insoluble condition on heating. A temperature of at least 210 deg. C. is required to produce this change. Glyptal resins are not at present offered as a substitute for bakelite resins, partly because they do not mould quickly enough and partly because they do not compete in price. Their use is for purposes for which bakelite is not suitable, and their characteristics are claimed to open up a field of entirely new uses. So far as micanite is concerned, it has properties of particular importance. It is mechanically strong, and adheres to smooth surfaces; it is flexible and does not become brittle at elevated temperatures; it gives an electric strength which is quite as good as that of shellac bonding, and it is equally as good as shellac in not "tracking" under the influence of an electric arc; its abrasiveness and rate of wear are comparable with the corresponding characteristics of copper.

The ordinary process of manufacturing micanite commences with sheets of brown paper, which are laid upon benches and covered with mica splittings bedded in an adhesive, usually varnish applied with a brush.. The plate is built up in successive layers to its prescribed thickness, after which it is placed between metal plates and transferred to steam heated ovens for drying out the solvent. In large scale manufacture the removal of solvent is helped by vacuum pumping, and the solvent is recovered in water-cooled condensers. From the ovens the sheets are transferred to powerful hydraulic presses and pressed at high temperature. Accuracy in thickness, which is very important for commutator insulation, is obtained by passing the pressed sheets between high-speed sand-paper rollers, which are adjustable to fine limits and give sheets consistent to within 2 or 3 mils.

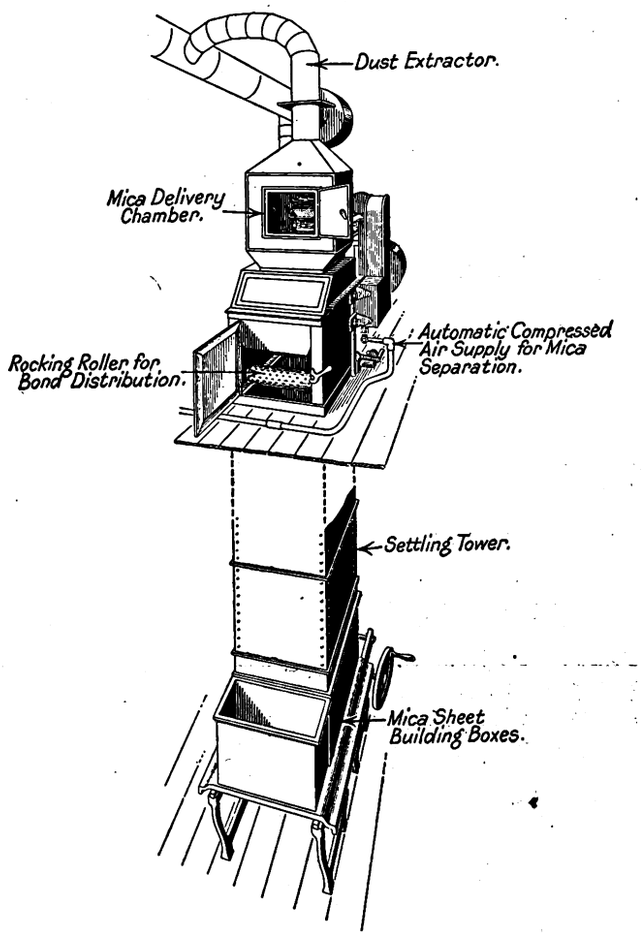

Fig. 6.—Mica tower for micanite building.

The work of building up the material is usually performed by girls, and one of the chief difficulties is that of obtaining uniformity of mica distribution and of bonder content, owing to differences and variation in the personal judgment of the workers. It is important to employ reliable skilled workers. A typical process of ten years ago for segment micanite shows initial materials consisting of 47 lb. of liquid shellac to 100 lb. of mica, with a loss of 20% in drying out the solvent and a further 25% loss in grinding to exact thickness, the total loss of material, even apart from trimming, thus approaching 50%. Similar wastage was allowed for in the manufacture of V ring micanite.

Experimental research work directed to the elimination of such wastage and to the production of a more uniform product

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resulted in the development of the process of tower-building. This method of manufacture, which is used in this country by the Metropolitan-Vickers Electrical Company and the Micanite and Insulators Company, consists of discharging weighed quantities of selected mica and dry powdered bond in alternate blasts down a tall tower chamber, in which the falling material is scurried into very uniform distribution. Fig. 6 is a drawing of a typical equipment, reproduced from "Electrical Insulating Materials," by Allan Monkhouse. At the top of the tower is an arrangement of baffles and air jets. The base of the tower is arranged to accommodate traversing box containers in which the micanite mixture is deposited. The sheets in their dry form are carefully removed to ovens, where the adhesion of the flakes is ensured by melting the bond before it can become disturbed. The finishing heat treatment is carried out in heavy presses, as for hand-built material. A typical press in the Metropolitan-Vickers works is shown in Fig. 7. As has been indicated in the first instalment of this article, it is possible to manufacture equal quality of micanite by the tower process, using a smaller and therefore cheaper grade of mica than by the hand building process.

A process somewhat similar in principle to tower building but involving simpler equipment is described in an American patent specification of 1906, the method in this case being to pick up the splittings from a bin by means of a suction box with a wire mesh bottom and to deposit each uniform layer so obtained by breaking the partial vacuum in the box.

Composition of Micanite.

With regard to composition of micanite it has been recognised in recent years that the proportion of mica should be as high as is compatible with secure bonding and the degree of flexibility which may be required for hot moulding. It is generally considered that micanite for flat use as for commutator segments should contain not less than 95 per cent. by weight of mica. Micanite for V rings and similar service must contain 10 to 15 per cent. by weight of varnish bond in order to allow the splittings to slip a little in the hot moulding process, during which the percentage of varnish undergoes some reduction.

With the minimum quantities of bond now used in micanite manufacture there is sometimes a tendency, especially in hand-built material, for dry spots to be formed where thick patches of mica have caused practically all the bond to be squeezed away. This trouble can be obviated to a large extent by cushion pressing, in which layers of fabric are introduced between the micanite and the steel platens of the press. This gives resilient pressing and tends to even out the bond. It is not regarded as good practice to use excess of bond and squeeze it out either in the pressing process or in tightening up the commutators.

Mica V rings up to diameters of 12 or 14 in. are usually built up in complete ring form. Above this size segmental construction is usually adopted with the object of eliminating expensive moulds. The segments are cut to template, assembled in layers with staggered joints and hot pressed in moulds such as are illustrated in Figs. 8 and 9. These illustrations actually show a special process in use by the Micanite and Insulators Company for building large V rings of practically solid construction. In this process the rings are built up of carefully prepared mica or micanite strips laid on a suitable template and bonded with a slight overlap. The work involves very careful manipulation and requires highly skilled labour.

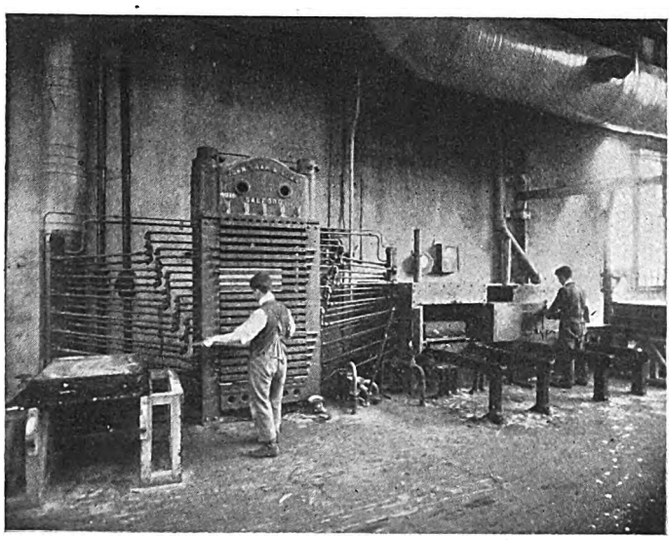

Fig. 7—Steam-heated hydraulic press for micanite.

Flexible micanite is produced by bonding mica splittings with special mixtures of resins, gums and oils, usually including a non-drying oil such as castor oil. Such micanite retains its flexibility for a number of years and is a convenient form of insulation, since it can be formed and bent without the application of heat. Its applications include slot linings and the insulation of cross-over wires in coils. Sheets built of large mica splittings rigidly anchored to each other are used for the almost pure mica slot insulation specified for armatures and stators to Admiralty requirements. The flexibility of such material is due to the thinness of the sheets used.

Heat-resisting micanite, used for domestic and other heating appliances, demands careful selection of the mica to be used.

Fig. 8.—Building a commutator "V" ring—setting the mould.

For service in which the maximum temperature does not exceed about 500 deg. C. either muscovite or amber mica may be used satisfactorily. For higher temperatures amber mica is essential and even this is limited to about 850 deg. C. for reliable service. Above this temperature it is advisable to use amber mica in block form. Special bonders are used for heat-resisting micanite but even the best of those commonly used up to the present time lose their adhesive properties after a short period of service.

Typical electric strength values for the different kinds of micanite are shown in Table I:—

TABLE I.—ELECTRIC STRENGTH OF MICA PRODUCTS.

Variety.	Electric Strength, Volts/mil.
Hard micanite—	
Muscovite	800–900
Phlogopite	700–850
Hot moulding micanite	800–900
Flexible micanite	600
Heat-resisting micanite	700–850
Micafolium	400–500
Mica Cambric	600
Mica Silk	700

Micafolium, another important mica product, consists of selected mica splittings carefully arranged by hand on a selected paper backing. The splittings are laid with an overlap on adjacent splittings, built up to two or three layers, and bonded with liquid adhesive. As the building process proceeds the paper travels slowly forward and finally passes through heated tunnels in which the solvent is driven off. The finished material is collected in rolls. The material is extensively used for the insulation of the slot portions of turbo-stator bars and other high voltage machine windings. In this work the micafolium is first tightly wrapped on the bar by hand and afterwards tightened up in a Haefely machine such as is illustrated in Fig. 10. This machine, called after its inventor, has an arrangement of heated bars which slowly rotate with an ironing action round the bar, pulling the wrap very tight and producing a wrap which is very hard and has a very high mica content. Although hard the cell has a certain amount of flexibility, sufficient to allow for slight displacement

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or bending of the slot portion without fracture of the insulation. In most cases, and practically always when the slot length is great as in turbo-alternators, it is desirable and usual to subject the bars from the Haefely machine to a steam pressing. The effect of this process is to pack the insulation still more closely, driving off any moisture which may still be contained by the paper and any remaining solvent and closing up any pockets in the cell. Incidentally the pressing greatly improves the space factor in the slot. Very careful manipulation is required in the pressing process in order to avoid trapping gases in the material by prematurely closing up the ends of the wrap. Bars effectively wrapped and pressed in this way can be made to withstand very much higher voltages than are at present required in alternator manufacture, the limiting feature being the insulation of other portions of the windings.

Mica fabrics are built up in a manner somewhat similar to micafolium but using cambric or silk instead of paper and preparing usually in sheet rather than roll form. These materials are usually required to be very flexible in order to bed closely to the conductors on which they are wrapped and for this reason the splittings should be fairly large and overlapped after the manner of roof tiles. To prevent the splittings from lifting, the final mica surface is covered by a layer of thin tissue paper, forming a cambric-mica-paper sandwich. In most cases the finished material is cut into strips or tapes which are used for insulating the individual conductors and the end connectors of machine windings. Where economy of space is of prime importance fine Japanese silk of approximately 1·25 mils. thickness is used for the backing. The cambric or silk fabric permits of the use of this material under considerable tension. In cases where tensile strength is not important a tape of similar construction but with paper backing is often used.

Mica tubes are of different kinds and vary greatly in their mica content. One form of true mica tube, used in automobile sparking plugs and for the spacing tubes of resistance frames, consists of piles of pure mica washers assembled with a bonder under considerable pressure at high temperature. For work in which puncture value is of great importance tubes are made by wrapping sheets of bonded splittings round steel mandrels of the desired diameter and baked hard. Good tubes made in this way should ring like metal when struck. Such tubes are used for the insulating of shafts or bars of brushgear and other equipment on which clamped insulated fixtures have to be mounted.

Extensive use is made of mica tubes made by winding paper with mica sheet fed in between the layers. A refinement of this process is a winding of micafolium such as is used for the Haefely wrapped cells already described.

The use of mica tubes is governed chiefly by considerations of the stress voltage and temperature conditions of service. For high voltage stresses and high temperatures a high percentage of mica should be used. A pure mica tube of $\frac{1}{8}$ in. wall thickness tested at 20 deg. C. should easily withstand

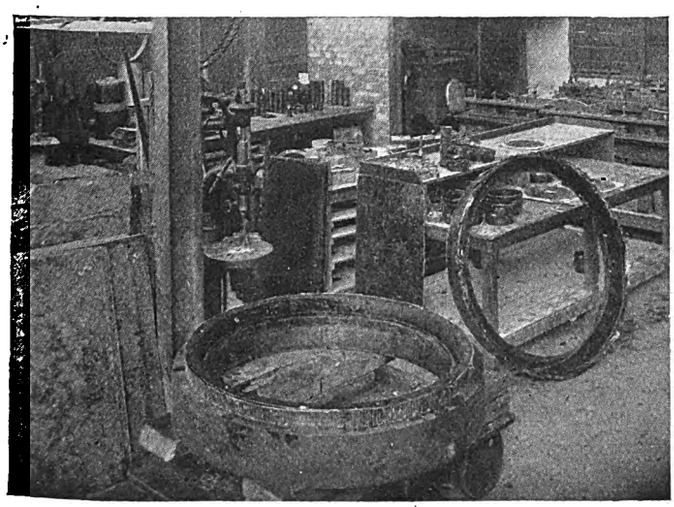

Fig. 9.—Building a commutator "V" ring—the ring moulded.

50 kV for 1 minute, corresponding to an electric strength exceeding 400 V per mil. As the percentage of paper increases the electric strength rapidly falls. With a mica content of about 25 per cent. by weight it is about 250 V per mil. A paper tube without mica may have a strength as low as 150 V per mil but the value then depends on the class of paper.

Even pure mica tubes, *i.e.* without paper, vary in electric strength according to the mica used. In connection with this and other uses it is therefore of interest to note the following typical electric strength values obtained on various mica splittings. (Table II.)

TABLE II.

Variety.	Electric Strength (Volts/Mil.)
Heavy spotted green mica	1 100
Medium spotted green mica	1 200
Medium spotted brown mica	2 000
Clear ruby mica	2 250
Clear brown mica	3 500
Canadian amber mica	3 800
Clear white Muscovite	3 000

A notable recent innovation in the use of mica is a new material known as Mycalex, a British invention, manufactured by the Mycalex Co. at Harlesden, Middlesex. The material is

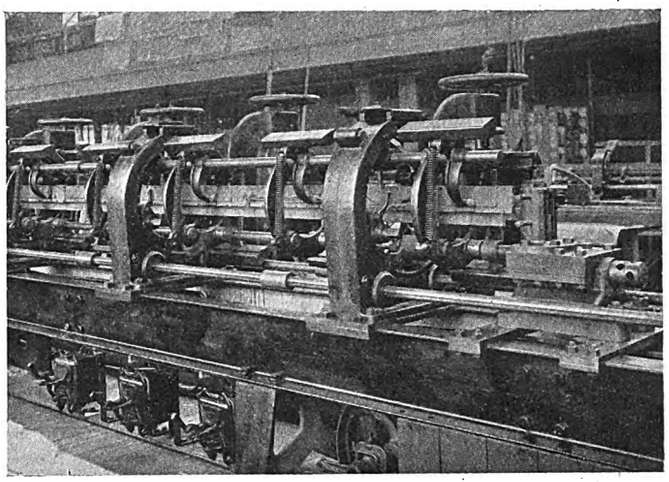

Fig. 10.—Haefely machine for ironing micafolium wrap of turbo-alternator stator bars.

a vitreous product made from block mica ground down to an almost colloidal state and fused with lead borate. The process of manufacture is interesting as it involves temperatures far exceeding those usually occurring in the insulation work to which the material is being adapted. The mixture of finely divided mica and lead borate is first moistened to a putty-like mixture, which is roughly formed or briquetted to the desired shape. The formed pieces are passed through a tunnel oven where they reach a temperature of about 750 deg. C., just below the critical temperature of mica, and are then compressed in a hydraulic press capable of a pressure of 550 tons, causing intimate fusion of the ingredients. Manufacture is at present concentrated on boards and rods but is eventually to include tubes and mouldings. The characteristics of the material are shown in Table III.

TABLE III.—CHARACTERISTIC PROPERTIES OF STANDARD MYCALEX.

Specific Gravity	3·0 to 3·2
Dielectric Strength at 90 deg. C. on 18 in. thickness	300 V/mil
Dielectric Strength at 180 deg. C. on 18 in. thickness	200 V/mil
Surface Flashover—distance 1 in.	17 to 18 kV
Carbon Arc Penetration	Rather rapid. Local fusion.
Fuse Wire Test	Surface disintegrated but no carbonisation
Water absorption—Specimen $\frac{1}{8}$ in. thick, 24 hours	·016 to 0·20%
Permittivity ("K")	5 to 8
Thermal Conductivity	23 W per cm. cube per deg. C.
Linear Expansion	·0000088 from 25 deg. to 50 deg. C.
Linear Expansion	·0000114 from 150 deg. to 175 deg. C.
Plastic Yield (Martens Test)	450 deg. C.
Hardness—Schleroscope	40
Hardness—Brinell	40 to 50
Tensile strength	5 300 to 12 800 lb./sq. in.
Bending strength	18 000 to 25 000 lb./sq. in.
Crushing test	48 000 lb./sq. In.
Impact test	6 to 7 kg. cm/sq. cm.

The most outstanding feature is probably the low power factor and power loss values. For this reason the Mycalex has found favour for high frequency work and is already

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employed in the manufacture of low wave-length transmission sets. Another interesting feature is the fact that the insulation resistance measurements only show a rapid decrease at about 400 deg. C. whereas porcelain shows a rapid decrease at 250 to 300 deg. C. The material is made in various grades ranging from the " ordinary " which is refractory at 540 deg. C. up to a special arc-resisting grade of an alternative base composition.

The author's acknowledgments are made to the various manufacturers mentioned for some of the information here given and for the use of photographs, to Sir Isaac Pitman and Sons, Ltd., for Fig. 7, and to the Metropolitan-Vickers Electrical Co. for permission to publish information gained in research work.

ANGLO-AMERICAN CO-OPERATION.

Important Agreement Between English Electric and Westinghouse Companies.

THE English Electric Co., Ltd., of Queen's House, Kingsway, whose works are situated at Preston, Stafford, Rugby, Bradford and Coventry, announce that they have entered into a comprehensive arrangement with the Westinghouse Electric International Company, of New York, and Westinghouse Electric and Manufacturing Company, of East Pittsburgh, Pennsylvania, U.S.A., whereby there will be an exchange of technical information between the two organisations on steam turbines and electrical apparatus.

The arrangement includes the granting of licences for the use of patents and for the manufacture and sale of various products. These licences will, of course, be subject to the existing commitments of the two companies in various parts of the world. Under this arrangement, the English Electric Company, Ltd., will have the benefit of the results of the extensive research work carried on by the Westinghouse Electric and Manufacturing Company.

The English Electric Company, in making the above announcement, wish to make it clear that the technical and manufacturing link thus established does not carry with it any control from America.

The British interests in control of the English Electric Company, Ltd., believing that a moderate financial interest on the part of the American Westinghouse Companies would be highly desirable, have offered a participation in the ordinary shares of the company at par, but this participation will, in any case, be under 10% of the total. If accepted, this will increase the new money provided under the scheme of reorganisation by a corresponding amount.

"MOONSHINE."

Electricity from the Air.

ELECTRICAL development in Italy is progressing beyond all possibilities in this country for, according to the daily Press which has again shown its lack of discrimination between facts and fancy, Naples has produced a new Edison. Saverio Natella, a boy of seventeen years of age, has discovered an entirely new method of producing electricity, which, it appears, he is able to extract from the ether. His invention consists of an apparatus, rather resembling a wireless set, and an aerial. We have no particulars as to the actual apparatus contained in the box as Natella is applying for a patent and will not disclose any particulars until this has been granted. His invention has nothing to do with Hertzian waves but after making a thorough study of electro-mechanics, mathematics, magnetism and finally, astronomy, he has discovered, and he claims that positive electric waves exist at a height of 62 326 metres above sea level, while negative waves exist about 1 500 metres higher. These waves are the result of the revolutions of the stars as well as those of the earth, and they can be extracted from the atmosphere by means of his aerial. The only cost of this invention is the capital outlay, for, once in possession of the apparatus, one can continue to extract electricity from the ether for all time. He calculates that the total cost of a station for 100 000 V would amount to £700 and there would be no running expenses.

Natella gave a demonstration of his invention in a small town in Italy which has no electricity supply. He guaranteed to light an electric lamp at a given hour, and succeeded in doing so—unfortunately although he had taken every possible precaution he was not sufficiently protected against the current to which he was exposed, for his apparatus gave 550 V, and Natella only regained consciousness two hours later.

MUNICIPAL SHOWROOMS.

Cape Town Makes Full Use of Suburban Sub-stations.

By A. B. DENT.

ALTHOUGH South African municipalities engage in the business of generating and selling electricity to consumers, their charters forbid allied appliance merchandising activities.

Civic control of light, heat, and power is not conspicuous by advertising, display, and salesmanship enterprise. The attitude in too many cases is that of " We have something that you badly want; come and get it." A municipality may enjoy a monopoly of electricity supply, but obviously it cannot increase consumption without effective promotion work.

Outstanding among the South African municipal electricity departments is that of Cape Town. Often the city engineer, who is the man directing the entire project, is a professional man first and foremost. A clever technician is frequently burdened with a one-track brain—one given to thinking in the department's technical production problems, but oblivious to the increased consumption possibilities. It is rather like the factory which turns out mammoth quantities of a certain product, without making prior arrangements to market it.

Cape Town's electrical engineer is a man of vision—one who combines professional skill with business ability to an ideal degree. He is Mr. G. H. Swingler. As recently as 1924 Cape Town was jogging along in a serene manner with its electricity supply, when the department launched an advertising campaign to stimulate increased consumption, and with it the prospect of a lower rate. The scheme had limitations; housewives interested in lightening their domestic burdens expressed a desire to have appliances demonstrated to them under impartial conditions, so that they would not be placed under any obligation.

Mr. Swingler sensed the pressing need, and his electrical appliance showroom recommendations were accepted by his governing board as a legitimate supplementary service.

The department's headquarters, situated in the town hall, could not be utilised for demonstration purposes. Fortunately the department had two suburban sub-stations, each with its own offices. It was therefore decided to remodel these structures to provide for a separate showroom equipped with a show window frontage.

Sea Point and Wynberg Showrooms.

The Sea Point showroom is situated three miles from the city hall; while the Wynberg showroom is eight miles from the down-town section. A third showroom is now being planned in another residential area.

As stated in Mr. Swingler's own words, " The principal function of both of these buildings is that of a sub-station for the distribution of electricity. Since they are both located in residential areas it was necessary to camouflage the true industrial and commercial purposes of the sub-stations in order to conform with the architectural appearance of each neighbourhood."

The object of the showrooms is to enable housewives at their leisure to inspect the latest introductions in electrical appliances. Emphasis is laid on the fact that there is no obligation to buy, which is the direct opposite of the attitude experienced in a contractor's showroom. Importance is also attached to the facilities for obtaining from the experienced man in charge of the showroom unbiassed and accurate information relative to the operation, utility, and economic value of such appliances.

The merchandise displayed in the showrooms is not purchased by the Department, but is loaned by the various Cape Town electrical contractors and wholesalers. The Department maintains the right to accept or reject such wares for display purposes, and to demonstrate them in what it considers the most efficient manner. As a result of these necessary reservations it is felt that the public is able to choose through the showroom displays and demonstrations only the most reliable equipment. Consumers are also protected from the numerous inferior appliances on the local market. No display advertising signs are used, since the aim of the showrooms is to preserve a refined home environment, to which end the appliances are displayed with suitable furniture and furnishings.

Appliances are not sold from the showrooms, although the Department receives the usual trade discounts from sales introduced by them. Such discounts meet part of the showroom operating costs.

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UNEMPLOYMENT AND WORK—VII.

Trade Union Policy, Good and Bad

By SIR ERNEST J. P. BENN.

PUBLIC opinion has travelled a very long road since the days when a combination of workmen was an illegal conspiracy, and we should be more than human had we been able to make so complete a change in our views without at least some errors and mistakes. To-day the notion that working men should be banded together in trade unions is almost universally accepted, and for that reason is hardly discussed amongst us. The trade unions are thus able to get along with what they conceive to be their business with a minimum of criticism and interference, and as in the nature of things they are bound to take a one-sided view of industrial problems, it is also natural that they should be doing a great deal of harm.

The Whitley Councils.

The war brought about many revolutions, but none so drastic or complete as the alteration which took place in the relations between trade unions and employers' organisations. The Whitley Report, and the joint councils which arose out of it, were welcomed on all hands as opening a new era of industrial peace and harmony, but, unfortunately, this excellent arrangement has produced in many trades what is in fact a conspiracy between capital and labour to rob the consumer.

I have never been a believer in low wages. I have never been able to see any economy in paying a man less than the maximum that can be got out of the job. I do not sympathise with much of the talk one hears about the need for reducing wages. In most cases I fail to see any such need. Rather am I convinced that it would be easy to increase the rates of many wage schedules. The difficulty about wages is of quite another kind: it is the work that is given for the wage. The elaborate systems of restriction and restraint chiefly arising out of demarcation; the awful waste of valuable time involved in most of these arrangements; the total lack of elasticity which we have introduced into our working arrangements—most of these things are to me merely stupid. The labour cost per hour of most jobs is far higher than the wage rate per hour. The consumer does not get this difference; the labourer does not get it; it is sheer waste.

In most cases the arrangement simply means the serious limitation of the demand, and less employment for everybody. Now the Whitley Report, the most useful document which was ever printed upon Government paper, has, strangely enough, tended to perpetuate and strengthen all these abuses. The employers in a trade which is full of trade union restriction will band themselves together on trade union lines, will agree upon costing systems and price lists, and fix the price of the article sufficiently high to cover up these abuses. The effect is to create a capital and labour trust, striving to obtain wealth from scarcity.

Most of the talk about over-production requires to be examined from this point of view. A trade which is riddled with extravagance will, through its unions, federations and joint councils, agree upon prices for its products which the market cannot stand. It will then be troubled with over-production, not because there is not a big demand for its products, but because people will not pay the price put upon them. In so far as that difficulty is due to the waste of labour arising from trade union restrictions, it is a trouble which the trade itself can and should remove.

Obstruction by Rules.

There is an even more serious side to this question of trade union abuses. I refer to the way in which rules and regulations are used to keep people out of work. I recently endeavoured, in a trade in which I am supposed to possess some influence, to get a boy of seventeen started on the career that he had chosen for himself. I failed entirely, notwithstanding a really strenuous endeavour. Trade unionists have yet to learn that every piece of work done leads directly and immediately to another piece of work. They are as a body afflicted with the notion that work is a limited thing, and that such work as exists must be shared out and spread over. It is only another variation of the Socialist fallacy that wealth is limited and must be divided up. These people fail to realise that economic endeavour is a continual process of creation. There is no more limit to the amount of work available than there is to the amount of wealth available, and to start upon the assumption that these things are fixed or limited in any way, and must therefore be regulated or rationed is simply foolish.

I always feel that one can appeal to trade unionists, and even to Socialists, with much more hope than to employers or capitalists, if only a small proportion of what the former classes claim as their aims may be allowed. The trade unions are loud in their protestations about service to the public, whereas employers and capitalists, whatever may be their real motive, do not as a class make much in the way of a public claim to be social servants. I can see a very sincere welcome for the idea that a particular trade is a service to the community, and that the trade union which governs it exists to render that service more perfect and more plentiful. If, however, we examine the actions of most of the trade unions from this point of view, they fall a long way short of this ideal. The difficulty, and it is a natural difficulty, is that each trade will think of itself and not of the rest. It persists in the fallacious notion that it can make arrangements for its own benefit and can impose them upon society as a whole. Thus it comes about that when some good trade unionist, owing to negotiations inside his own trade, succeeds in doubling his wages, he finds that other people have also had the same pleasant idea, and that the things he wants to buy are two-and-a-half or three times as expensive as they were before. His doubled wages leave him, therefore, rather worse off than he was. We have reached the stage in which it is almost true to say that every trade is organised in such a way as to get as much as possible for a minimum output. Very little thought is required to show that in these circumstances we can only expect to go on paying more and more for less and less. We are all following the same road, and it is due to our own intellectual self-respect that we should at least understand what we are doing.

Eclipse of the Consumer.

If we could get back to the notion that trade is a service, things would bear a very different complexion. It was certainly a service in the old days of free and open competition, and a very hard service. We did not then, perhaps, sufficiently recognise it as service. The buyer settled the price with a vengeance, the standard of living went up by leaps and bounds, and all sorts of incidental troubles came bubbling up to the surface. Now we have gone to the other extreme. The buyer has ceased to be a serious consideration with us. He must buy our goods on our terms, and if he fails to do so, then the trouble is not with us; it is with somebody else. We go in deputation to the Government, and seek for our particular form of dole. It may be a derating scheme or a subsidy or a tariff, but, whatever it may be called, it is a device to save us from the consequences of our own inability to accommodate ourselves to the market. Similarly with the worker. We must take his labour on his terms, and if that is not agreeable, we must provide for his needs. The trade union idea has established itself so firmly in the mind of the nation that we are all thinking of the convenience of the producer and forgetting that the consumer has any opinions at all.

The argument can be reduced to the very simplest terms, if we enquire as to the mentality of the trader or the worker, it matters not which, when doing and handing over a piece of work. Does the average workman say to himself:

"Here is a job which somebody wants. If I do it well, cheaply, and efficiently, the customer will want some more, and if he himself does not want more, he will go round to his friends, tell them how cheap and efficient I am, and they will then come into the market."

If that were our attitude of mind as a people, we should hear nothing about unemployment. But so long as most of us take another line, and say: "Here is a piece of work. I do not know when I shall get another. The man who wants it may as well pay me as much as I can screw out of him, and keep me at work on the job as long as I can make him," then, in so far as that is our attitude, or anything like it, the wonder is not that we are afflicted with a proportion of unemployment, but rather that there is any employment at all.

This unemployment disease is not amenable to Acts of Parliament and official arrangements. It needs a different outlook, a change of heart, another frame of mind on the part of most of us.

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BETTER STREET LIGHTING.

Obsolete Methods which Cause Accidents—Advantages of Mid-Street Suspension—Making the Most of Our Streets.

By CYRIL SYLVESTER, A.M.I.E.E.

BEING interested in lighting problems in general, I cannot but remark upon the progress being made by our competitors—the gas engineers. One has only to look round the gas lighting showrooms of any municipality to see lighting units which compare very favourably, in appearance and utility, with modern electric lighting units. There is no doubt that we have set them an excellent example. They are taking lessons from us; they are learning more from us than we did in the days when we followed in their footsteps.

These observations relate more particularly to the development of street lighting systems. In the early days of gas, when darkness brought an end to vehicular street traffic, the chief consideration was the illumination of footways. The conventional method of lighting was a gas jet accommodated in a lantern fitted on the top of a standard. The object of the lantern was merely to protect the jet from wind and rain. The art of light control was not understood; the inside of a lantern, which should have acted more or less as a reflector, was often painted the colour of the standards, a dark red or green. The illumination was in the form of a ring of light immediately under the standard; one could see, but very dimly, objects situated between standards.

When we began to think about the use of electricity for street lighting, we merely removed the gas jet and replaced it with an electric bulb. It was accommodated in the same lantern which served as a protector for the gas jet. It is true that, after a time, the inside of the housing was painted white so that a certain amount of light was reflected in a downward direction instead of being absorbed, as before, but with very little efficiency. One could hardly expect a lantern with a top designed as a water-shed to have scientific reflection features.

Many of these lighting units are still to be seen in London and the provinces. This is not because well designed lighting units are not available; the reason is that, in many cases, the cost of new lighting units, when compared with the higher efficiencies obtained, is not considered worth while. Yet this is a brake on the progress which should be made in connection with better street lighting. Part of the enormous increase in the number of street accidents can be traced to bad lighting, which is worse for motor drivers than no lighting at all.

Even in districts where new lanterns have been fitted, they are not installed under the best conditions. This is no fault of the illuminating engineer or the designer of the units. The facts are that two or three firms are asked to quote for the supply of lighting units which "must be fitted on the existing standards." The firms have no option; they know it is useless to point out that the height of the standards relative to their spacing is not satisfactory. All they are concerned about is securing the order.

For a street to be well illuminated it is necessary for the intensity to be high and to be even. This is impossible through the medium of lighting units with concentric illumination fitted on standards which once accommodated units intended solely for footway illumination. The gas people realise this—a fact that I will substantiate later.

A lighting unit with concentric illumination, no matter how efficient it may be, when tested at the photometer, must be inefficient if the whole of the light is not projected on the road. As the matter stands, such a unit illuminates the front of buildings, or projects undesirable light into bedroom windows. When fitted in country districts, a large proportion of the light emitted serves to illuminate Brown's meadow or Jones' cabbage patch.

If the illuminating engineer had his way, he would suspend all street lighting units by a system of mid-street suspension. This projects practically the whole of the light on to the road. With suitable refractors, in which the prisms have been designed in conjunction with considerations of height and spacing, there is no reason why the resultant illumination should not be even and of high intensity.

[*Photo by courtesy of the General Electric Co*

The new lighting of the Victoria Embankment, London—an example of street lighting as it ought to be.

In many of the large cities on the Continent, mid-street suspension is general. It is true that the units are equipped with opal glass globes, but they are fitted so close together that directional illumination through the medium of refractors is not necessary; the light is well diffused with just that amount of directional quality to create the correct effect of light and shade.

What can be done in England by suspending lighting units over the centre of a roadway is manifest by the excellent results to be seen on the Thames Embankment. Here two lighting units are fitted on each span; the spacing of the spans is equi-distant, and was determined after due consideration had been given to the height at which the units were fitted. The intensity is high and the illumination is even. Another installation on the same system is to be seen in Maidstone. The street in which it is fitted is narrow, but practically no light is wasted and it is very even.

Even illumination is impossible with the use of units situated on the edge of footways, unless arrangements are made to make the light directional through mediums other than those which are embodied in the design of lanterns. The colours of buildings vary considerably—from dark red to white. In the first case, the majority of light incident upon the face of buildings is absorbed; in the second, a large proportion would be reflected into the street at angles governed by the positions of the reflecting surfaces. This makes for uneven and patchy illumination.

Interesting developments are being carried out by the gas people in the Streatham district of London. They are making the best they can of their lighting units by adding what may be termed "reflection or directional accessories" to ordinary street lanterns. In the first place, the lanterns are equipped

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with an enamelled steel reflector of high reflection factor. On one side of the lantern (the side nearest to the buildings) a V-shaped reflector of mirror glass is fitted. High pressure gas burners are fitted in the top of the lantern and at the bottom, which is open, is fitted a square pyramid of mirror glass. The V-shaped reflector effectively prevents the light falling upon the face of the buildings adjacent to the unit, and it redirects it in the direction where it is required—on the roadway. The pyramid reflector prevents the concentration of light at the base of the standard and it is directed into the roadway and on to the footways. I have tested the illumination before, and after these accessories were fitted and, although I hold no brief for gas, the improvement is remarkable.

The subject of street lighting is very important from a national point of view. One of the most difficult matters to be dealt with at the present moment is the traffic problem. This can be solved by good street lighting. I was talking recently to the manager of a well-known carrier company. He complained of the slowness of transport through daytime traffic congestion. He said: "If only the roads were well lit I could do practically the whole of my work during the night, and my company would save money."

This is only one company. As one moves about London, it can be seen that vans and lorries are blocking the roads and preventing traffic progress. Practically the whole of this work could be done out of daylight hours if the roads were sufficiently well illuminated. It is done in an industrial interior; work after daylight ends is possible in well illuminated workshops. Why not on roadways? A road way is made to facilitate traffic; it should be made to work the whole of the twenty-four hours in each day. If only the Ministry of Transport and illuminating engineers could get together on the subject of better street lighting there would be a saving of life and limb, traffic congestion would be reduced, and the general public would greatly benefit.

AUSTRALIA AND THE BRITISH ELECTRICAL MANUFACTURER.

Factors Underlying the Possibility of Co-operation—Our Largest Market for Electrical Products—Australian Electrification Well Advanced—Tariff Aspect.

(FROM A CORRESPONDENT.)

At a time when intra-imperial industrial co-operation is a subject much discussed in both political and industrial circles, but a subject which, in general, has scarcely progressed beyond the form of the reiteration of principles, the results of an examination into the factors underlying the possibility of co-operation between the electrical industry in Australia and Great Britain should be of interest. The examination has been made in the purely impartial light of economic research, the relevant statistics being taken from the official Australian Year Book and from the official Trade Returns from both countries. Any suggestions, moreover, which may be expressed or implied for the bringing about of some degree of rationalisation in the conduct of this intra-imperial policy in respect of electrical development, have nothing to do with political considerations, and must stand purely as deductions from the observed facts.

The importance of this investigation must be realised at the outset by the fact that Australia is today the largest market for the export of British electrical products. It is, moreover, a market in which the potential expansion in the future is very great indeed, greater probably, both from the point of view of absolute volume and rate of development, than most of the new countries, so that a consideration of a policy to be adopted can, with every confidence, be based upon a long-term view.

In face of this fact it would not be sufficient merely to advocate a greater concentration of the British exporter upon the Australian markets. Such action would lead to wasteful price-cutting as, in the past, it has been accompanied by a maldistribution of productive resources. For an arrangement which is to be beneficial both to the Australian and British manufacturers a more reasoned examination of the facts will be necessary, and in doing so an estimate must be made of the balance of present concession as against future advantages.

An examination of the figures relating to the public supply of electricity shows that the capacity of all generating plant installed in Australia has risen from 238 349 H.P. in 1919 to 803 706 H.P. in 1928, while an estimate for 1929 would put the figure at about 1 000 000 H.P. Thus over the period of ten years the generating capacity has been more than quadrupled. It is important to note, moreover, that the above figures relate only to public supply undertakings and do not include private industrial generating plant or installations in power stations owned by the States. Including the latter, the total generating capacity in Australia, in 1928, was about 1 340 000 H.P.

In order that some estimate can be obtained of the degree of electrification in industry, the figures for the total capacity of generating plant installed are expressed as a percentage of the total prime-mover capacity in industry. The result is, of course, an indication of the amount of prime-mover machinery which is engaged in driving electrical generating plant. In 1919 this figure was 50·7%, while it had risen to 76·5% in 1928. The increase in generating plant capacity between 1919 and 1928 of 565 357 H.P. has been accompanied by an increase in prime-mover capacity of 578 572 H.P. This seems to indicate that almost the entire expansion in prime-movers has been due to expansion in electrical generation, or, in other words. that electrical supply development is keeping full pace with the development in general industry. This being the case, one would expect a corresponding increase in the electric motors installed in industry driven by purchased energy. In 1919 this figure was 159 372 H.P., while by 1928 it had risen to just over 500 000 H.P. Thus the public supply system is obtaining a steadily increasing proportion of its demand from industrial power purposes.

The operation of the supply industry is economical. This is shown by the fact that the average price obtained per unit sold has fallen from 1·7d. in 1922 to 1·32d. in 1928, at which figure it compares very favourably with that quoted in the United States or in Great Britain. In reaching this figure advantage has been taken of the steadily declining overhead charges represented by expenditure on land, buildings, plant machinery. The total expenditure under these heads per H.P. of generating capacity installed was £42 in 1922 and has fallen steadily to £33 in 1928, a figure which, although not as low, is comparable with that obtaining in Great Britain. The output of electricity has risen from 835 000 000 units in 1922 to 2 194 486 000 in 1928, an increase of roughly two and a half times, giving at the latter date an annual output per head of population of about 340 units, as against an output of about 180 units in this country.

Thus, both on the basis of consumption per head of population and of the degree of electrification in industry, Australia is already far advanced. The economic operation and design of the generating stations has enabled current to be supplied at an exceedingly low cost, and indicates that the Australian engineers have taken advantage of the most modern developments in supply technique. The problem of electrification in Australia, therefore, does not include the difficulty of overcoming prejudice, nor is it necessarily one of education. At the same time, as has been indicated, it is not primarily one which has to deal with the intensification in the use of electric current, but is rather one of extensive development, a development, that is to say, which will move *pari passu* with the development in general industry.

Local Manufacturing Possibilities.

This point is one of extreme importance when a consideration is made of what branches of the electrical industry shall be developed within Australia itself. It would be practically useless to attempt the foundation, by the imposition of tariffs or by means of government subsidies, of industries for the manufacture of heavy generating machinery in the country at the present time. The immediate demand for such products, while growing, would not constitute a sufficient turnover for the profitable operation of that branch of the electrical industry in which experience in this country has shown that the profit margins are at a minimum. Nor is the immediate future development of such a demand likely. The degree of industrialisation which would be necessary to justify the

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installation of heavy manufacturing plant, although one assumes it to be accompanied by the fullest use of electrical power, is by no means yet reached.

The part which the British manufacturer has played in the development of the use of electricity in Australia can be estimated from an examination of the import returns over a number of years and also from a census of the equipment in the supply industry at the present time.

The total imports of electrical machinery and apparatus have increased steadily from £4 720 534 in 1923 to £7 166 008 in 1928, with a recession to £6 127 000 in 1929. If we add to these totals the imports of allied machinery such as steam turbines, water tube boilers, etc., for which the latest figures obtainable are for 1928, the import totals are raised to £4 866 491 in 1923, while for the latter date they are £7 454 928. Of these totals, that is to say, those which include the allied machinery, Great Britain has supplied about 67% over the period in question. In the category of allied machinery the percentage supplied by Great Britain is about 95%, or practically the entire market, the same figure pertaining to the imports of wire and cables. In the case of dynamo-electric machines, transformers, control and switchgear, the British percentage has been in the neighbourhood of 65% while in the lighter apparatus it has ranged between 25% and 50%.

Some of the largest stations in the Empire at Yallourn, belonging to the Electricity Commission of Victoria with 150 000 kW, Bunnerong in the Sydney municipality with 150 000 kW and White Bay belonging to the New South Wales Government with 147 750 kW, are being equipped either entirely with British machinery or to British specifications. The fact that this preponderance in the installation of British equipment has justified itself has been shown above by the economic operations in the supply industry of Australia. With those factors in mind we can touch on the broad question of co-operation between British and Australian industry.

One point of immediate importance arises out of the consideration of the tariff adjustments which would be best calculated to bring about this policy of rationalisation. The aims of such a tariff should be the protection of those branches of the electrical manufacturing industry which could be established on a true economic basis in Australia at the present time. On the other hand, those goods which cannot yet be supplied by the home market should, at least on the British Preferential basis, be admitted duty free. For this purpose one can divide the electrical imports into three broad categories. Firstly, those goods which in the main constitute the capital equipment of other industries. The manufacture of these requires very heavy capital outlay, which in view of the present degree of development in Australian industry generally, would not be justified. The necessity for importing such equipment from abroad at the present time means that the cost of the import duties on these goods must be borne by the importers, and thus constitutes a very serious burden on municipal and industrial enterprise. The second category is composed of goods which could still be included in the category of capital goods, but in which there is a fairly high rate of turnover. Thus the ratio between capital equipment necessary and gross output is not so large as in the first case. The third category includes goods which, in the main, could be produced in Australia at the present moment. They are of the nature of light apparatus (consumers' apparatus) and constituting as they do, a very small proportion of an individual consumer's expenditure, their price may be raised temporarily in order that the initial stages of manufacture be undertaken without loss.

The doctrine of *laisser-faire* is no longer one which can be relied upon to secure an equitable balance of trade between two countries. The conception of a vacuum in which such an economic equilibrium was supposed to be achieved has been found to be no longer valid, and the *ceteris paribus* which was such an important function in the principle has been disturbed by both financial and political agencies. To assume then, that because conditions of trade have been favourable in the past, they will remain so in the future, is to adopt an all too optimistic view, and when it is agreed that the potentialities in the trade relations between Great Britain and Australia can only be developed to the fullest extent by a conscious guidance, this is not to advocate a change in policy; it is rather the inculcation of a policy where no policy has existed before. The accumulation of considerable adverse balances of trade with nations which have no other interests than that of commercial exploitation; this has been the difficulty in the recent commercial development of Australia. It is a difficulty which, however, will be overcome when the phrase Intra-imperial Co-operation is converted from being a mere catchword of the newspapers to an accepted industrial policy.

BOOK REVIEW.

Transmission Networks and Wave Filters. By T. E. SHEA, M.S. (London: Chapman and Hall. 470 pp. 32s. net.)

Mr. Shea, of the Technical staff of the Bell Telephone Laboratories, deals very completely with the mathematical and electrical theory of the performance of transmission networks, balanced and unbalanced, and the general characteristics and formulæ of various types of networks and network arms are fully discussed. Characteristics and properties of wave filters are also examined, and the book includes an analysis of recurrent signals by the Fourier series and application of Fourier integral analysis to the solution of purely transient waves.

BOOKS RECEIVED

"Journal of the Institution of Electrical Engineers." Vol. 68. No. 401. May. (London: E. and F. N. Spon). 10s. 6d. net.

"Electrical Distribution Engineering." By H. P. Seelye. (London: McGraw-Hill Publishing Co.) Pp. viii+710. 30s. net.

"Anfangsgründe der Wechselstromtechnik." By Konrad Gruhn. (Dresden and Leipzig: Theodor Steinkopff.] Pp. vi+82. 5·80 marks.

"Nouvelle Encyclopedie Electro-Mechanique." By L. Lagron. (Paris: Librairie Scientifique Albert Blanchard.) Pp. 587. 36 francs.

"Electrical Wiring and Contracting." Edited by H. Marryat. Vol. V. (London: Sir Isaac Pitman and Sons). Pp. vii+237. 6s. net.

"Alternating Current Bridge Methods." By B. Hague. 2nd Edition. (London: Sir Isaac Pitman and Sons.) Pp. xvi+391. 15s. net.

Standards Yearbook, 1930. Compiled by the National Bureau of Standards. (Washington: U.S. Government Printing Office.) Pp. 301.

"Bulletin International XXVIII. Résumés des Travaux Présentés. Classe des Sciences Mathématiques, Naturelles et de la Médecine." (Prague: L'Academie des Sciences.) Pp. vi+450.

"Elements of Electricity." By Anthony Zeleny. (London: McGraw-Hill Publishing Co.) Pp. xxiii+438. 15s. net.

"Transverse Tests of H-Section Column Splices." By J. H. Edwards, H. L. Whittemore and A. H. Stang. Bureau of Standards Research Paper No. 157. (Washington, D.C.: Superintendent of Documents.) 10 cents.

"Lehrbuch der Psychotechnik." By Prof. Dr. W. Moede. (Berlin: Julius Springer. Vol. I. Pp. ix+448. 48 marks.

"Industrial Electricity and Wiring." By J. A. Moyer and J. F. Wostrel. (London: McGraw-Hill Publishing Co.) Pp. ix+469. 13s. 9d. net.

"Die Wirtschaftlichkeit der Energiespeicherung für Elektrizitätswerke. By Ludwig Musil. (Berlin: Julius Springer). Pp. x+142. 18 marks.

"A Critical Review of Literature on Amplifiers for Radio Reception." Radio Research Special Report No. 9. (London: H.M. Stationery Office.) Pp. viii+239. 5s. net.

"The Effect of Distribution and Colour on the Suitability of Lighting for Clerical Work." Illumination Research Technical Paper No. 10. (London: H.M. Stationery Office.) 6d. net.

"Engine-Ignition Shielding for Radio Reception in Aircraft." By H. Diamond and F. G. Gardner. Bureau of Standards Research Paper No. 158. (Washington, D.C.: Superintendent of Documents.) 15 cents.

Science Abstracts. Sections A and B. Vol. 33, No. 389 (May). Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s. 6d. Annual subscription, 35s., or 60s. for both sections.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Supply Authorities and Radio Apparatus.

[To the Editor.]

Sir,—I should like to draw attention to what appears to me to be a very misguided attitude on the part of many supply authorities—their lack of interest in electrically operated mains apparatus, which in many cases amounts practically to discouraging its use. The reasons put forward for this attitude are usually that the energy consumed by mains receivers and supply units is so small as to be negligible and to be so small that the meter does not measure it.

The average type of mains receiver seldom consumes less than 30 W, and it is a very poor kind of electricity meter that will not measure this consumption. Further, radio apparatus is most commonly operated in the evenings when the lighting is in use, and, in consequence, the consumption of the radio receiver or supply unit is added to the general consumption and properly measured.

The very important point, however, which seems generally to be overlooked, is that great numbers of people install electricity in their houses in the first case for the facility of operating radio receivers and associated apparatus from the mains and the removal of the bugbear of batteries. Radio mains apparatus is therefore a direct incentive to the spread of the use of electricity, as when once installed for radio purposes it is obviously used in many other ways.—Yours faithfully,

J. Baggs.

Manchester.
May 28.

Unemployment and Work.

[To the Editor.]

Sir,—Only three weeks ago you were good enough to print a letter from me in connection with Sir Ernest Benn's second article on Unemployment and Work, and therefore I feel some diffidence about trespassing on your space again. Also I am anxious not to lead your readers to imagine that I am in any way connected with the writer of these excellent articles, a sort of little Benn, for nothing is further from the truth. When I hear the thunder of the gods, and am moved to join in with my tin whistle, it should be readily understood that there is no connection between the sources of the sounds.

There may be many reasons for the decay of individual responsibility. Recent legislation, the decline of public worship, the trend of modern thought, but the obligation remains and the failure to realise it has been bewailed by no less a person than Mr. Snowden. The short-sightedness of politicans, however, is notorious, and political astigmatism is extremely contagious. We are all inclined to denounce the dole for others whilst demanding it for ourselves. Safeguarding, export credits, State guaranteed loans, relief works, exchequer grants, public assistance are among its various forms, so that it is almost impossible to foresee where the process of trying to live by taking in one another's washing is likely to end.

In a miasma of despair, apparently, and it is only by each and all of us remembering our responsibilities that any light can be seen.

In my small workshop I have unfortunately had to discharge many people for laziness, incompetence and insubordination, but for over six years no one has been discharged for reasons beyond his control. By hook or by crook everyone in my employ has worked full time except during holiday periods. I do not, however, pretend that such a system could immediately become universal, but I think much could be done in that direction. As I have pointed out previously, the trouble often starts in the home, so that boys and girls set out to obtain work with a very big handicap. If they and their parents really felt that failure to become efficient would lead to starvation, much greater trouble would be taken to attain this end. Employers would be assured of much better material on which to work, that is to say, if boys and girls entered employment feeling that their lives depended on them doing their best and of losing no opportunity of learning, the trouble would be much simplified.

It must be obvious to any thinking person that State insurance against unemployment has miserably failed. Quite recently Mr. Noel-Buxton stated that his department was considering a sound scheme of unemployment insurance for agricultural workers. Surely a moment's reflection by any sane person would convince him that any form of compulsory insurance might be unsound. I have always felt that fire and life insurance, as administered by insurance companies in this country, are wonderfully cheap, and yet these companies make good profits. Compare this with State insurance. The deduction of contributions is resented by the workers, the employers' contribution is a serious burden, those who receive its benefits are thoroughly dissatisfied with it, and its liability on the State is a staggering one, and yet we have a Minister of the Crown actually advocating its extension. Changes may take place by sudden or gradual means, but those which follow the latter course are usually the more effective. I advocate the abolition of State unemployment insurance, but by gradual means, so as to minimise the incidence of personal hardship. Under my scheme the State would cease to insure all workers below the age of 30, continuing benefit for another six months after cessation, but I would compel employers to pay three-quarter wages for six months to those whom they put off and do not discharge for misconduct. This compensation would be paid by employers whether or not the recipient obtained other employment, but it might be commuted by agreement with the worker on payment in a lump sum of 75% of the outstanding liability. For test purposes an employer might engage a man or woman for two months without incurring this obligation, but at the end of two months the employee must either be discharged or come under the scheme, and could not be re-engaged without immediately entering it. On the other hand, for those employers who are normally in the habit of engaging and throwing off labour intermittently, there would still remain in the beginning the men and women in industry over 30, which is the age after which it becomes increasingly difficult for anyone to get fresh employment. My scheme would in fact ensure rather better chances of employment for those over 30 than they have to-day, but each year the age limit would be raised. In other words, no one would enter State unemployment insurance. I would, however, raise the insurance contributions of both employer and employee, but entirely abolish the Treasury contribution, in return for which the loan now owing to the Treasury by the Insurance Fund would cease to become a liability on it, and would be added to the national debt. Any man or woman over 30 who desired to enter the scheme and relinquish State insurance would have the opportunity of doing so within six months, and would cease to be insured.

I do not pretend that my scheme, as outlined above, is free from blemishes, but it would, at any rate, have the advantage of making both employers and employees realise their dependence on one another and not on outside influences. Employers must realise their obligations to those whom they employ, employees must likewise recognise their obligations to their employers and themselves by becoming efficient, and politicians must realise that the best way to accumulate material wealth is by the freest possible production and interchange of the goods on which our welfare and comfort depend.—Yours faithfully,

D. G. Ryder.

London, S.E.14.
June 2.

ELECTRICAL TRADES ASSOCIATION.

Advantages of Membership.

Readers are reminded that the above-named association has been formed with the following objects: (1) To regulate credit; (2) to provide a means of debt collection without legal process; (3) to provide members with credit information; (4) to represent members at meetings of creditors and in matters where the opinion of the trades may be important; (5) to provide a special organisation for these trades, and (6) to protect the interests of members. The annual subscription to the association is £2 2s., payable on January 1 in each year. No charge is made for supplying credit information up to 25 inquiries a year; more than this number on special terms to be agreed. A fee of 10% of the amount collected is charged on all debts given over to the Association for collection. No other charge is made, and if no part of the debt is collected there is no fee. In cases where legal proceedings are necessary, whether as regards debt collection or otherwise, the Association's solicitors will act for members at reduced fees. The secretary is Mr. David Pollock, and the address Mitre Chambers, Mitre Street, London, E.C.3.

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NEWS IN BRIEF.

Plays by Television—Floating Power Station—E.D.A. for South Africa—Large Canadian Hydro-electric Plant Begun.

A PUBLIC telephone service between this country and Latvia was opened on May 5.

Work has commenced on the new electric signalling system at St. Enoch Station, Glasgow.

Edinburgh Corporation has decided to seek powers from Parliament to make electrification of the railways within the city compulsory.

A total of 640 000 000 incandescent electric lamps were sold in the United States during 1929, an increase of 76 000 000 over 1928.

The number of telephones working with the Post Office system at March 31 was 1 882 110, an increase of 127 469 when compared with the total at the same date last year.

East Retford Corporation is advertising for a manager of the Corporation's electricity department. The salary offered is £350 per annum.

In connection with the electric power installation at the Barming Mental Hospital, Kent County Council has decided to instal hot cupboards and hot carving tables at a cost of £350.

A successful television demonstration is reported to have taken place in the laboratory of the General Electric Co., of New York, when a play was audible and visible in a theatre at Schenectady a mile away.

Mr. W. S. Wyman, president of the New England Public Service Company, recently described to the members of the New England Division of the N.E.L.A. an enterprise which will enable the company to supply energy to places where it may be needed in an emergency. A floating power-plant will be installed on a 4 500-ton ship which has been bought from the Government Shipping Board.

Colchester Corporation is inviting tenders for the installation of electric light in Canterbury Road School.—The Borough Surveyor has been asked to proceed with working drawings for new offices for the electricity department.

A sub-committee has reported to Guildford Electricity Committee that it had been decided that the cookers manufactured by the General Electric Co., Ltd., and Revo Electric, Ltd., and water heaters manufactured by the General Electric Co., Ltd., and Sadia, Ltd., be let on hire.

At the end of 1929 there were 676 electric railway transportation companies in the United States. On April 1 of this year, 380 electric railways were operating 12 819 motor 'buses over approximately 23 900 miles of route. These include 66 companies with 647 motor 'buses operating over 2 262 miles of route that have substituted 'buses for entire railway property.

The National Federated Electrical Association and the Electrical Trades Union announce that under the National wages agreements dated August 7, 1920, and September 22, 1921, the variation in cost of living justifies a 30% reduction in the basic rates of wages (April, 1921) and that the net hourly rates of pay applicable to the respective grades as from the second pay day in June are as follows:—A, 1s. 10d. (decrease 1d.); B, 1s. 7d. (decrease ¾d.); C, 1s. 5½d. (decrease ¾d.); D, 1s. 4d. (decrease ¾d.).

It is proposed to form an association to be known as the Electrical Development Association of Southern Africa. This proposal is the outcome of a paper submitted by the chairman of the Electricity Supply Commission, Dr. H. J. van der Bijl, to the Association of Municipal Electrical Engineers. The Cape Town Electricity Committee has given the matter careful consideration, and recommends that the T.C. support the Association, the subscription to be a minimum of £100 per annum with a maximum of £250, provided other municipalities support the proposal.

The International Hydro-Electric System, a division o International Paper and Power Co., produced 347 174 000 kWh in April, an increase of 13% over the output of the present plants of the system in April, 1929, and 60% over their output in April, 1928.

Chester Corporation has accepted a tender, amounting to £3 980, for alterations at the electricity showrooms, Northgate Street, and application is to be made to the Electricity Commissioners for sanction to borrow £5 000 to meet the cost of the alterations and incidental expenses.

In 1918 the average household in the United States was using 272 kWh of electricity a year for which it paid an average price of 8·3 cents per kWh. In 1924 the average use had increased to 378 kWh but the rate had decreased to 6·55 cents per kWh. In 1929 the average home was using more than 500 kWh at an average price of 6·2 cents per kWh.

Clitheroe Corporation has decided, as an experiment, to instal in six Corporation houses, an electric washboiler, cooker and kettle. Tenants are to pay 1s. 3d. a week in addition to the charge for energy.

Mr. H. B. Lees Smith, Postmaster-General, speaking at Sutton, Yorks, on May 30, said unemployment could not be cured under the present "anarchical individualistic system." There must be some central regulating authority in each industry to adjust output to potential demand. He cited the progress made by the Post Office telephone department, and added that international as well as national regularisation would be needed before unemployment could be gripped completely by the throat.

LOOKING BACKWARD.

FIFTY years ago, THE ELECTRICIAN *of June 12, 1880, stated that 1 716 Jablochkoff candles were then in use in France.*

The application of electricity to railway traction was suggested by Dr. Siemens in a paper read before the Society of Telegraph Engineers.

* * *

TWENTY-FIVE years ago, it was recorded in THE ELECTRICIAN *of June 9, 1905, that the Governments of Switzerland and Baden had granted a concession for the development of 50 000 h.p. of electrical energy from the Rhine falls at Laufenburg.*

The "Electrical World" of New York was quoted as reporting the installation of a 1 000 000 V transformer in Purdue University, under the supervision of Prof. J. W. Esterline.

Mr. S. E. Fedden, general manager of the Sheffield electric light department, complained in his annual report that progress had not been as rapid as anticipated, "owing chiefly to trade depression."

The National Federated Electrical Association announces that in view of the revised rates of wages for journeymen which came into operation on the second pay day in June for the pay period covered by that pay day, the corresponding rate for mates under the London agreement is 1s. 5½d. per hour.

Electric labour-saving appliances, having a retail value of nearly $1 000 000 000, were sold in the United States last year, establishing a new high record and a material advance over 1928. The 1929 total was $925 000 000, as compared with $813 000 000 in 1928. A notable feature of the year was the advance made by electric refrigerators, of which 630 000 were sold, with a retail value of $181 175 000. The 1928 total was 468 000. In each case the figures cover only domestic units. The demand for electric exercisers reached a total of 70 500, as compared with 15 000 the year before. Health lamps also registered a big increase, with a record total of 250 000, valued at nearly $10 000 000. Electric irons continued to hold their lead in the greatest number sold, more than three million having gone into the country's homes.

Work has now commenced on the construction of the new Chats Falls power plant on the Ottawa River. This project is one of the largest hydro-electric power developments at present under construction in Canada. It is a joint undertaking of the Ontario Hydro-Electric Power Commission and the Chats Falls Power Co. The fact that the Ottawa River is an interprovincial stream, forming the boundary between the Provinces of Ontario and Quebec, accounts for the division of interests. The Ontario Concession is entitled to the power developed from the Ontario half of the river, while the Chats Falls Power Co. has the privilege of developing the Quebec section. The joint power house will contain eight turbines, each rated at 28 000 H.P., or a total of 224 000 H.P. Provision will also be made for the later installation of two more similar units, so that eventually the development will have a capacity of 280 000 H.P.

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PERSONAL.

SIR William Bragg has been elected a corresponding member of the Vienna Academy of Sciences.

Mr. H. B. Sharpe, late transport manager to Rotherham Corporation, has been appointed to Morecambe.

Mr. R. Borlase Matthews has been appointed one of the judges of the implements entered for the Silver Medal of the Royal Agricultural Society of England at the forthcoming Manchester Show.

Mr. C. G. Morley New, borough electrical engineer, Cardiff, is on the short list for a similar appointment under Nottingham Corporation, at a commencing salary of £1 750. Mr. New's present salary is £1 300.

At the business meeting of the Electrical Contractors' Association of Scotland last week, the following office-bearers were elected for the ensuing year: President, Mr. D. H. Morris, Dundee; vice-president, Mr. Henry Meighan, Glasgow; secretary, Mr. Walter Finlay, W.S., 55, Frederick Street, Edinburgh.

Mr. F. Massingberd Rogers, Sir Edward Hilton Young, Mr. Percy Horsfall and Col. Wade Hampton Hayes have joined the board of the English Electric Co., and, in accordance with the scheme for reorganization of the capital of the company, the following directors have resigned, viz., Sir Charles E. Ellis, Sir John A. F. Aspinall and Lieut.-Col. Sir John H. Mansell.

With reference to the statement in our May 16 issue, page 621, to the effect that the Leyton Town Council had increased the salary of the borough electrical engineer and manager, the name of Mr. J. W. Speight was incorrectly given. The borough electrical engineer and manager at Leyton is, of course, Mr. J. Wetherell, and the increase in salary refers to him.

The President of the Board of Trade has appointed Ald. E. B. Lewis, President of the National Chamber of Trade, as an additional member of the Committee recently set up under the chairmanship of Lord Chelmsford, to examine the present situation as regards the British Industries Fair, and to consider what means can be adopted to increase still further its utility to British trade.

At the first meeting of the new committee of the Association of Consulting Engineers, held last week, Mr. A. H. Dykes, who has for 21 years acted as honorary secretary, was appointed chairman of the committee for the ensuing year, and Mr. S. R. Raffety (Messrs. Rofe and Raffety) was appointed acting honorary secretary during Mr. Dykes's term of office. The address of the office will remain 11, Victoria Street, Westminster, S.W.1.

The Institute of Transport announces that the Council has elected the undernamed to take office at October 1, 1930: President, Sir Arthur Stanley; Past Presidents to serve on the Council, Messrs. R. H. Selbie, Roger T. Smith, Sir Henry P. Maybury, Colonel Sir Joseph Nall, Air Vice-Marshal Sir W. Sefton Brancker, and Sir Josiah C. Stamp. Vice-Presidents. Messrs. A. L. Barber, R. Bell, Sidney E. Garcke, R. J. Howley, J. H. Follows and D. J. Owen. Hon. Treasurer, Sir Henry P Maybury.

Mr. C. C. Paterson, who has been nominated as President of the I.E.E.

The new president nominated by the Council of the I.E.E. is Mr. C. C. Paterson, the director of the research laboratories of the G.E.C., Wembley, and the new vice-president, Col. R. K. Morcom, a director of Belliss and Morcom.

At a meeting of the Senate of the University of London, last week, Prof. J. K. Catterson-Smith was appointed to the University Chair of Electrical Engineering tenable at King's College. Since 1923 he had been Professor and Head of the Department of Electrical Engineering at the Indian Institute of Science, Bangalore, of which he has also officiated as director. At the same meeting of the Senate Prof. H. R. Robinson, of University College, Cardiff, was appointed to the Chair of Physics of the East London College.

The Electricity Commissioners have appointed Messrs. C. D. Taite (chairman), M. H. Adams, H. K. Beale, J. Bruce, A. N. East, A. Holmes, W. Innes, A. B. Owles, S. L. Pearce, T. Roles, W. C. P. Tapper, E. R. Wilkinson, and Alderman W. Walker to be a committee, with Mr. C. S. Jenkins as secretary, to consider and report upon the measures which have been taken, both in this country and abroad, to obviate the emission of soot, ash, grit and gritty particles from the chimneys of electric power stations. The committee held their first meeting on June 2.

Mr. H. Savage, whose retirement is referred to below.

Mr. Henry Savage, who retired from the position of manager of the North Woolwich works of W. T. Henley's Telegraph Works Co., Ltd., after 40 years' service, on June 7, was the recipient of a presentation at the works on June 4. Sir George Sutton, the chairman of the company, who was unable to be present, wrote expressing his regret both at his inability to be there and at the departure of Mr. Savage. He stated that he was glad to be able to include himself as a fellow-worker of Mr. Savage, and he wished that the company could have had a few more years of his life at Woolwich. The presentation consisted of an epidioscope and a pocket wallet to Mr. Savage, and a fitted leather dress case and a writing case to Mrs. Savage. These gifts were subscribed for by the staff and workpeople at North Woolwich, and staffs at the city office and Gravesend works. Mr. Percy Rosling, the company's general manager, presented the gifts, and in doing so mentioned incidentally that when Mr. Savage commenced with the company as a junior, he (Mr. Rosling) was his first immediate chief. It was an achievement of considerable merit to have entered the company's service as a junior and to have reached the position of the manager of the works. Mr. Ernest Lefeaux, assistant works manager, occupied the chair and made the presentation to Mrs. Savage on behalf of the staffs and workpeople. Incidentally, Mr. Lefeaux has been appointed by the company to take over the works managership at North Woolwich. Mr. Charles Andrews, on behalf of the hourly-paid workers, paid a tribute to Mr. Savage for the smooth manner in which he had controlled the employees at Woolwich, and for the interest he had taken in running the sick club, the bowls club and other industrial and social functions. He mentioned that during the course of his managership there had never been the least industrial friction, leaving out of consideration the general strike in 1926. In acknowledgment Mr. Savage said there were various reasons for his retirement, but they were purely personal and voluntary. The management did not wish him to leave and he had no difference with the company, management, staff or the workpeople. He paid tribute to the foundation work of his predecessor, Mr. Robert J. Hatton, now a director of the company, to the board of directors and management for the help they had given him in providing him with adequate finance for new buildings, machinery and apparatus, and to his colleagues at the works, without distinction, for the manner in which they had co-operated with him. Mr. and Mrs. Savage are shortly leaving for a long sea voyage, expecting to be back home in January of next year.

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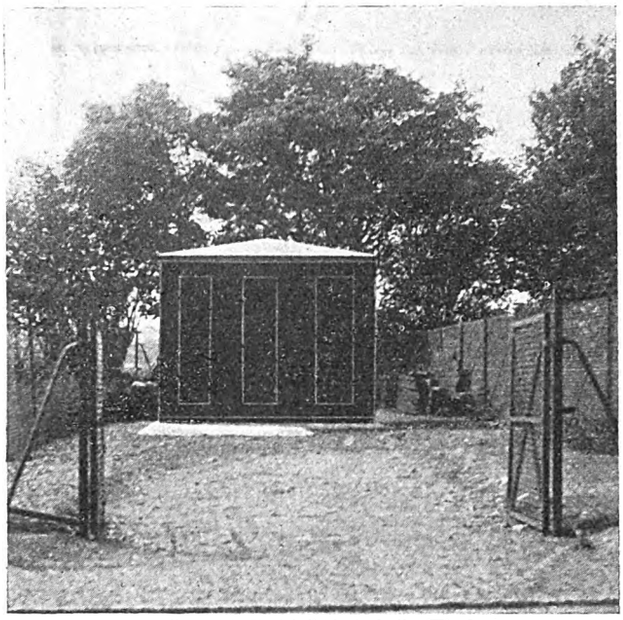
RURAL ELECTRIFICATION.

Inauguration of Rural Supply at Winchester.

THE inauguration ceremony of the scheme to supply with electricity the Parishes of Twyford, Compton and Shawford in the Rural District of Winchester was held in the Parish Hall at Twyford on May 21.

The Chairman of the Winchester Electricity Committee (Alderman Johnson) presided, and among those present were :



One of the "English Electric" kiosks in the Winchester area.

the Mayor and Mayoress, the city electrical engineer (Mr. R. Ayton), Mr. A. M. E. Maylett (representing W. T. Henley's Telegraph Works Co., Ltd., the principal contractors) and members of the Electricity Committee. A large number of residents of the neighbourhood were present in the Hall at the invitation of the Committee, to watch the ceremony of switching on the current, which was performed by the Mayor.

Mr. Maylett presented to the Mayor, on behalf of his firm, a handsome silver electric table lamp with ornamental shade as a memento of the occasion.

Tea was then served to the visitors and afterwards they were invited to inspect a selection of domestic electrical accessories and appliances which were ranged on stands round the Hall.

For the purpose of this rural electrification scheme, energy is purchased in bulk from Southampton Corporation, who deliver it at 11 000 V, three-phase, 50 cycles, to a switching and metering kiosk supplied by the English Electric Co., Ltd., situated at the southern extremity of the Winchester supply area. From this point the current is transmitted by overhead line to the outskirts of Twyford, whence it is carried by underground cable to two transformer kiosks, also supplied by the English Electric Co., Ltd., situated in Compton and Twyford, respectively. These kiosks are provided with oil switches with overload and leakage trips, isolating switches, low tension distribution units of Henley manufacture, and 100 kVA transformers, though space has been allowed for the installation of 300 kVA transformers when they are warranted by the growth of the load.

Low tension distribution is 4-wire, three-phase, 230–400 V, and is carried out generally by overhead lines though in some cases it has been necessary to lay underground cables.

The whole of the overhead work was carried out by W. T. Henley's Telegraph Works Co., Ltd., h.t. and l.t. cables were supplied by the Enfield Cable Works, Ltd., the laying and jointing being done by the Electricity Department's own staff.

NEW TELEPHONE CARD.

We have received a copy of a " Telephone Card " which has been prepared for the North Metropolitan Electric Power Supply Company (the Northmet Company). The card offers a handy means of recording important numbers, gives the telephone number of the nearest Northmet showroom, and can either stand at the side of the telephone or hang from the mouthpiece. A copy of the card will be sent at an early date to all Northmet consumers who are telephone subscribers.

ELECTRIC TRACTION.

Results of Trial Runs with New High Power Electric Locomotive of the P.L.M.

THE Oerlikon Company recently supplied to the P.L.M. Railway Co. four express locomotives which, with their one hour rating of 5 400 H.P., claim to rank as the most powerful single locomotives ever built ; they are for operation with d.c. at 1 500 V, and are now in use on the Mt. Cenis line. The locomotives in question have been the object of special interest on the part of engineers, so much so that the Midi Railway approached the P.L.M. Railway with a view to obtaining the loan of one of these locomotives for the purpose of trial runs. The tests were to be carried out with a trailing weight of about 900 tons at a speed of 120 km./hour (75 m.p.h.) on the section Bordeaux-Bayonne (197·6 km. = 122·7 miles), which is equipped with overhead contact wire. This line has frequent gradients and inclines, with values up to a maximum of 1 in 182, and long straight stretches up to 45 km. (about 30 miles) in length, which are only interrupted by curves of large radius, the latter being only in exceptional cases less than 800 m. (874 yards).

On February 24, shortly after its arrival at Bordeaux, the locomotive was run light over the section Bordeaux-Morcenx (108·5 km. = 67·4 miles) at speeds up to 120 km./hour (75 m.p.h), and, on the return journey it was used for hauling an express train of about 200 tons. During that run, the commercial speed attained was 96 km./hour (59.6 m.p.h.), without this necessitating the use of the parallel connection of motors. On the following day, a train representing a trailing weight of 600 tons, and consisting of 16 four-axle coaches, was hauled. During this run the following readings were taken on the locomotive instruments :—

Connection of motors.	Total current amps.	Pressure Volts.	Output at Wheel rim H.P.	Speed km./hour	(m.p.h.)
Parallel	2 000	1 350	3 270	92	(57)
Parallel with field reduction of—					
45%	1 920	1 300	3 030	107	(66)
30%	1 720	1 320	2 760	112	(69)
45%	1 920	1 250	2 900	115	(71)

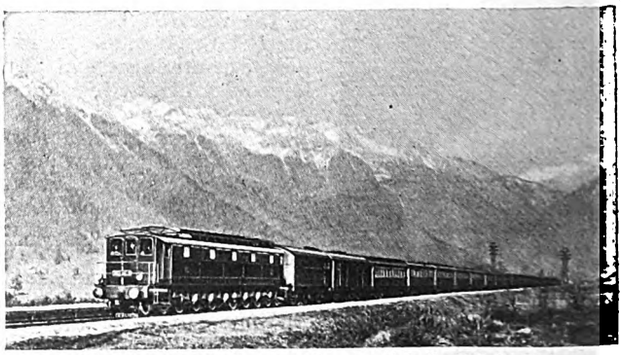
The locomotive soon gained the confidence of the Midi Railway authorities, and was transferred to the regular service, in which connection it was used for hauling the fastest express trains with trailing weights up to about 435 tons.

Work on the permanent way and signals caused some long stoppages. In order to make up for lost time due to these causes, actual speeds of 120 km./hour (75 m.p.h.) had to be maintained over nearly the whole section—197·6 km.

During these runs a few readings were taken on the locomotive instruments ; the values obtained are given in the following table :—

Connection of motors.	Total current amps.	Pressure Volts.	Output at wheel rim H.P.	Speed km./hour.	(m.p.h.)
Parallel-series with field reduction of—					
45%	1 440	1 450	2 530	115	(71)
45%	900	1 600	1 740	102	(63)
Parallel-series with full field ..	1 170	1 500	2,130	118	(73)
" " " ..	1 080	1 490	1 950	120	(74)

It may be noted that it was not necessary to resort to the parallel connection of motors for obtaining the specified speed with the load in question. As heavier loads were not provided for, in the case of ordinary express trains, special trains were formed with a trailing weight of 600 and 800 tons. Even with these heavy loads it was possible to reach speeds up to 120 km./hour (75 m.p.h.). A single pantograph was used for collecting current at all speeds up to about 1 800 A, two collectors being utilised only above that value of current.



One of the electric locomotives recently supplied to the P.L.M. Railway.

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FARADAY CENTENARY.

Progress of Arrangements for Celebration in September Next Year.

As a result of the work of the Committees appointed by the Royal Institution and the Institution of Electrical Engineers to act jointly in the arrangements for celebrating in 1931 the centenary of Michael Faraday's discovery of electro-magnetic induction, a scheme has been drawn up and has received the approval of the Managers of the Royal Institution and of the Council of the Institution of Electrical Engineers. The arrangements will include a Faraday Exhibition to which the public will be admitted for ten days, and here will be shown reproductions and illustrations of Faraday's actual experiments, prepared by the Royal Institution, and including a display of some of the historic apparatus. The Institution of Electrical Engineers, the Federal Council for Chemistry, and the representative organisations of the electrical and chemical industries co-operating with them, will illustrate by means of special exhibits the development of electrical and chemical science and industry in all branches which have their origin in Faraday's work. Thus will be illustrated, in a unique display, the fruition of the work of one of the world's greatest natural philosophers. The exhibition will be held in the Albert Hall, which is particularly well suited for the type of exhibition proposed, and will be open to the public from about September 23 to October 3. The draft programme of the arrangements which is still subject to alteration, is as follows :—

SEPTEMBER 21.—Afternoon : Reception of foreign and other delegates at the Royal Institution. Evening : Faraday Commemorative Meeting at the Queen's Hall.

SEPTEMBER 22.—Morning : I.E.E. Summer Meeting begins with Joint Conference of the I.E.E. and allied associations. Afternoon : Visits and social functions. Evening : Conversazione by the Royal Institution (for reasons of space only a limited number can be invited). I.E.E. Conversazione at the Albert Hall, at which the exhibition will be opened.

SEPTEMBER 23.—Morning : I.E.E. Summer Meeting and Conference continued. Opening of Faraday Exhibition to the public. Evening : Opening meeting of the British Association at Westminster Hall.

FOLLOWING DAYS.—Continuation of I.E.E. Summer Meeting and British Association meetings.

The exhibition will be managed by the British Electrical Development Association for, and in the name of, the Institution of Electrical Engineers, and the various associations and organisations connected with the electrical industry are being asked to co-operate by providing the exhibits.

Faraday Celebration Committees.

CALLED BY THE ROYAL INSTITUTION : The Duke of Northumberland, Sir Robert Robertson, Sir William Bragg, Mr. J. S. Highfield, Mr. Charles H. Merz, Major C. E. S. Phillips, Sir Arthur Keith, Sir James Jeans, Dr. F. E. Smith, Lt.-Col. K. Edgcumbe, Prof. H. E. Armstrong, Prof. T. M. Lowry, Major O. J. R. Howarth, Mr. T. Martin.

HOSPITALITY SUB-COMMITTEE : Major C. E. S. Phillips, Sir William Bragg, Mr. J. S. Highfield, Col. Sir Thomas F. Purves, Mr. L. B. Atkinson, Dr. F. E. Smith, Mr. O. J. R. Howarth, Mr. Emile S. Mond.

CALLED BY THE INSTITUTION OF ELECTRICAL ENGINEERS : Col. Sir Thomas F. Purves, Commander Rollo Appleyard, Mr. L. B. Atkinson, Capt. J. M. Donaldson, Mr. D. N. Dunlop, Capt. P. P. Eckersley, Lt.-Col. K. Edgcumbe, Mr. H. Willoughby Ellis, Mr. A. J. Fuller, Mr. E. Leete, Mr. J. T. Mould, Mr. C. C. Paterson, Mr. F. W. Purse, Mr. C. Rodgers, Lt.-Col. W. A. Vignoles, Mr. B. Welbourn, Mr. A. P. Young.

EXHIBITION AND PUBLICITY SUB-COMMITTEE : Lt.-Col. W. A. Vignoles, Col. Sir Thomas F. Purves, Mr. H. Willoughby Ellis, Mr. J. T. Mould, Mr. C. Rodgers, Sir William Bragg, Sir Robert Robertson, Prof. H. E. Armstrong, Mr. W. G. Plummer, Commander Rollo Appleyard, Mr. A. P. Young, Mr. T. Martin, Mr. P. F. Rowell, Mr. C. Holmes Waghorn, Mr. J. I. Bernard.

Plymouth Corporation has asked the Surveyor to obtain alternative schemes for the lighting of the new roads on the Central Park. The Hospital Committee has deferred consideration of tenders for the supply of a new battery installation at the Mental Hospital, and the Electrical Engineer has been asked to submit a report and estimate of the cost of providing an alternative method of generation.

CHURCH LIGHTING.

THE electrical installation recently carried out at the Southwell Minster by A. Dean and Co., Ltd., of Victoria Street, London, S.W.1, furnishes direct evidence of what can be accomplished by skilled electric lighting engineers.

Illustrating the new lighting effects at the Southwell Minster.

According to tradition, the church dates back to A.D. 625. Its history, however, is obscure until some 300 years later, but there is little doubt that the existing Norman nave dates from A.D. 1108. We mention this fact because in the work of installing electric light every possible care had to be taken to preserve not only the masonry, etc., but also to avoid any possible offence to the eye. The scheme of lighting was planned and carried out under the supervision of Mr. W. D. Caroe, of Great College Street, Westminster, S.W.1., acting on behalf of the Ecclesiastical Commissioners. The lighting of the nave, central tower and chancel incorporates the G.E.C. principle of flood lighting by means of silvered glass projectors equipped with 200 W white-sprayed Osram lamps. In all there are over seventy of these units installed in the Minster, thirty-two being employed for lighting the nave and central tower, and a similar number for the chancels. Those in the nave are concealed at clerestory level, 50 ft. from the ground, and are directed eastwards and downwards at an angle of 45°. This results in a softly diffused distribution of the lighting with ample illumination at pew level, and a pleasing form of reflected lighting on the roof. This illumination is supplemented in the transepts and aisles by a system of unconcealed lighting in lantern fittings designed by the architect. That the building has lost nothing in its beauty by this modernising is shown by the above photograph.

LEGAL INTELLIGENCE.

Well-known Brighton Electrical Contractor and the Factory Act.

THE Brighton magistrates on June 7 delivered their judgment in the recently reported action in which Mr. H. J. Galliers, electrical contractor (and a former Mayor of the Borough) was summoned for failing to provide a guard rail and toe board for the protection of his workmen on a building at 81 and 82, King's Road, Brighton.

The governing point, according to the decision of the Bench, was whether on the date of the summons the building in question was a factory within the meaning of Section 105 of the Factories and Workshops Act, the machinery on the premises having been removed on March 11, which was about a week before the accident took place. The premises then ceased to be a factory within the meaning of the Act. The summons therefore failed and the action dismissed.

The Bench allowed Mr. Galliers ten guineas costs.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

LEYTON CORPORATION, June 13.—Re-wiring electric light installation at Farmer Road School. Particulars from the architect, Mr. J. H. Jacques, 61, West Ham Lane, Stratford, London, E.; deposit, £1.

STONE URBAN DISTRICT COUNCIL, June 13.—Re-wiring sewerage works. Specifications from the surveyor, Mr. W. R. Harlow, Stone, Staffs.

OSWESTRY CORPORATION, June 14.—Supply, erection, etc., of 3 core 11 000 V, paper insulated underground cable; l.t. 3 core, 4 core and 2 core, 400 V, paper insulated cable, service material, and link disconnecting boxes (specification No. 1A); e.h.t. 11 000 V, oil immersed, truck type switchgear, and 400 V, ironclad, air break switchgear (specification No. 2A); and one, two or three oil immersed, self-cooled, three phase, step down (11 000 V to 400 V) transformers (specification No. 3A). Specifications from Mr. H. W. Edwards, borough electrical engineer, 28, Oswald Road, Oswestry; deposit £2 2s. for each. All apparatus and materials to be of British manufacture and cable to be C.M.A.

WALLASEY CORPORATION, June 14.—Electric lighting work at New Brighton Ferry, including supply of switches, lamps, etc. Specification from the Ferries General Manager, Seacombe Ferry.

IRVINE CORPORATION, June 16.—Electric lighting work in connection with erection of (1) four blocks, each of four houses, and (2) 16 blocks, each of four houses, on Springbank Farm, Irvine. Specifications from Mr. A. R. Wilson, town clerk, Council Chambers, Irvine; deposit, £1 1s. for each.

LEEDS CORPORATION, June 16.—Supply of (1) 100 tramcar bodies; (2) 100 tramcar trucks, with wheels and axles; (3) 100 tramcar pneumatic brake equipments; (4) 100 tramcar electrical equipments. Specifications from Mr. R. L. Horsfield, general manager and engineer, Tramways and Transport Department, 1, Swinegate, Leeds; deposit £2 for each.

NOTTINGHAM CORPORATION, June 17.—Twelve months' supply of general stores to the electricity department. Forms of tender, etc., from the Engineer, Electricity Station, Talbot Street, Nottingham; deposit 5s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, June 17.—Supply and erection of double circuit, 33 000 V, overhead transmission line, supported by steel towers. Specification (No. 33/T/2), etc., from Mr. E. F. Hetherington, chief engineer and manager, West Midlands Joint Electricity Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit 10s. 6d.

COVENTRY CORPORATION, June 18.—Pumping plant in duplicate, for the Brownshill Green Water Scheme—contract No. 4, each set including centrifugal borehole and force pump, with vertical electric motor and all accessories. Specification, etc., from Dr. H. Lapworth, 25, Victoria Street, Westminster, S.W.1; deposit £3.

EAST HAM EDUCATION COMMITTEE, June 18.—Electric light installations at Monega and Sandringham Schools. Specifications, etc., from Mr. F. R. Thompson, Education Office, Town Hall, East Ham, London, E.6.; deposit 10s.

MANCHESTER CORPORATION, June 18.—Heavy a.c. equipment, cables and lighting at new Children's Sanatorium, Abergele, North Wales. Specification from the City Architect, Town Hall, Manchester; deposit, £1 1s.

RICHMOND (SURREY) CORPORATION, June 18.—Borehole pump, with 35 B.H.P. electric motor; two horizontal pumps, with 80 B.H.P. electric motors; two ditto, with 65 B.H.P. electric motors; and two ditto, with 10 B.H.P. electric motors. Specification, etc., from the Water Engineer, Hotham House, Heron Road, Richmond; deposit, £5 5s.

SCUNTHORPE AND FRODINGHAM URBAN DISTRICT COUNCIL, June 18.—Wiring for electric lighting and power at Public Bath to be erected at Doncaster Road, Scunthorpe. Specificatin (D) from Mr. W. Farrar, engineer, Council Offices, Scunthorpe; deposit, £2 2s.

CENTRAL ELECTRICITY BOARD, June 19.—Supply and laying of 33 kV and other cables in connection with Central England Electricity Scheme. Specification (C.E.-G.C.3) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

OLDHAM PUBLIC ASSISTANCE COMMITTEE, June 20.—Supply of electric lamps and fittings, for the Poor Law Institution. Tender forms from the Public Assistance Officer, Town Hall, Oldham.

BENFLEET URBAN DISTRICT COUNCIL, June 23.—Three vertical spindle centrifugal pumps, with electric motors and automatic control, etc. Specification from Mr. W. E. Blezard, 9, Victoria Street, Westminster, S.W.1; deposit, £2 2s.

CENTRAL ELECTRICITY BOARD, June 23.—Supply and erection of 66 000 V and other cables in connection with Mid-East England Electricity Scheme. Specification (M.E.E.-G.C.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

CENTRAL ELECTRICITY BOARD, June 27.—Supply and laying of pilot cables in connection with the Central England Electricity Scheme. Specification (C.E.-S.C.1), etc., from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

CENTRAL ELECTRICITY BOARD, June 30.—Supply and erection of metering equipment required in the area of the Central England Electricity Scheme. Specification (C.E.-G.M.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

METROPOLITAN WATER BOARD, June 30.—Twelve months' supply of electric lamps. Form of tender (No. 24) from the Chief Engineer (Room 155), 173, Rosebery Avenue, London, E.C.1. Stamped, addressed envelope to be sent.

CARDIFF CORPORATION, July 1.—Supply of h.t. switchboard (Contract No. IV); h.t. switchboard (No. V); transformers (No. VI); and battery and charging plant (No. XV), for the Llandough Hospital, now in course of erection. Specifications from Messrs. Plevin and Jenkins, 4, Working Street, Cardiff; deposit £2 2s. for each. Only manufacturers on the King's National Roll are invited to tender.

EPSOM URBAN DISTRICT COUNCIL, July 1.—Sale and removal of two Lancashire boilers, by Edwin Danks, at the generating station, Church Street. Further particulars from Mr. H. W. Watts, resident electrical engineer, the Electricity Works, Church Street, Epsom.

BELFAST CORPORATION, July 5.—Manufacture, supply, delivery and erection of (*a*) h.t. armour clad switchgear (specification No. W.108); and the manufacture, supply and delivery of (*b*) transformer kiosks with h.t. and l.t. switchgear (specification No. W. 109); (*c*) static transformers (specification No. W.110). Specifications from Mr. F. H. Whysall, city electrical engineer and general manager, East Bridge Street, Belfast; deposit £2 2s. (returnable) for each specification.

SUNDERLAND CORPORATION, July 7.—Manufacture and supply of (1) paper insulated, lead sheathed cable for general main-laying requirements; (2) rubber insulated wire; (3) consumers' meters; and (4) gasfilled and vacuum lamps, for 12 months. Specifications, etc., from the General Manager, Electricity Department, Dunning Street, Sunderland; deposit, 10s. for each.

DUNDEE CORPORATION, July 12.—Supply of six 300 kVA outdoor type transformers. Specification from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH AFRICAN RAILWAYS AND HARBOURS, June 13.—Supply of 2 000 V switch units and l.t. switchboards (tender No. 1 649). (Reference B.X. 6 365.)

BULAWAYO MUNICIPALITY, June 13.—One 5 000 kW turbo-alternator, condensing plant, switchgear, transformers, etc. (Reference B.X. 6 321.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., June 14.—(1) Ore crushing plant; (2) buildings and wagon hoists; (3) electrical equipment. Specifications from the office of the High Commissioner for South Africa, South

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Africa House, Trafalgar Square, London, W.C.2; deposit £25, returnable to tenderers for at least sections (1) and (2).

MADRAS GOVERNMENT, June 15.—Complete electrical equipment of three 66/110 kV outdoor sub-stations, in connection with Pykara hydro-electric scheme. Specification (No. E.26) (price 30s.) and general conditions of contract (price 3s. 6d.) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4, on payment of the respective fees (not returnable).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of indicators (schedule No. C.588). (Reference B.X. 6 333.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of multiple twin cable. (Reference B.X. 6 349.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, June 17.—Supply of loading coil pots. (Reference B.X. 6 350.)

CAPE TOWN MUNICIPALITY, June 18.—Supply of 1 000 steel tubular poles (specification No. 500/1930). (Reference A.X. 9 622).

MELBOURNE CITY COUNCIL, June 18.—Supply and installation of automatic electric signals for traffic control (contract No. 2 787). (Reference B.X. 6 421.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, June 19.—Supply of metal-clad, 2 000 V switchboard, for Bloemfontein workshops sub-station (tender No. 1 657). (Reference B.X. 6 402.)

INDIAN STORE DEPARTMENT, June 23.—Supply and erection of 11 000 and 400 V a.c. and 220 V d.c. switchgear, power and control cables, etc., at Shanan power house. Forms of tender (£3 15s., not returnable) from the Director General, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24.—Supply of 110 kV outdoor steelwork and switchgear for Waitaki power scheme—section 71. (Reference B.X. 6 238.)

CAPE TOWN MUNICIPALITY, June 25.—Supply of single phase transformers (specification No. 495/1930). (Reference B.X. 6 378.)

EGYPTIAN MINISTRY OF THE INTERIOR, June 25.—Pumping machinery, electric motors, etc., for waterworks at Abou-Tig-Nekheila. (Reference A.X. 9 509.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of condensers (P. and T. 151/2 240). (Reference B.X. 6 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of 100 000 3¼ in. and 30 000 2 in. lead clips. (Reference B.X. 6 375.)

JOHANNESBURG MUNICIPALITY, June 26.—Electricity meters and time switches (contract No. 405). (Reference B.X. 6 449.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, June 30.—Supply and maintenance of an electric generating unit, with motors, transmission lines, etc., at Tor Quarantine, on the Gulf of Suez. (Reference B.X. 6 466.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 1.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 63. (Reference B.X. 6 443.)

POWER SECURITIES CORPORATION, LTD., July 1.—Supply of (*a*) 4—3 000 kVA transformers (specification E.28, price 15s.); (*b*) indoor 11 kV switchgear (E.23, price 22s. 6d.), for Pykara, Madras, hydro-electric scheme. Specifications (on payment of above fees and 3s. 6d. for general conditions of contract) from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

CAPE TOWN MUNICIPALITY, July 2.—Supply of paper insulated, lead covered, impregnated, lead sheathed and armoured cable. (Reference B.X. 6 426.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 8.—Supply of telephonists' telephones. (Reference B.X. 6 352.)

MELBOURNE CITY COUNCIL, July 9.—Supply of totally enclosed, metal-clad switchgear (specification No. 1 024). (Reference B.X. 6 401.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND GOVERNMENT RAILWAYS, July 16.—Supply of two overhead electric, 30 cwt., underhung, travelling jib cranes, with 12 ft. jib, for goods sheds at Wellington and Auckland. (Reference A.X. 9 442.)

MELBOURNE POSTS AND TELEGRAPHS, August 19.—Supply and delivery of telephone jacks. (Reference B.X. 6 477.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 19.—Three single phase transformers, to step up from 22 000 V to 57 600 V between phases, for Penrose sub-station, Arapuni power scheme, section 308. (Reference B.X. 6 427.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 2.—Supply of 110 kV switchgear, steelwork and controlling equipment, for Mangahao power scheme. (Reference B.X. 6 452.)

A MAGNET scone plate at work in the confectionery department of Cooper's Stores, Liverpool.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 9.—Supply of 110 kV switchgear and controlling equipment, for Mangahao power scheme—section 217. (Reference B.X. 6 454.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 16.—Supply of 110 kV switchgear, steelwork and controlling equipment, for Mangahao electric power scheme (section 221). (Reference B.X. 6 453.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 50 kV switchgear and steelwork, for Arapuni power scheme—section 276. (Reference B.X.6 451.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 110 kV and 50 kV switchgear and protective system, for Arapuni power scheme (section 273). (Reference B.X. 6 450.)

Tenders Accepted.

HALIFAX CORPORATION.—F. Heighington, electrical work in sanitary conveniences, £70.

GLASGOW EDUCATION AUTHORITY.—H. M. Caldwell and Co., supply of electric lamps.

TOTNES CORPORATION.—Tangyes, Ltd., electric motor and centrifugal water pump, £128.

ROMSEY CORPORATION.—L. Groves and Co., electric light installation at Town Hall, £67.

CROYDON CORPORATION.—F. Wingfield, wiring at new switch house, £398. (Recommended.)

DUNDEE EDUCATION AUTHORITY.—J. Smith, electrical installation at Rockwell School, £2 571.

IPSWICH CORPORATION.—Ransomes, Sims and Jefferies, Ltd., supply of three trolley omnibuses.

MERSEY DOCKS AND HARBOUR BOARD.—Liverpool Electric Cable Co., Ltd., supply of electric cables.

WARRINGTOM CORPORATION.—H. Lilley, wiring 260 council houses at Westy estate, £6 1s. per house.

LEITH EDUCATION AUTHORITY.—R. Edgar and Co., electric light installation at new school, Wardie.

BIRKENHEAD CORPORATION.—English Electric Co., Ltd., supply of a 1 000 kVA transformer, £380.

LONDON COUNTY COUNCIL.—Alex. Hawkins and Sons, electrical installation at Tooting Home, £1 495.

AIR MINISTRY.—Siemens Electric Lamps and Supplies, Ltd., supply of automobile type lamps.

HOTEL EXCEL, NEAR BLACKPOOL.—P. J. Frampton, electrical work in connection with erection of new building.

TYNEMOUTH CORPORATION.—Adamson and Green, supply of switchboard at Preston Road sub-station, £85.

EPSOM URBAN DISTRICT COUNCIL.—Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of lamps.

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WORK IN PROSPECT.

BATH.—Telephone exchange, Weston, for H.M. Office of Works, King Charles Street, London, S.W.

CATFORD.—Town Hall, shops and offices, to cost £126 944, for Lewisham Town Council. Particulars from the contractors, G. E. Wallis and Sons, Ltd., 11–12, Old Cavendish Street, W.

CATSHILL.—School for Worcestershire Education Committee. Particulars from the architect, Mr. A. V. Rowe, Worcester.

DARLINGTON.—Grammar School extensions, for the Education Committee. Particulars from the Borough Surveyor.

DERBY.—School (720 places), Nottingham Road, for the Borough Education Committeee. Particulars from the Director of Education.

New Shops and Showrooms.

DEWSBURY.—New shops and showrooms. Particulars, Mr. T. Blakeley, Town Hall, Dewsbury, borough architect.

DONCASTER.—New public baths. Particulars from Mr. R. E. Ford, Priory Place, Doncaster.

DOUGLAS (ISLE OF MAN).—Blocks of flats, for the Town Council. Particulars from the architect, Mr. J. E. Teare, 46, Athol Street.

DUNSTABLE.—Police station, for Beds County Council. Particulars, Mr. F. W. Smart, Bedford.

EVESHAM.—Senior School for Worcestershire Education Committee. Particulars, Mr. A. V. Rowe, Worcester.

HALIFAX.—Licensed premises, Haley Hill. Particulars from the architects, Walsh and Maddock, 10, Harrison Road.

HERNE BAY.—School (650 places), for Kent Education Committee. Particulars from the director of education, Mr. E. S. Davies, Maidstone.

HUDDERSFIELD.—Houses (31), Newsome, for the Town Council. Particulars from the Borough Architect, 26, Ramsden Street.

HUDDERSFIELD.—Shops and offices, Market Street. Particulars from the architect, Mr. J. Ainley, 55, New Street.

LANARKSHIRE.—Housing scheme (50), Harthill, for the County Council. Particulars from the Clerk, Glasgow.

MIDDLETON-IN-TEESDALE.—Co-operative stores. Particulars from the architect, Mr. J. Clayton, High Row Chambers, Darlington.

OSSETT (YORKS).—Houses (42), for Councillor Joseph Illingworth.

PRESTON.—Roman Catholic church (£15 000). Particulars from the contractor, Mr. John Dillon.

ROSSINGTON.—New houses (24). Particulars from Mr. W. R. Crabtree, Nether Hall, Doncaster.

ROTHERHAM.—Houses (20). Particulars from the builder, Mr. A. J. Pugh, Rawmarsh, nr. Rotherham.

ROTHERHAM.—Two schools, for the Education Committee. Particulars from the Clerk.

ROYSTON.—New school, 800 places. Particulars from the Education Architect, County Hall, Wakefield.

SANQUHAR.—Drill hall, for Dumfries-shire Territorial Army Association. Particulars from the Secretary, Dumfries.

SHELF.—Council houses. Particulars from Mr. G. R. Oddy, Ward's End Chambers, Halifax.

SLEAFORD.—Houses (50), Grantham Road, for U.D.C. Particulars from S. F. Clare, surveyor, Jermyn Street.

STRATFORD-ON-AVON.—Houses (24), for the Town Council. Particulars from the contractors, Wheeler and Mansell.

STURRY.—School (400 places), for Kent Education Committee. Particulars from the director of education, Mr. E. S. Davies, Maidstone.

SWANSEA.—Houses (50), at the Gorseinon housing site, for T.C. Particulars from J. T. J. Williams, "Penybryn," Alexander Road, Gorseinon.

TAVISTOCK.—New Grammar School, for T.C. Particulars from County Architect, 97, Heavitree, Exeter.

TWICKENHAM.—Houses (72), at Fielding Avenue, for T.C. Particulars from G. R. King, borough engineer.

WALTON.—Cinema, at corner of Queen Drive and Breeze Hill. Particulars from Mr. A. E. Shennan, architect, 14, North John Street, Liverpool.

WHITWOOD.—Proposed school, 500 places. Particulars from the Education Architect, County Hall, Wakefield.

WOMBWELL.—Extensions to printing works. Particulars from Mr. C. F. Moxon, Regent Street South, Barnsley.

YORK.—Extensions, County Hospital. Particulars from the architect, Mr. E. Stanley Hall, 54, Bedford Square, London, W.C.

YORK.—Various schools extensions. Particulars, borough surveyor, F. Spurr, Guildhall, York.

TRADE PUBLICATIONS.

SPECIFICATION No. A.410, dealing with transformers, has been published by CROMPTON PARKINSON, LTD., Guiseley.

"Marine Electrical Equipment" is the title of a new booklet published by CROMPTON PARKINSON, LTD., of Guiseley.

The FURSE WHOLESALE, Co., LTD., Traffic Street, Nottingham, has published list No. 25/20 of electrical supplies, apparatus and appliances.

Price list No. N.S.110 of the "Selco" carpet washer has been received from S. G. LEACH AND CO., LTD., 26/30, Artillery Lane, London, E.1.

MONEL WEIR, LTD., Cathgart, Glasgow, has sent us publication No. M.M.3 describing the applications of Monel metal and malleable nickel.

List No. A-600 dealing with the "All-Test" instrument for all a.c. tests has been published by CROMPTON PARKINSON, LTD., Guiseley.

The "Midworth" distant repeater is dealt with in catalogue No. 162 issued by EVERSHED AND VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4.

BROOKHIRST SWITCHGEAR LTD., Northgate Works, Chester, has issued leaflet No. 315 relating to oil immersed synchronous motor starting panel, type S.70-10.

"'A.W.P.' Welds Under the Microscope" is the title of a new leaflet by ALLOY WELDING PROCESSES, LTD., Ferry Lane Works, Forest Road, London, E.17.

Specification No. A.516, dealing with "T.A.P." oil immersed, automatic fuse type, circuit breakers, has been issued by CROMPTON PARKINSON, LTD., Guiseley.

The RELAY AUTOMATIC TELEPHONE CO., LTD., Marconi House, Strand, London, W.C.2, has sent us a leaflet entitled "Take Care of the Seconds and the Hours will Take Care of Themselves."

"How to Make E.H.T. Joints" is the title given to a useful pocket book prepared and published by the engineering department of W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.

We have received from the ELECTRICAL EQUIPMENT AND CARBON CO., LTD., 107/111, New Oxford Street, London, W.C.1, a copy of pamphlet K.P.4, giving details of the "K.P." tongs for cable drawing.

The CREDENDA CONDUITS CO., LTD., Oldbury, near Birmingham, has published list No. C.103/2/30 dealing with the "Credenda" conduit bender.

We have received from BRUCE PEEBLES AND CO., LTD., Edinburgh, a copy of leaflet No. 172, describing the company's marine type dynamos and motors. The issue includes many interesting photographs of installations afloat.

Leaflet No. 1 013, dealing with across-the-line type, automatic starters, with thermal overload protection, for squirrel cage motors, has been published by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.

A particularly attractive list relating to the new stop watches introduced by VENNER TIME SWITCHES, LTD., of 45, Horseferry Road, London, S.W.1, has been received. The reference number of the list is X100, and the issue replaces list No. 28A.

BRITISH INSULATED CABLES LTD., Prescot, Lancs, have issued publication P.255, dealing with "Prescot" compound sealed service and joint boxes; P.F.68, relative to "Coraline" soldering paste and replacing P.F. 52; and P.F.69, describing "Helsby" jointing materials, this latter replacing H.92.

A Domestic List.

A special brochure, consisting of 32 pages of well-illustrated matter describing the "Hot-point-Maytag" electric clothes washer, wringer and ironer, has been published by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, London, W.1.

Two new publications of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, are leaflet No. 39/1-1, describing flame-proof motors, and 40/1-4, reprints of two articles by Mr. L. H. A. Carr, namely, "The Determination of the Efficiency of Polyphase Motors from Test Results" and "The Circle Diagram of the Induction Motor."

We have received from AEONIC RADIO, LTD., 90, Regent Street, London, W. a newly issued catalogue dealing with lighting plants, battery charging equipment, theatre, marine, factory and power station switchboards, moving iron and coil instruments, automatic battery cut-outs, shunt regulators, resistance units, quick-break switches, charge and discharge switches, replacement fuses, and dynamos and motors.

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CABLES AND RADIO.

Views on Electrical Communication at Imperial Press Conference.

THE first technical session of the Imperial Press Conference was held on June 5th at Grosvenor House, London. The Postmaster-General, Mr. H. B. Lees-Smith, outlined the overseas and Imperial services carried on by the Post Office, and Sir Basil Blackett, chairman of Imperial and International Communications, Ltd., spoke on "Empire Communications and the Empire Press."

The Postmaster-General, referring to the recent opening of a picture telegraphy service between London and Berlin, said the Post Office was now conducting similar services with Frankfort, Munich, Copenhagen, and Vienna, and extensions to other continental cities were under consideration. He had no doubt that before many years picture telegraphy services would be developed between all the principal countries of the world. It was an example of the exceeding modesty of this country in general, and the British Post Office in particular and its aversion to self-advertisement, that there was very little knowledge of the fact that this country possessed at Rugby the largest and most powerful wireless station in the world. In January, 1927, the Post Office began the Transatlantic wireless telephone service between London and New York. The service carried conversations ranging from 300 to 600 a week, and arrangements were in preparation by which in due time similar services would be provided to the Dominions and the other chief countries of the world. The public use of the Australian service, opened a month ago, had been encouraging, and the number of calls had been higher than was expected in the early days of the service.

As a result of the link established by the London and New York service, a subscriber in Vienna could speak to Montreal, provided his message went through Rugby. They had quietly and unostentatiously secured for this country a very important position in the system of long-distance telephone services of the world and enabled the subscriber to a British telephone to communicate with 90 per cent. of all the telephone subscribers in the world. They had started on a task of holding together an Empire of which the political and constitutional bonds were looser than at any previous time.

Sir Basil Blackett said it was a great disappointment to him and his company when the Post Office in this country refused their offer to co-operate with them in providing the wireless link for the overseas telephone service. He did not believe it would be found to be in the true interest of the country and the Empire that there should be competition between Government-run overseas telephone services and telegraph services operated by the Communications Company, especially constituted as it was as a public utility company under considerable Government control, any more than it was found desirable to continue the position that had developed in 1928 when Government-operated beam wireless services were competing with cable services operated both by Government and by companies. He believed the future would prove it to be entirely irrational and economically and scientifically wasteful to draw a hard and fast line between radio-electric telegraphy and radio-electric telephony.

At present they had negotiations in progress in India. Australia, and South Africa for amalgamating cables and wireless in those countries. They had to wait the conclusion of agreements with the Governments concerned, but as soon as the amalgamation took place they intended to reduce the cable rate to the level of the wireless rate.

With regard to the tendency to publish the same newspaper or a chain of newspapers at different points, he said the company had something to offer in facsimile transmission. A whole page of "The Times" had been transmitted experimentally across the Atlantic within half an hour, and full-page American newspaper advertisements had been transmitted commercially from the United States for simultaneous publication in European and American newspapers.

POLISH ELECTRICITY.

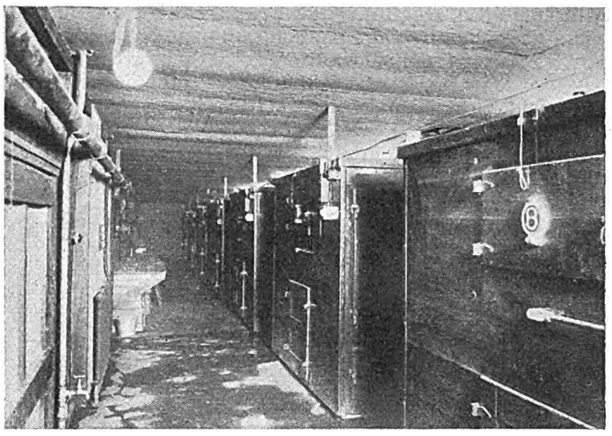
The Polish Government rejected last week the proposal made last year concerning a scheme to build a series of electric plants and transmission lines, using both fuel and water power. In return for this construction a 60 years' concession on the distribution of electric power was to be granted to a Mr. W. A. Harriman. He was to invest at least 25 000 000 dollars (£5 000 000) during the first 10 years of operation in Poland.

BUSINESS ITEMS.

THE EVER READY CO. (GREAT BRITAIN), LTD., Hercules Place, London, N.7, announce price reductions of many of their popular lines, special attention being drawn to radio batteries.

PALMER AND RILEY, wholesale wireless and electrical factors, of Accrington, have opened branch showrooms in King Street, Blackburn.

More than usual interest attaches to Captain Kingsford Smith's contemplated aeroplane flight across the Atlantic, in that a full wireless equipment will be carried. The installation comprises a three-valve receiving set capable of being tuned to a wide wave-band, viz., from 28 to 2 000 metres, a short wave transmitter operating on a wavelength of approximately 33 metres at 250 W, and another transmitter operating on a wavelength of 600 metres. The call sign of the "Southern Cross" is VMZAB and the transmission will be telegraphy on raw a.c. The receiving set installed is one specially made up for Captain Kingsford Smith prior to his flight from Australia as a result of co-operation between the General Electric Co., Ltd., and the New Systems Telephones Co., of Australia. It has been reconditioned by the G.E.C. Research Laboratories in preparation for the trans-Atlantic flight. It is equipped with Osram S.215, HL.210 and L.210 valves, and "Gecophone" headphones will be used. The batteries are of the "Magnet" type, while Osram lamps have been installed for lighting the plane.



SEVEN incubators, each of which will take 16 000 eggs, at the Absol Park Farm, near Felstead, Essex. This farm is the first of its kind in this country, and the method is the Buckeye. It is entirely electrical. Chicks hatched and bred by this means are at five days old equal in development to the naturally bred chick of eight days. Until the age of eight weeks, the chicks enjoy artificial sunlight day and night. At the end of that period they are brought for the first time into touch with natural surroundings. The electrical installation, which ranks as an engineering achievement, was carried out by Mr. E. A. Kett, of Saffron Walden. Henley Cables were used throughout.

The ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, has received two more orders for electric trolley buses from Bradford Corporation and from Messrs. Balfour Beatty for the Nottinghamshire and Derbyshire Traction Company. The order from Bradford is for 12 double-deck, top-covered vehicles, each having a seating capacity for 56 passengers. The chassis will be of the "English Electric" low-loading, three-axle type, with air-operated brakes on all wheels, rheostatic braking also being included. The equipment will consist of a DK.122, 100 H.P. twin-type motor, fitted with roller bearings and a contactor-type, foot-operated controller. This further repeat order from Bradford Corporation brings the total of trolley buses supplied by the ENGLISH ELECTRIC CO. to this undertaking to 52 vehicles. The order from Messrs. Balfour Beatty for the Notts and Derby-Ilkeston routes is for 6 single-deck saloon-type trolley buses, each having a seating capacity for 32 passengers, mounted on two-axle type chassis, with which is incorporated air-operated brakes on all four wheels and a system of rheostatic brakes is provided. The electrical equipment will consist of a DK.121, 60 H.P. motor, fitted with roller bearings and contactor-type, foot-operated controller. These vehicles will have the main entrance door at the near side front and an emergency exit at the rear of the body.

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ELECTRICITY SUPPLY.

Unemployment Relief Work at Sheffield—Extensions at Glasgow, York and Colchester—Birkenhead and the E.C.A.—Wakefield and Domestic Appliances—Southwark (London) and the Price of Cable—Torquay Tramways—Eastbourne and the Central Board.

GLASGOW electricity department is to extend mains at a cost of £6 000.

The Nigerian Electricity Supply Corporation, Ltd., expects to commence to deliver power this month.

It has been decided that 103 gas lamps in King Street, Aberdeen, be superseded by electric lamps.

Balbriggan (Co. Dublin) is now lighted electrically by means of energy supplied by the Shannon power undertaking.

Sanction is sought by York Electricity Committee to borrow £7 845 for the provision of a switch house and h.t. switchgear.

Wakefield Electricity Committee has obtained sanction for a loan of £5 000 for the provision of domestic apparatus for hire.

Bradford Housing Committee is to wire 22 houses on the Clayton Estate subject to the tenants agreeing to pay 3d. a week increased rent in respect thereof.

Birkenhead Electricity Committee has agreed to receive a deputation from the Electrical Contractors' Association in regard to carrying out installation work under the assisted wiring scheme.

Liverpool Corporation announces its intention to refund, in certain cases, deposits held against electrical energy supplied. Deposits will not be returned in cases where circumstances make its retention desirable.

Eastbourne Electricity Committee has received the Central Electricity Board's proposals for a bulk supply of electricity to Eastbourne. The Electricity Committee seeks sanction to borrow £8 300 for further extensions.

At a recent meeting of ratepayers at Athboy, Mr. Delargy, of the Public Lighting Department of the Irish Free State Electricity Supply Board, delivered an address on the advantages of electric lighting, and the meeting decided in favour of such lighting.

Hereford Electricity Committee has reported that on the completion of the deed of transfer of the electricity undertaking to the Shropshire, Worcestershire and Staffordshire Power Co. the cash balances remaining in the hands of the Corporation amounted to £13 783 on capital account and £11 701 on revenue account.

Cheltenham Electricity Committee has further considered the proposed hire purchase scheme, and the Chairman reports that at a recent conference the local contractors passed a resolution supporting the scheme, and asked that it should be put into operation as soon as possible. The Committee has approved a draft hire-purchase agreement.

The Unemployment Grants Committee has approved a grant to Sheffield Corporation of 50% of the interest on approved expenditure out of loan not exceeding £38 499 to be raised to meet the cost of the changing over of l.t. mains in various districts and extensions of mains in new districts proposed to be carried out as relief works.

Irlam U.D.C. has decided to enter into an agreement with the Stretford and District Electricity Board for a supply of electricity to Irlam and Cadishead. The agreement provides that the Board will carry out the whole of the undertaking under a Provisional Order which the council has held for some years. The cost of the scheme is estimated at £42 000.

At last Saturday's meeting of the Torrington branch of the Devon Farmers' Union, the subject of electricity wayleaves was discussed. Mr. C. Hoskin, county secretary, stated that in a case at Exeter the Union's solicitor secured the inclusion in the agreement of a clause directing that any claim by a farmer should be assessed within seven days and paid within a month.

The Lighting Superintendent has submitted to Bolton Highways Committee estimates of the cost of lighting Victoria Road, Kiln Lane and the new road connecting such roads by gas and electricity respectively, as follows: for 42 lamps, 40 yd. apart, initial cost, £320 11s. 6d. for gas; £318 12s. 10d. for electricity; annual cost, £141 1s. 6d. gas and £151 10s. electricity. The Committee adopted the electric scheme, and authorised the necessary work.

Colchester Electricity Committee has authorised the Borough Electrical Engineer to arrange for the erection of l.t. lines in Great Holland, Rowhedge, Alresford and Weeley at a cost of £3 882. The Committee seeks sanction to borrow £20 000 for mains and services, and £20 000 for cookers, wiring, slot meters and fittings. Terms submitted by the Commercial Engineer and approved by the P.C. for lighting streets at St. Osyth by electricity have been approved.

An inquiry was held recently by Mr. J. H. Monroe, K.C., into the proposed electric lighting scheme for Omagh. Several witnesses said that there was no general demand for electric lighting, and that 75% of the merchants and tradespeople of the town were against the scheme. For the U.D.C., which has approved of the scheme, it was remarked that contemporary cases had shown that people who objected most turned out to be subsequent enthusiastic supporters of such schemes.

Schemes for extensions totalling 390 000 kW to generating plant are understood to have been sanctioned by the Electricity Commission. The capacity of the County of London Electric Supply Company's station at Barking and that of the Newcastle-on-Tyne Company's station at Dunston is to be enlarged by 150 000 kW in each case, while the North Metropolitan Company's plant at Brimsdown is to have an addition of 50 000 kW and a further 40 000 kW are to be added to the London County Council's plant.

The L.C.C. reports that the lighting of the operating theatre at Fulham Hospital should be improved. It regrets that it is not possible to secure a suitable lamp of British make, and it proposes to fix a lamp of French make at an estimated cost of £97 10s. An alternative system of lighting is necessary, and the council proposes that the current should be obtained from accumulators, for use if the supply from the hospital plant should fail. A new sterilising apparatus has recently been provided and storage accommodation is required.

Southwark (London) Electricity Committee reports that the existing contract for the supply of cable provides for a variation in prices according to fluctuations in the prices of copper and lead. During the past few weeks the price of copper dropped from approximately £83 per ton to prices in the neighbourhood of £60 to £65 per ton. Just prior to the meeting the price of copper was £60 10s. per ton, and as the lead market appeared to be on the rise, as a matter of urgency the committee gave instructions for the electrical engineer to order such cable as might be required during the next three or four months at the price then prevailing.

Torquay Electricity Committee has received a report from the Town Clerk pointing out that a draft agreement has been arranged between the corporation and the Torquay Tramways Co., Ltd., for the supply of current. (1) The corporation to supply the company with current at three points instead of at one as at present. (2) The company to pay the interest and redemption upon the costs of the apparatus and its installation at the two additional points of supply until the revision of the supply agreement. (3) That upon the revision of the supply agreement the interest and redemption then outstanding be taken into account in arriving at the price per unit to be paid for the current supplied.—The committee has decided to purchase a booster transformer and to connect at Paignton in order to facilitate the supply throughout the area served by the ring main, and application is to be made to the Electricity Commissioners for sanction to borrow £1 000 to cover the cost.—The committee is seeking sanction to borrow £7 500 to re-cable the urban district of Buckfastleigh.

An inquiry was opened last week at Buckie by Mr. H. Nimmo, on behalf of the Electricity Commissioners, into the electricity scheme promoted by the T.C. The Buckie Gaslight Co. and the Grampian Electric Supply Co. were amongst the objectors. Mr. James Keith, K.C., for the Council, said they did not anticipate any deficiency the first year or perhaps the second. Provost Merson said that there was a general demand for electricity and the local fishermen were unanimously in favour of the scheme. Mr. F. W. Purse, chief engineer to the London and Home Counties Joint Electricity Authority, said the scheme was sound and reasonable and would not hamper national development in any way. Mr. C. M'Ewan, engineer for the scheme, said provided sanction was given quickly, the supply could be on by December of this year. Mr. H. Partington, general manager of the Grampian company, said the company's new draft Order was not yet formulated, since, owing to the extent of the area, they had to prepare, and lodge, over 80 maps. They expected to make application in a month. They were prepared to put down a temporary station at Buckie until they got their Order, and would then go as far as the T.C. could go.

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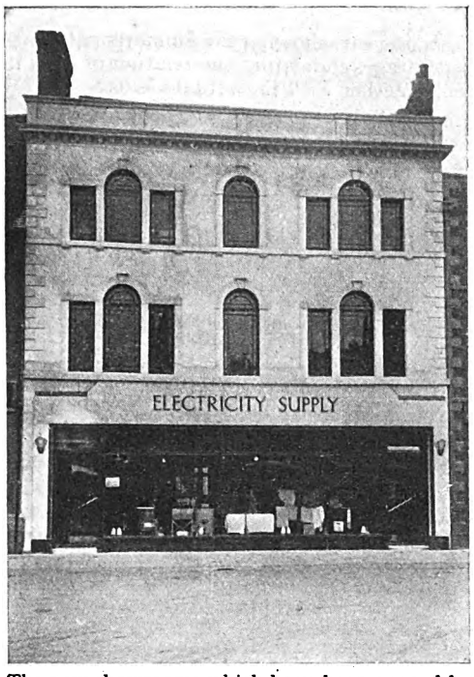
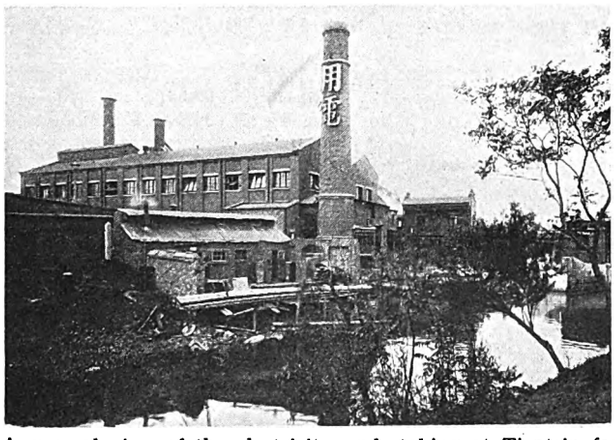
ELECTRICAL PICTURES OF THE WEEK.

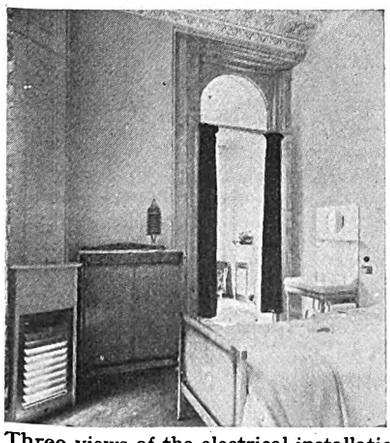


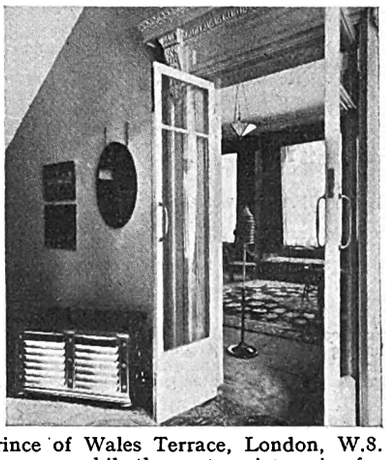
The new showrooms which have been opened by the Shropshire, Worcestershire and Staffordshire Electric Power Co., at Evesham, Worcestershire, in accordance with the company's campaign to increase the sales of electricity in the rural areas. The initial window displays were devoted to wash-boilers, water-heaters, irons, etc. The premises are artistically illuminated, and complete facilities are provided for demonstrations of domestic cookers, fires, and labour-saving appliances. Another part of the company's campaign in the rural areas this summer will be a series of exhibitions, lasting until September, in the nine counties which the company now serves.



A general view of the electricity undertaking at Tientsin for which Mr. A. M. Sillar is consulting engineer. Electrical development in Northern China is making steady progress in spite of the unrestful conditions prevailing in the country.

"Exide" battery service agents photographed at the Forth Bridge during the annual convention arranged by the Chloride Electrical Storage Co., Ltd., last month. Meetings were held at the North British Hotel, Edinburgh, from May 26 to 30.





Three views of the electrical installation at the recently opened Princes Court Hotel, Prince of Wales Terrace, London, W.8. The left-hand picture shows the heating arrangements provided in the bed and dressing rooms, while the centre picture is of a "Tricity" cooker in one of the kitchens. The tasteful appearance of the reception rooms will be appreciated from the view given in the right-hand photograph.

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FINANCIAL INTELLIGENCE.

By "AUDITOR."

Below are tabulated the results of 25 electric traction companies for the last financial year, showing the amounts paid out in the form of dividends; the reserves, etc., allocated; and other appropriations, with percentages indicating the relation of each item to the total issued capital. Recent or current prices of the different issues are also given, together with the actual yields :—

	Issued Capital. £	Brought Forward £	%	Profit £	%	Total £	%	Dividends Distributed £	%	Reserves, etc. Allocated £	%	Other Appropriations £	%	Carried Forward £	%	Total £	%	Ann. Divs.	Recent Price	Par Value	Yield
Calcutta Tramways	700 000	11 020	1·16	64 439	6·78	75 459	7·94	54 792	5·77	—	—	7 383	0·77	13 284	1·40	75 459	7·94	6·04	12/6	£1	9·66
„ 5% Cm. Pref.	250 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	12/7	£1	7·95
	950 000																				
City of Buenos Aires Trams (1904)	1 240 000	1 346	0·11	71 155	5·74	72 501	5·85	62 000	5·00	10 000	0·81	—	—	501	0·04	72 501	5·85	5	4⅛	£5	5·71
Cork Elec. Supp.	149 500	14 170	5·19	42 737	15·67	58 621	21·49	21 114	7·74	20 287	7·44	—	—	17 220	6·31	58 621	21·49	10	—	£1	—
„ „ 5% Cm. Pref.	123 270	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	5	—	£1	—
	272 770																				
Dudley, Stourbridge & Dis. Elec. Tractn.	100 000	303	1·15	6 312 Loss	3·15	6 009 (Debit)	3·00	—	—	—	—	—	—	6 009 (Debit)	3·00	6 009 (Debit)	3·00	—	—	£5	—
„ „ 5% Cum. Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	£5	—
	200 000																				
Fife Tramway Land P.	500 000	5 849	0·58	67 205	6·72	73 054	7·30	40 000	4·00	7 767	0·77	—	—	25 287	2·53	73 054	7·30	4	12/6	£1	6·40
„ „ 6% Cm. Pref.	500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	17/6	£1	6·86
	1 000 000																				
Gateshead & Dis. Trams	152 110	18 895	6·64	25 516	8·96	44 411	15·60	18 925	6·65	5 177	1·82	—	—	20 309	7·13	44 411	15·60	8	—	£10	—
„ „ 6% Pref.	12 610	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	—	£10	—
„ „ 5% Pref.	120 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	£10	—
	284 720																				
Jarrow & Dis. Elec. Traction	59 934	427	0·71	1 081 Loss	1·80	654 (Debit)	1·09	—	—	654 (Written off)	1·09	—	—	—	—	654 (Debit)	1·09	—	—	£1	—
Liverpool Overhead Railway	500 000	3 730	0·56	10 224	1·55	13 954	2·11	7 931	1·20	400	0·06	—	—	5 623	0·85	13 954	2·11	—	11/-	£10	—
„ „ 5% Perp. Pref. (1892)	120 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	3⅜	£10	14·81
„ „ 5% Perp. Pref. (1900)	38 620	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	3⅜	£10	13·79
	658 620																				
London & Sub. Traction	1 846 104	36 137	1·05	10 480	0·30	46 617	1·35	—	—	—	—	—	—	46 617	1·35	46 617	1·35	—	2/-	£1	—
„ „ 5% Cm. Pref.	1 603 456	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9/9	£1	—
	3 449 560																				
London United Trams	656 250	53 431 (Debit)	3·30	17 384	1·08	36 047 (Debit)	2·22	—	—	—	—	—	—	36 047 (Debit)	2·22	36 047 (Debit)	2·22	—	8d.	5/-	—
„ „ 5% Cum. Pref.	962 841	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3/6	£1	—
	1 619 091																				
Madras Elec. Trams. (1904)	75 000	1 703	0·98	8 741	4·99	10 444	5·97	6 000	3·44	—	—	—	—	4 444	2·53	10 444	5 97	—	—	£1	—
„ „ 6% Cm. Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	10/-	£1	12·00
	175 000																				
Merthyr Elec. Traction & Lighting	70 000	3 654	3·65	12 422	12·42	16 076	16·07	3 125	3·12	7 000	7·00	—	—	5 951	5·95	16 076	16·07	2½	—	£5	—
„ „ 5% Cm. Pref.	30 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	£5	—
	100 000																				
Metropolitan Elec. Trams.	474 336	80 827 (Debit)	8·29	6 934	0·71	73 893 (Debit)	7·58	—	—	—	—	—	—	73 893 (Debit)	7·58	73 893 (Debit)	7·58	—	—	£1	—
„ „ 5% Cm. Pref.	500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	£1	—
	974 336																				
Para Elec. Railways	390 000	5 002	0·70	28 103	3·93	33 105	4·63	19 500	2·73	10 000	1·40	—	—	3 605	0·50	33 105	4·63	—	2/6	£1	—
„ „ 6% Cm. Pref.	325 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	13/9	£1	8·73
	715 000																				
Peterborough Elec. Traction	30 000	4 232	8·14	4 839	9·30	9 071	17·44	2 820	5·42	—	—	694	1·33	5 557	10·69	9 071	17·44	5	—	£1	—
„ „ 6% Cm. Pref.	22 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	—	£1	—
	52 000																				
Potteries Elec. Traction	245 000	4 982	1·02	32 711	6·67	37 693	7·69	—	—	32 280	6 59	—	—	5 413	1·10	37 693	7·69	—	3/9	£1	—
„ „ 5% Cm. Pref.	245 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7/-	£1	—
	490 000																				
Provincial Trams.	124 560	3 679	1·64	11 080	4·93	14 759	6·57	6 000	2·68	4 810	2·14	300	·013	3 649	1·62	14 759	6·57	—	1/3	£1	—
„ „ 6% Cm. Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4½	£10	—
	224 560																				
Rangoon Elec. Tramway & Supp.	400 000	20 624	3·18	123 829	19·05	144 453	22·23	61 667	9·49	61 000	9·39	—	—	21 786	3·35	144 453	22·23	11⅝	35/-	£1	6·66
„ „ 6% Cm. Pref.	250 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	20/-	£1	6·00
	650 000																				
Rothesay Tramways	81 768	1 846	2·01	2 461	2·68	4 307	4·69	500	0·54	—	—	2 000	2·18	1 807	1·97	4 307	4·69	—	—	£1	—
„ „ 5% Cum. Pref.	10 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	£1	—
	91 768																				
South Staffordshire Trams	128 648	895	0·44	2 132	1·04	3 027	1·48	2 280	1·11	—	—	—	—	747	0·37	3 027	1·48	—	—	£10	—
„ „ 6% Pref.	76 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	£10	—
	204 648																				
South Staffordshire Tramway (Lessee)	50 000	1 790	1·31	2 429	1·77	4 219	3·08	—	—	2 500	1·83	—	—	1 719	1·25	4 219	3·08	—	—	£5	—
„ „ Deferred	36 823	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5/-	—
„ „ 7% Pref.	50 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	£5	—
	136 823																				
Swansea Improvements & Trams	130 000	5 184	2·88	9 865	5·48	15 049	8·36	10 398	5·78	—	—	—	—	4 651	2·58	15 049	8·36	6	—	£10	—
„ „ 6% Pref.	9 840	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	—	£10	—
„ „ 5% Pref.	40 160	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	£10	—
	180 000																				
Wolverhampton Dis. Elec. Trams.	161 000	1 149	0·70	458	0·29	1 607	0·99	—	—	—	—	—	—	1 607	0·99	1 607	0·99	—	—	£5	—
Wrexham & Dis. Transport	125 000	7 912	6·33	3 005	2·40	10 917	8·73	3 125	2·50	—	—	—	—	7 792	6·23	10 917	8·73	2½	—	£1	—
Yorkshire (West Riding) Elec. Trams.	250 000	1 010	0·21	26 854	5·58	27 864	5·79	11 102	2·31	14 962	3·11	1 040	0·22	760	0·15	27 864	5·79	—	5/-	£1	—
„ „ 6% Cm. Pref.	231 305	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	9/6	£1	12·63
	481 305																				

* Including interest £1 714 (0·63%)

The issued capital of the above 25 companies, on which dividends, if any, were declared, aggregates £14 496 135, and the total amount of profit realised during the year, after deducting losses, is £577 610, or 3·98% of the total issued capital. After deducting debit balances, the sum brought forward from the previous appropriation is £21 281, representing 0·15% of the capital, while the amount carried forward to the current year's appropriation is £82 380 net, or 0·57%. The total dividends distributed absorbed £331 279, or 2·28% of issued capital, and the sum allocated to reserves, etc., was £175 529 representing 1·21%. The following is a summary of the totals, with percentages :—

	£	£	%		£	£	%
Total credit balances brought forward	155 539			Dividends distributed		331 279	2·28
Less debit balances	134 258			Reserves, etc., allocated		175 529	1·21
		21 281	0·15	Other appropriations		11 417	0·08
Profits, less losses		577 610	3·98	Total credit balances carried forward	198 329		
Other Income		1 714	0·01	Less debit balances	115 949		
						82 380	0·57
		£600 605	4·14			£600 605	4·14

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COMPANY NEWS.

Reports and Dividends—Callender's Cables Increased Profit—Burndept Wireless Ltd.—East Anglian Supply Co. and Ericsson Meetings.

TRANS-RADIO A.G. FUR DRAHTLOVEN UBER SEEVERKEHR.—A div. of 8% was declared at the recent annual gen. mtg.

ILLINOIS POWER CO.—Qrtrly: divs. of 1½% and 1¾%, respectively, on 6% and 7% pfd. stk. will be payable on July 1.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Intm. div. 5%, tax free, on ord. shs. (same as last year), will be payable on June 2.

MONTREAL LIGHT, HEAT AND POWER CO.—Intm. div. on new no par value shs. at rate of $1.50 p.a., will be payable on July 31.

NEDERLANDSCHE KABELFABRIEK.—Div. of 25%, agst. 21% for previous year, is announced. Net pft. £186 000, agst. £143 000.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—Div. of 90 cents p. sh. for qrtr. ending June 30 will be payable on July 1.

SOUTH AFRICAN LIGHTING ASSOCIATION.—Net pft. for 1929, £5 700, agst. £2 415. Div. 5%, agst. 4%, less tax at 2s. 6d. Fwd. £5 431, agst. £4 230.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Net earngs. for April, $2 374 333, agst. $2 333 352. Net earngs. for year to end of April, $9 032 279, agst. $8 917 906.

BURMA ELECTRIC SUPPLY CO., LTD.—Directors have decided to postpone consideration of ord. div. until result of year's workg. to July 31 next has been ascertained.

BERLIN ELEKTRICITATS WERKE A.-G. (BEWAG).—Fin. div. on Rm. 15 000 000 common stk. 10%, after paymnt. of Rm. 10 507 000 to City of Berlin, which owns whole of cap. stk.

PARA TELEPHONE CO., LTD.—Net pft. for 1929, £8 936, plus £1 962 brt. in. To depreciatn., etc., £4 623. Fin. div. of 4%, less tax, makg. 6½% for year, is recommended. Fwd. £1 726.

KALGOORLIE ELECTRIC POWER AND LIGHTING CORPORATION, LTD.—Pft. for 1929, £18 392, agst. £16 545, plus £623 brt. in. Income tax, £1 652, to depreciatn. res. £7 000. Div. on ord. shs. 6% less tax at 2/3. Fwd. £1 432.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—The unificatn. of the sh. cap. by conversn. of pref. and ord. shs. into shs. of no par value was approved by shhldrs. on March 20, and has now been confirmed by supplemental charter.

BRITISH COLUMBIA POWER CORPORATION.—Gross earngs. for April, $1 213 993, agst. $1 205 482; net, $321 170, agst. $388 507. Aggregate gross earngs. from July 1, 1929, $12 324 706, agst. $11 748 835; net $3 684 451, agst. $3 944 224.

COMPANIA HISPANO-AMERICANA DE ELETRICIDAD.—Gross pft. for 1929, 120 756 628 gold pesetas. To sinkg. fund 51 070 331 gold pesetas. Net pft., 52 718 513 gold pesetas, agst. 42 993 751 gold pesetas. Fin. div.of 10%, Spanish tax free, proposed on all shs., makg. 17% for year, agst. 15%.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has granted official quotations to £40 029 7½% non-cum. "A" ord. stk., £22 327 "B" ord. stk., and £33 050 5½% cum. pref. stk. of Cables and Wireless, Ltd.; and 63 785 £1, fully paid, ord. shs. of the Underground Electric Railways Co., of London, Ltd.

LIMA LIGHT, POWER AND TRAMWAYS CO.—Pft. for 1929 £P.175 204, plus £P.1 063 brt. in. After contribution of £P.38 305 to bonds fund and £P.46 000 to amortisations, and providg. for pref. divs., res. (£P.2 168), and directors' fees, div. of 75 centavos p. sh. (same as last year) is recommended. Fwd. £P.857, agst. £P. 1 063.

LISBON ELECTRIC TRAMWAYS CO., LTD.—Net pft. for 1929 £178 311 against £161 399. Sum of £50 000 to gen. res., £15 000 to staff benefit fund, against £10 000, and £10 000 to exchange reserve, same. Directors recommend final div. on ord. shs. at rate of 4% making 7% net, carrying forward £28 085, agst. £16 880.

SHANGHAI ELECTRIC CONSTRUCTION CO., LTD.—Pft. for 1929, £170 763, plus £12 028 brt. in. To renewals £40 000, taxatn., £24 000; res., £20 901; Shanghai staff provident fund, £2 049; intm. div. of 5%, £30 000. Fin. div. 7½%, makg. 12½% for year, tax free. Fwd. £20 840. Operatg. pft. was Mex. $1 923 610, agst. Mex. $1 672 325.

INTERNATIONAL HYDRO-ELECTRIC SYSTEM.—The 6% conv. deb., due 1944, of the International Hydro-Electric System have been introduced on the New York Stock Exchange. The company is a subsidiary of the International Paper and Power Co., and one of the most important public utility concerns operatg. in the U.S.A. and Canada. Debs. now listed are part of the $30 000 000 ($6 000 000) issue made in New York last year.

AT a horse show and parade recently held at St. Helen's, British Insulated Cables Ltd., who had entered a horse and decorated wagon, were awarded the silver cup for the best decorated turnout, and were also the recipients of the first prize for the best horse in its class. The accompanying reproduction shows the B.I.'s novel and topical entry.

UNITED INDUSTRIAL ENTERPRISES CO. (VIAG).—Output of operatg. subsidiaries during year ended March 31, 1930, 3 437 930 000 kWh, agst. 3 087 654 000. The company controls the largest electricity supply system in Germany, and its principal subsidiary, Elektrowerke A.-G., which uses brown coal, produced 2 332 000 000 kWh, agst. 2 009 000 000; while East Prussian Works generated 59 679 620 kWh, agst. 39 266 700.

MADRAS ELECTRIC SUPPLY CORPORATION, LTD.—Rev. for 1929, £117 482, agst. £114 363. Net pft. £65 867, agst. £65 935. Fin. div. 5½% on ord., again makg. 8%, tax free. To res. for contingencies, £1 500; gen. res. £8 000 (making £110 000). Fwd. £7 444, agst. £6 906. Result of tramways workg. showed available blce. £10 444, after provisn. for deb. int. and sinkg. fund, depreciation and renewals. Div. paid on pref. shs., 6%. Fwd. £4 444.

ELECTRIC SUPPLY CORPORATION, LTD.—Net rev. for 1929, £55 902, agst. £53 563. To income tax acct. £2 500; directors' extra renumeratn., £2 125. To repairs, renewals and depreciatn. fund, £5 374 (makg. £75 000). Fin. div. on ord. shs. 7%, again makg. 11% for year. Fwd. £20 416, agst. £17 013. Exmouth undertakg. was disposed of as at Jan. 1, 1929, but actual transfer delayed until April, 1930. Company has disposed of its int. in Wellington company.

BRITISH AND INTERNATIONAL UTILITIES, LTD.—This company has been organised with initial cap. of £250 000 to acquire interests in leadg. electrical and public utility undertakgs. in United Kingdom and British Empire. The company has been registered in London by Messrs. Dawnay, Day and Co., Ltd., and the Compagnie Italo-Belge pour Entreprises d'Electricité et d'Utilité Publique, S.A., the Belgian subsidiary of the Adriatica Company of Venice (Societa Adriatica di Elettricita.).

NEW ENGLAND POWER ASSOCIATION.—Gross earngs. in 1929, $40 408 009, agst. $31 835 605. Total productn. for the Association Companies, 1 751 529 000 kWh, agst. 1 581 212 000 kWh. The increase of 10·8% was slightly greater than that reported by the entire industry in U.S.A. Association plants produced 1 402 446 000 kWh, or 80·1% of total, and remainder was purchased. Maximum load for year in primary production, 347 000 kW, and includg. surplus power, 381 000 kW. Association hydro plants generated 573 459 000 kWh, agst. 693 900 000, decrease being result of dry conditions durg. most of year.

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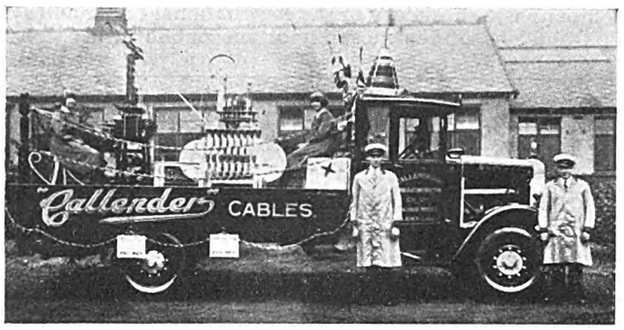
Compagnie Française des Tramways Electriques et Omnibuses de Bordeaux.—Divs. announced (and payable at Comptoir National d'Escompte de Paris, 8-13, King William Street, London, E.C.4) are : on bearer shs. agst. coupon No. 43, Fr. 13.40 ; on reg. shs. by endorsement on certificate, Fr. 14.70 ;



THIS Callender lorry, fitted out at the Leigh works, won two first prizes at the local demonstration, held on May 24, in aid of the Leigh Infirmary. The working exhibit which consisted of a braiding machine and a multiple cotton covering machine driven by an electric motor fixed on the lorry won first prize for the best tableau and the lorry won the first prize for heavy vehicles.

on actions de jouissance, agst. coupon No. 11 for bearer shs., Fr. 3.84 ; on actions de jouissance by endorsement on certificate for reg. shs., Fr. 4.20.

Electrical Enterprises-Ludwig Loewe Co. ("Gesfuerel"). — Net pft. for 1929, RM.9 098 143, agst. RM. 5 806 636. Div. of 10% on RM. 76 474 000 has been declared. Cap. was increased at end of last year on occasion of merger of Electric Enterprises Co. with Ludwig Loewe Co. RM. 1 051 737 (£525 868) is carried fwd. Company's hldgs. are shown in blce. sheet at RM. 115 002 370 (£5 750 118), includg. investmts. in Compania Hispano-Americana de Electricidad (Chade), Transports, Electricite et Gaz (Constantinople), Compagnies Reunies Gaz de Electricite (Lisbon), and Soc. Internationale d'Energie Hydro-Electrique (Sidro).

Calcutta Tramways Co., Ltd.—Pft. on tramways for 1929, £127 397, agst. £130 643, after provisn. for depreciation, £64 000, and loss on omnibuses, £28 171. After crediting int. receipts and deductg. income tax, contributn. to redemptn. fund, pref. sh. div. and intm. ord. div., blce. is to be disposed of by placing £7 383 to staff providt. fund, paying fin. div. of 10d. p. sh. on ord. shs., makg. 1s. 2½d. for year, tax free (same rate as last year) and carrying fwd. £13 284, agst. £11 020. Tramways carried over 82 750 000 passengers, an increase of over 9 500 000, and omnibuses carried more than 7 000 000 passengers.

Companies Struck off the Register.—The following joint stock companies were struck off the register on April 4 : Airships Electric Advertising Co. ; Chippenham Electric Supply Co. ; Eureka Electric and Wireless Maintenance Guarantee Co. ; Flactem Wireless ; Melksham Electric Supply Co. ; Midland Electrical Tube Co. ; Scientific Products ; Trowbridge Electric Supply Co. ; Winchcomb Electric Light and Power Co. The following were struck off the register on May 16 ; Oxford Scientific Instrument Co. ; Regent Electrical Co. The following are to be struck off unless cause to the contrary is shown before August 2 : Alklum Electrics ; British Wireless Supply Co. (1924) ; Radio Equipment Co. ; Radio Phonopore and Electricals ; Standard Electric Sign Co.

Callender's Cable and Construction Co., Ltd.—Accounts for year ended Dec. 31, 1929, show bal. of £403 911 19s. 8d. from which there is to be deducted : Appropriation for depreciation of bldgs., plant and machinery, etc., £50 000 ; provision for income tax, £10 000 ; int. on deb. stock, £13 500 ; div. on 6½ % pref. shs. for year, £26 000 ; div. on 7½% pref. shs. for year, £30 000 ; contribution to pension fund, £10 000 ; leaving £264 411 19s. 8d., plus bal. from 1928, £570 246 5s. 7d., less transferred to res. a/c., £238 730 ; making a total available, £595 928 5s. 3d. Directors recommend payment of a div. on ord. shs. Nos. 1–1 116 000 at the rate of 15% per ann., being 3s. per sh., less income tax, of which 1s. per sh., less income tax, was paid on Nov. 2, 1929, and 2s. per sh., less income tax, will be paid forthwith, amounting to £167 400, leaving to be carried forward £428 528 5s. 3d.

Burndept Wireless (1928), Ltd.—In a circular issued to the shareholders, the directors state that the models of apparatus which the company displayed at the Radio Exhibition, in September last, were extremely well received by the trade, and the actual orders obtained very considerably exceeded in value those placed with the company at any previous exhibition. Unfortunately, however, difficulty was experienced with certain components purchased from outside sources, both on acct. of delay in delivery and of their failure, when delivered, to give satisfactory performance, which resulted in a considerable number of orders being cancelled, also in apparatus being returned after delivery. These difficulties have now been overcome, and while full advantage of the winter season was not obtained, ready and substantial sales are being effected of the apparatus now before the public.

Company Meetings.

L. M. Ericsson Telephone Co., Stockholm.—At the annual meeting last week the managing director stated that the amount of unfilled orders on the books of the company's Swedish factories increased by 13% during the past year, and the number of completed orders rose by 17%. For the foreign factories the figures were 35 and 11% respectively.

Dundee, Broughty Ferry and District Tramways Co., Ltd.—Mr. George Balfour, M.P., presiding at the recent annual meeting, said the profit for the year, after payment of income tax, secretarial and administration expenses, etc., and adding £1 169 brought forward, was £2 504. Deducting £1 116 for interest on debenture stock, there was left a balance of £1 388 9s.' This balance was, unfortunately, insufficient to justify the payment of a dividend on either class of share capital, and therefore the directors proposed to carry it forward to next account. The report was adopted.

East Anglian Electric Supply Co., Ltd.—At the meeting last week, Sir James Devonshire, chairman, said those shareholders who were present at their last meeting would remember that they were told of their large contract which had been secured for the supply of electricity to the British Acetate Silk Co. That supply had been brought into operation in the summer of last year, but after operating for a few months that company got into difficulties and the supply had to be disconnected. He understood that a winding-up petition had been presented to the Courts by other creditors. Unless the silk works were able to resume operations, it would appear probable that East Anglian Electric Co. would make a substantial loss, and the heavy cost of the line erected to supply them would be a burden until they could find other work for it. On May 15 of this year, the Electricity Commissioners made an Order which confirmed the company's statutory powers to supply electricity over a large part of Norfolk and Suffolk. Construction work during the next few years would involve the expenditure of over £500 000. A resolution to increase the capital of the company by a further £200 000 was carried at a subsequent extraordinary meeting.

Rangoon Electric Tramways and Supply Co., Ltd.—Mr. W. A. W. Dawn, presiding at the meeting on June 4, said the gross profit for the year was £178 040, against £175 599 ; £61 000 had been transferred to reserve for renewals. The net profit was £62 828, an increase of £4 770. The plant had been operated satisfactorily during the year, and there was a slight reduction in the cost of generation. The plant was sufficient to meet all foreseeable requirements for some years ahead. Notwithstanding the trade depression in Burma during the year under review the demand for current might be considered satisfactory, the increase in receipts from this side of their business being £12 236 over the previous year. Work was in hand on an extension of the supply to Bauktaw, and temporary supply to Kanbe was under consideration. A cable for a supply to the 15th mile on the Prome Road had been laid, and would be put into use as soon as the new wireless plant was ready. It was anticipated that the reconstruction of the tramway track on concrete foundations would be completed by the end of the next dry season. Plans were being got out for a new and experimental type of tramcar with a central entrance. The electrical re-equipment of the existing cars was being pushed forward ; the new equipment was a considerable saving in weight. The number of omnibuses had been increased in the course of the year. There was a slight improvement in the company's omnibus position. The department showed a loss, but the loss was less than that which occurred last year. The report was adopted and the dividends were approved.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BRITISH ELECTRICAL MANUFACTURING CO., Alexandra Works, Brent View Road, West Hendon, manufacturers. £14 19s. 8d. April 25.

CHALKWELL ELECTRIC AND RADIO STORES, 2, Nelson Road, London Road, Leigh-on-Sea, radio dealers. £17. April 8.

DE VILLIERS, Mr. A., 161, Westminster Bridge Road, S.E., wireless dealer. £20 15s. 6d. April 24.

ETHERINGTON, Mr. H. High Street, Haslemere, wireless dealer. £11 9s. 6d. April 7.

KAPLAN, Mr. H., 37, Lisle Street, W., wireless dealer. £10 2s. April 30.

KELSALL WIRELESS SERVICE, Kelsall Hill, nr. Chester, wireless dealers. £10 17s. 9d. April 14.

LONDON WIRELESS CO., 32, London Road, Derby, wireless dealers. £11 5s. 7d. May 6.

MARTIN, Thomas, G., 4, Chaucer Gardens, Beehive Lane, Ilford, wireless dealer (trading as BEEHIVE RADIO AND ELECTRICAL STORES). £25 17s. 11d. April 14th.

SWORDER, Mr. C. J., Wireless Depot, High Street, Crowthorne, wireless engineer. £24 6s. 5d. April 30.

WIRELESS PICTURES (1928), LTD., Dorland House, 14-16, Regent Street, S.W. £48 6s. 8d. April 1; £47 8s. 9d., March 7; and £14 14s. 10d., April 14.

WOODWARD, Mr. R., High Street, Lyndhurst, wireless dealer. £10 9s. 6d. April 29th.

Bills of Sale.

APPLE, Helen (wife of Benn Apple), trading as H. APPLE, 87, Tottenham Court Road, W., wireless and electrical dealer. Dated May 30; filed June 5. £100.

KNIGHT, Otto Algernon, trading as KAY AND CO., 169, Railway Approach, Shepherds Bush, wireless factor and general merchant. Dated June 2; filed June 5. £100.

SOLOMON, Samuel, 27, Kyverdale Road, Stoke Newington, electric bulb dealer. Dated May 23, filed May 28. £100.

Deeds of Arrangement.

ALEXANDER, Harry Morton, trading as WALSALL RADIO CO., 146, Lichfield Street, Walsall, and residing at 15, Bayswater Road, Perry Barr, wireless and electrical goods dealer. Dated May 31; filed June 6. Trustee, W. P. Barnfield, The Bridge, Walsall. Liabilities unsecured £1 369; assets, less secured claims, £530.

BIGGS, Charles Cooper, 1, White Avenue, Newbury Park, Ilford, and SMITH, John Leonard, 75, Grove Road, Wanstead, trading at 143, High Street, Wanstead, as BIGGS AND SMITH, electrical engineers, etc. Dated May 30; filed June 5. Trustee, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C. Secured creditors, £600; liabilities unsecured £736; assets, less secured claims, £400.

FLEURY, Edward, 310, Forest Road, Walthamstow, and 9, George Lane, South Woodford, electrical contractor. Dated May 31; filed June 5. Trustee, H. Cashman, 476, Barking Road, Plaistow. Secured creditors £720; liabilities unsecured £1 238; assets, less secured claims, £480.

SPENCE, Herbert Frank, Eureka Terrace, Honiton, electrical engineer. Dated June 2; filed June 6. Trustee, N. C. Eyre, New Street, Sidmouth. Secured creditors, £55; liabilities unsecured, £1 545; assets, less secured claims, £495.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

A. F. M. ELECTRICAL SERVICE, LTD. (late H. H. H. LTD.), London, W.—Reg. May 19, series of £500 debs. present issue £200; general charge. *Nil. Dec. 31, 1929.

ASSOCIATED WIRELESS CO., LTD., London, N.W.—Reg. May 20, £200 and £150 debs., to Mrs. U. Bolsom, Ulmarlodge, Bridge Lane, Golders Green; general charges.

CENTRAL WIRELESS CO. LTD., London, E.C.—Reg. May 23, series of £300 debs. present issue £100; general charge.

Satisfaction.

ENGLISH ELECTRIC CO. LTD., London, W.C.—Satisfactions reg. May 23, £45 200, part of amount reg. Oct. 3, 1919, and £41 736, part of amount reg. August 1, 1924.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

MORRIS, C. E., electrical engineer and radio expert, trading as BALDWIN'S, The Arcade, Littlehampton, Sussex. Creditors were called together on June 4 at the offices of Mr. A. E. Orbell, accountant and auditor, 6 and 7, Old Steine, Brighton. The statement of affairs showed liabilities of £400, all due to the trade, and assets (including stock £80, and book debts, estimated to realise £30) of £120, less £57 preferential claims, a deficiency of £337. Mr. Orbell reported that the debtor had been employed by various firms of electrical engineers and in April, 1929, he took over the business known as "Baldwin's" at The Arcade, Littlehampton, agreeing to pay £500 for the stock, goodwill, etc. The debtor estimated the value of the stock at about £250. Later he acquired a lease for seven years at a rental of £120 per annum. He had no capital of his own, but his mother paid the full purchase price and gave the debtor £50 as capital. Accounts were prepared for the six months to October 31, 1929, and they showed sales of £1 033, with a net profit of £31, while the debtor's drawings were £153. Recently an execution was levied on behalf of a judgment creditor, but the sheriff's officer withdrew and reported that the assets were insufficient to cover the rent. The creditors decided that the stock, fixtures, fittings, etc., should be sold and if there was any surplus after discharging the distrainable rent it should be received by Mr. Orbell, who was also to collect the book debts and distribute the proceeds *pro rata* amongst the creditors in settlement of their claims.

London Gazette, etc.

Winding-up Petition.

MAYFAIR ELECTRIC GRAMOPHONES, LTD. A petition for winding-up has been presented, and is to be heard at the Royal Courts of Justice, Strand, London, on June 23.

Company Winding-up.

"K. N." ELECTRICAL PRODUCTS, LTD. Meetings of creditors, June 20, 11.30 a.m.; and contributories, 12 noon, 33, Carey Street, Lincoln's Inn, London, W.C.2.

Company Winding-up Voluntarily.

TAYLOR (LEO), LTD. Meeting of creditors at the office of W. Latham, chartered accountant, 27, Birley Street, Blackpool, on Thursday, June 12, for the purpose, if thought fit, of nominating a liquidator and of appointing a committee of inspection.

Bankruptcy Information.

TUCKER, Joseph, 30, Lower Ashley Road, formerly 876, Filton Avenue, Bristol, trading as the Bristol Radiator Co., wireless dealer. Receiving order June 4. Debtor's petition.

Application for Discharge.

BAYNES, Maudslay, lately trading with another at 96, Regent Street, London, W.1, as Langham Radio, wireless manufacturers. Hearing, July 4, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Partnership Dissolved.

THE VENUS RADIOPHONE CO. (HARBURN, Frank Kilner, and THORNTON, John Tyne), radio engineers, Palace Hotel Buildings, Kirkgate, Huddersfield, by mutual consent as from May 31, 1930. Debts received and paid by J. T. Thornton, who continues business.

Bankruptcy Proceedings.

CLEMINSON (M.), LTD., wholesale merchants in electrical and wireless goods, 5, 6 and 7, Dysart Street, Finsbury Square, London, E.C. Under a winding-up order made in this case on May 5, on a creditor's petition, the statutory meetings were held last week, at the Board of Trade Offices, Carey Street. It appeared that the company was incorporated in December, 1925, with a nominal capital of £3 500, all of which had been issued. Shares to the number of 1 200 were subscribed for in cash. The directors had been Charles E. Cleminson, Nikolaus Brenz and James W. Rochester, but Brenz resigned on June 11 of last year. Cleminson had stated that he began business in Bishop Auckland in March, 1923, and he traded as a wholesale merchant chiefly in electrical goods. In September, 1926, the business was removed to London, and it was taken over by the company as from December 31 following. The purchase price was £2 348, which was satisfied by the issue of £2 300 in shares, and as to the balance in cash. The company's business was originally carried on at 4, Milton Street, City, and it chiefly consisted of the purchase and sale of electrical goods and wireless

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parts obtained from Germany. The company also acted as agents for certain German firms, but it bought and sold the goods for its own account. In December, 1927, it took the premises in Dysart Street, City. The turnover during the perod of thirteen months ending January 31, 1928, amounted to £42 495, on which there was a gross profit of £4 560, but a net loss of £599. During the subsequent period ending January 31 last, the turnover amounted to £46 949, on which there was a gross profit of £2 974, but a net loss of £2 198. The statement of the company's affairs had not yet been received, but the gross liabilities had been estimated at £13 860, of which £10 860 were due to unsecured creditors for goods supplied, and the balance represented the approximate amount of outstanding bills given by the company. The assets were valued at £440. Cleminson had attributed the failure of the company to its having to meet bills, to bad debts and to goods being sold at an insufficient margin of profit. In the opinion of the Official Receiver, the failure was also due to the fact that the overhead charges were much greater than the turnover and gross profit justified. The meetings passed a resolution for the appointment of Mr. F. S. Salaman, C.A., 1 and 2, Bucklersbury, City, as liquidator of the company.

M.E.D.A.S., LTD., electrical, radio, lighting and heating engineers and contractors, 185, Hammersmith Road, London. In the compulsory liquidation of this company the Official Receiver has issued a summary of its statement of affairs, showing liabilities £2 861, of which £2 021 are expected to rank, and estimated assets £840, absorbed in payment of preferential claims and part payment of four debenture holders. In his accompanying observations the Official Receiver reports that the company was registered on January 11 of last year with a nominal capital of £3 150, its objects being to take over as a going concern the business which had been carried on by A. C. L. Covell and D. J. Quenzer at the above address. In January last certain creditors were pressing the company for payment, and two of them began proceedings and obtained judgment. One creditor levied execution, and on January 29 the debenture holders appointed a receiver, who entered into possession, and the execution was withdrawn. He reports that up to the present he has not been successful in obtaining an offer for the business, and assets, and that there is no likelihood of enough moneys being realised to meet the debenture holders' claims. Mr. O. G. Sunderland, C.A., 15, Eastcheap, City, has been appointed liquidator.

MULLER, Moses Aaron, 17, Duncan Terrace, Islington, London. This debtor carried on business as an importer and merchant, dealing chiefly in electrical goods, and a sitting for his public examination was held in the London Bankruptcy Court last week before Mr. Registrar Mellor. The statement of the debtor's affairs showed liabilities £6 723, of which £6 600 are expected to rank, and net assets £62. It appeared that the debtor, who came to this country from Germany in 1922, carried on business as a manufacturers' agent until 1925, latterly at the above address. He then began business as a merchant and importer, chiefly dealing in electrical goods. He had a capital of £2 500, of which £500 represented his savings, and the balance borrowed money, and in March of last year he entered into a contract with a Germany firm who agreed to manufacture and supply to him goods to the value of £7 500. In order to finance the contract he accepted bills of exchange drawn by the German firm amounting in all to £3 000, but the goods were never delivered, although certain of the bills were met by the firm in question. In September he began proceedings against it for the recovery of £1 750, the amount for which he was liable on the outstanding bills, and damages. In February he obtained judgment for damages to be assessed. In October a writ was served on him by the holder of some of the bills, and in December he convened a private meeting of his creditors, when an offer of 4s. in the £ was made to the holders of the bills, the other creditors agreeing to defer their claims for the time being. But his offer was not accepted, and an execution being levied at the instance of a judgment creditor, he filed his petition. The debtor attributed his insolvency to the failure of the German firm to deliver the goods, to his liability in respect of the bills, and to bad debts. The examination was ordered to be concluded.

THE LEAD MARKET.

Quiet conditions again prevailed in the market last week, and according to James Forster and Co. prices moved within narrow limits. The American price is unchanged at 5.50 cents per lb. Closing prices on June 6 were: £18 1s. 3d. for June, £18 2s. 6d. for July, £18 3s. 9d. for August, and £18 5s. for September, or 3s. 9d. per ton up on the week.

COMING EVENTS.

Friday, June 13 (To-day).

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. Papers by Mr. E. J. Williams on "The Induction of Electromotive Forces in a Moving Liquid by a Magnetic Field, and their Application to the Investigation of the Flow of Liquids," Prof. E. V. Appleton on "Wireless Methods of Investigating the Electrical Structure of the Upper Atmosphere," and a demonstration by Dr. H. R. Lang on "A Modified Calendar Recorder for the Automatic Control of a High Temperature Oil Bath." 5 *p.m.*

Wednesday, June 18.

ELECTRICAL CONTRACTORS' ASSOCIATION (SUSSEX BRANCH).—Midland Bank Chambers, Brighton. Ordinary meeting.

Saturday, June 21.

SHEFFIELD ILLUMINATION SOCIETY..—Annual Outing, Belle Vue, Manchester.

NEW COMPANIES.

DISTRICT TRANSMISSION LINES, LTD.—Cap., £100. Electricians, electrical and mechanical engineers, etc. A director: J. Collier, Ecclerigg, Windermere.

ROBERTS (KENT), LTD.—Cap., £1 000. Electrical engineers, wireless and mechanical engineers, etc. Solicitor: M. Borg, 6, Cecil Square, Margate.

STATIC ELECTRIC, LTD.—Cap., £500. Electrical engineers, wireless and mechanical engineers, etc. Solicitor: J. L. Beech, 23, King Street, Manchester.

J. W. LEWSLEY, LTD.—Cap., £2 000. To acquire business of electrical and cinematograph engineer carried on by J. W. Lewsley at 33, Derby Road, Nottingham.

"BEEANTEE," ILLUMINATIONS, LTD.—Cap., £1 000. Electrical accessories manufacturers, agents, etc. Reg. office: Wingo House, 25, Norton Folgate, London, E.1.

BELGRAVIA ENGINEERING CO., LTD.—Cap., £2 000. Civil, mechanical and electrical engineers, etc. Reg. office: 8–10, Grosvenor Gardens, London, S.W.1.

STANDAGE POWER COUPLINGS, LTD.—Cap., £500. Mechanical, electrical and general engineers, etc. Reg. office: Precision Works, 100, Blackstock Road, London, N.4.

REES RADIO, LTD.—Cap., £1 000. Engineers, electricians, manufacturers of and dealers in wireless apparatus, etc. Reg. office: 75, Kilburn Lane, London, W.10.

STEAM USERS' SUPPLY CO., LTD.—Cap., £100. Electrical, mechanical and general engineers, etc. A director: G. F. Coombes, 480, Huddersfield Road, Wyke, Bradford.

STEWARD'S ELECTRICAL CO., LTD.—Cap., £2 500. Manufacturers and sellers of electric machinery, instruments, etc. Reg. office: 327, Southchurch Road, Southend-on-Sea.

BRIGHTON RADIO CIRCUIT, LTD.—Cap., £100. To acquire, construct and deal with wireless, land and submarine telegraphs, etc. Solicitors: J. K. Nye and Conne, Brighton.

JOHN SHAW AND CO. (ELECTRICAL), LTD.—Cap., £1 000. Electric lighting, heating, wireless, and general engineers, etc. A first director: J. S. Shaw, 46, Cranbrook Avenue, Hull.

STRATFORD WIRELESS, LTD.—Cap., £600. Manufacturers of and dealers in electrical and wireless apparatus and appliances, etc. Reg. office: 284, High Street, Stratford, London, E.15.

ELECTROHOMES, LTD.—Cap., £1 000. To acquire business of electrical appliance manufacturers carried on by Technical and General Trust, Ltd., at 52, Bedford Street, Strand, W.C.

BIAFONE CO., LTD.—Cap., £4 000. To acquire business of manufacturer of electrical apparatus carried on by M. E. Elliott at Gosford Road, Beccles, as Automatic Radio Manufacturing Co.

PENNINGTON, STEVENS AND TAYLOR, LTD.—Cap., £5 000. To acquire business of electrical and mechanical engineer, etc., carried on by P. E. Stevens at 17 and 18, Devonshire Square, London, E.C.

C. A. CARTER AND CO., LTD.—Cap., £1 000. Manufacturers and dealers in scientific, telegraph, telephone and radio appliances, etc. Reg. office: Edison Works, Edison Road, Crouch End, London, N.8.

BURGOYNE WIRELESS (1930), LTD.—Cap., £500. Manufacturers of and dealers in accumulators and batteries, wireless aerials, receivers, etc. Reg. office: 34A, York Road, King's Cross, London, N.1.

EUSTON MAGNETO CO., LTD.—Cap., £1 000. Manufacturers of, agents for and dealers in magnetos, lamps, bulbs, etc. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, London, W.C.2.

MAJESTIC ELECTRIC CO., LTD.—Cap., £10 000. Agents for sale and distribution of radio, telegraphic, telephonic, electrical, magnetic, and radio-active instruments and switchboards, etc. Solicitors: Wansbroughs, Robinson, Taylor and Taylor, Lion Chambers, Broad Street, Bristol.

METAL AND CHEMICAL PRICES.

		Price.	TUESDAY, June 10 Inc.	Dec.
Copper—				
Best Selected	per ton	£59 10 0	—	10s. 0d.
Electro Wirebars	„	£61 10 0	—	—
H.C. Wire, basis	per lb.	9 1/8d.	—	—
Sheet	„	9 1/8d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 0 1/8d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	8 1/4d.	—	—
Sheet „	„	8 1/4d.	—	—
Wire „	„	9 3/8d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 10 0	5s. 0d.	
Foreign or Colonial	„	£18 0 0	5s. 0d.	
Tin—				
Ingot	per ton	£139 5 0	7s. 6d.	—
Wire, basis	per lb.	1s. 11 1/4d.	—	1/4d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£16 15 0	2s. 6d.	—
Mercury	per bottle	£22 10 0	—	—

Sulphur—Flowers, Ton £12 0 0 Roll, „ £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10s. *Boric Acid* (Crystals) „ £32 0 0

Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2 1/2d.

Sodium Bichromate—Per lb., 3 1/2d.

Rubber—Para fine, 7 1/2d.; plantation, 1st latex, 6 1/2d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

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17 JUL 5 1930

THE ELECTRICIAN

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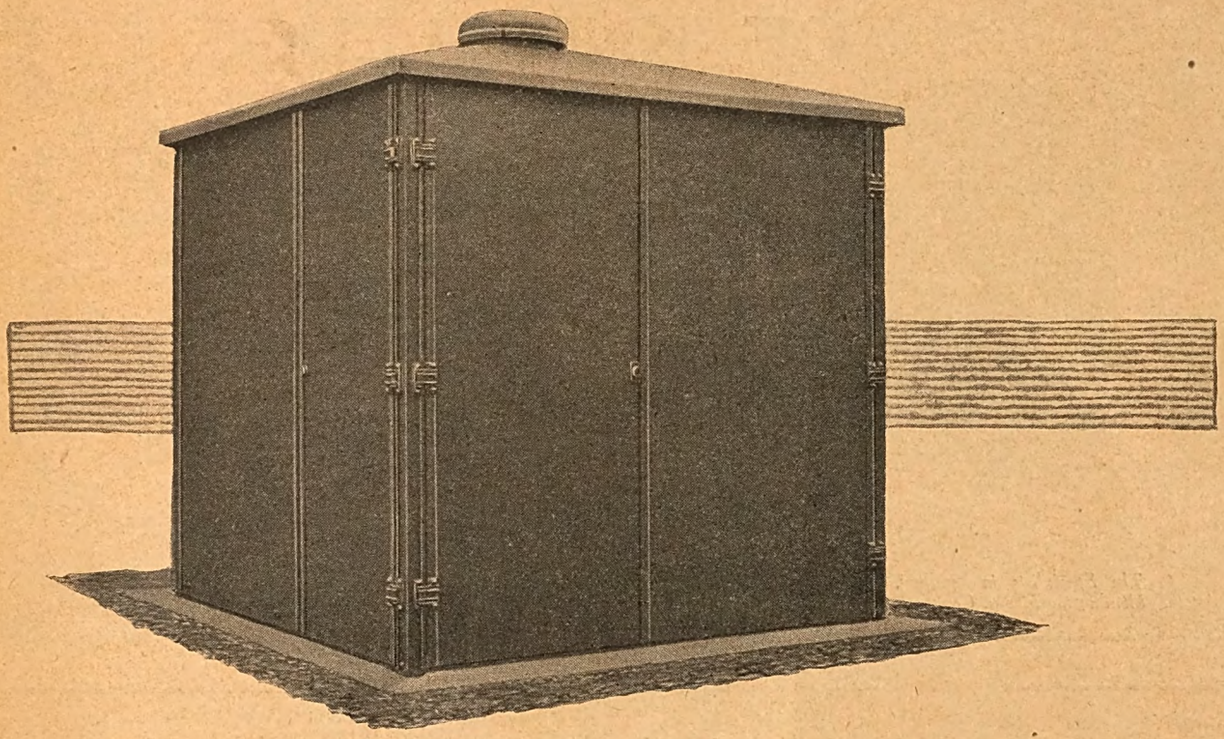

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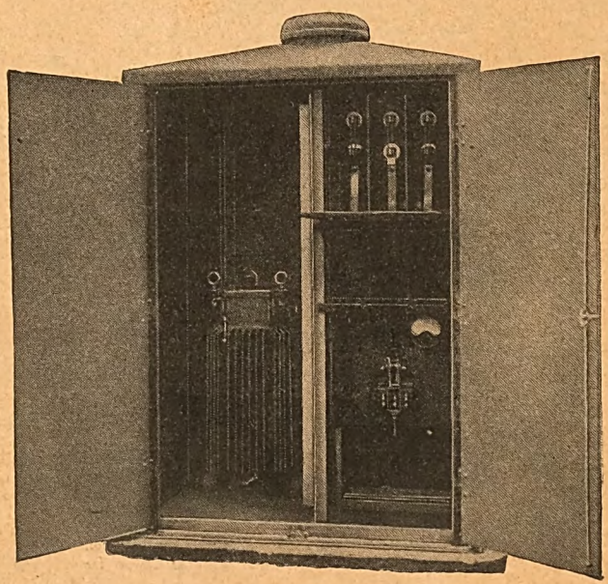

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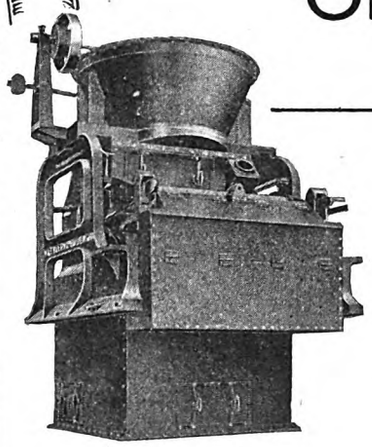

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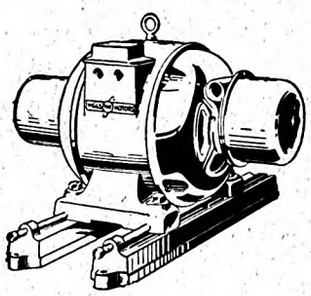
A.C.  D.C.

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

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Electricity Supply.

PUBLICATION by the Electricity Commission of the return of all authorised undertakers holding statutory powers of supply at the end of 1928 in the case of company undertakers and 1928–29 in that of public authority undertakings brings up to date the statistical returns issued by the Commission. Three volumes have been published during the past twelve months and it is hoped to issue subsequent returns not later than December in each year. Prompt publication will undoubtedly increase the value of the statistics to the industry and it is to be hoped that all undertakings will co-operate to this end by making their returns at the earliest possible moment. This applies particularly to those undertakings whose year ends on December 31, as early receipt of their returns enables the Commission to deal with them before those relating to others whose year extends over portions of two calendar years. There has been a certain tardiness on the part of some undertakings in providing the required information, and they will help matters forward if they will make every effort to send in their returns with the minimum of delay in future.

Some impressive figures indicating the growth of the supply industry since 1921-22 are contained in the large volume of statistics which has just been published by the Commission. Sales of electricity to consumers increased in seven years by 150 per cent., the average annual increase being nearly 670 000 000 units. At the end of 1928-29 some 3 000 000 individual consumers were connected to public supply systems, two thirds of the consumption being provided by public authorities and one third by companies. The generating stations engaged in public supply numbered 485 with an aggregate of 5 801 770 kW of plant, of which 69 per cent. was contained in 76 stations each of 25 000 kW capacity or more. Of the remaining 409 stations 200 had a capacity of less than 1 000 kW each. During 1928-29 additional plant installed amounted to about 543 000 kW and by the end of that financial year nearly half the total plant installed consisted of steam turbo-alternator units of 10 000 kW or over. Nearly two thirds of the current consumption was for power purposes, rather more than a quarter being used for lighting and domestic supplies and one-eleventh for traction. Direct employment was given by the electricity supply industry to more than 56 700 people engaged on generation, distribution and administration, the salaries and wages bill amounting to £9 386 000. It must be remembered that these figures do not take into account electricity generated by railways and tramways for their own requirements, nor do they include the large number of private stations owned by collieries and other industrial and commercial concerns nor supplies given by undertakings which have no statutory powers.

How important the electricity supply industry has become in the economic life of the country is shown by the financial side of the returns issued by the Electricity Commission. In 1928-29 the total working receipts of all authorised undertakings was £55 454 000, an increase of £2 124 000 compared with the previous year. Working expenses, exclusive of capital charges amounted to over £31 260 000 the percentage of revenue being 56 per cent. Generating costs account for over 35 per cent. of the total expenses. The burden of local rating, which has been substantially increased since the period covered by these statistics, was heavy enough in 1928-29, when it represented more than 9 per cent. of the total expenses. An excess of revenue over expenditure of £24 188 000, representing 8·1 per cent. on the capital expenditure, which was increased to 8·7 per cent. by the inclusion of £1 667 000 of revenue from other sources, cannot be regarded as excessive, being just about sufficient to maintain the industry in a healthy condition by enabling it to keep its plant efficient and up-to-date and to offer a reasonable return to investors.

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Current Topics.

World Power Conference.

On Monday the second Plenary World Power Conference was opened in the Reichstag, Berlin. There are over 4 000 registered members, of whom 2 500 are Germans. The British members number over 200. Austria has sent about 180, and the United States and Japan about 120 each. Of the 400 papers a large proportion are electrical or have some connection with electrical energy, but no newspaper can hope to publish even a résumé of such a large mass of material, which will eventually become available in volume form. The Electrician is represented at the Conference by Dr. A. Eckstrom and Mr. Vidar Eckstrom; who are contributing a series of articles reviewing the proceedings of the electrical section.

Professor Einstein on Space.

At the end of an address to the World Power Conference on Monday, Professor Einstein summed up the conclusions to which his latest mathematical work has led him by saying that, metaphorically speaking, space, which had been abstracted from material objects and made a scientific reality by Newton had, during the past century, swallowed up both ether and light and was about to swallow up both the gravitational and electro-magnetic fields and corpuscles as well, so that it would be left as the sole theoretical representative of reality. If these views are to be accepted we seem to have reached, by a process of mathematical analysis which must be taken on trust by all save a very few individuals, a very similar conclusion to that enunciated 3 000 years ago by Indian philosophers that all is illusion except Brahma—now, apparently, to be called Space.

Faraday Centenary.

In order to prevent any misconception in other countries as to the spirit in which the Faraday Centenary Celebrations are being organised, it is desirable to make it clear that the summary of the provisional arrangements which appeared in our issue of June 13 omitted certain references to the work of other electrical pioneers whose experiments preceded those of Faraday. The opening sentence of the statement actually issued by the Exhibition and Publicity Sub-Committee in connection with the provisional programme for next year's centenary was worded: "In 1831 Michael Faraday, following up the work of Volta, Oersted and Ampere, began, or rather resumed . . . experiment on the induction of electric currents." The centenary of Oersted's electro-magnetic discoveries was recently celebrated in Denmark, and our Continental friends may rest assured that, when commemorating the work of Faraday next year, earlier important electro-magnetic discoveries will not be overlooked.

Electrical Imports and Exports.

The decline in exports of British electrical manufactures, which began in April, continued in May, the value being £231 924 less than in May, 1929. Owing to the headway made during the first quarter of this year, exports for the five months ended May 31 were £58 656 above those of the corresponding period of 1929, but it is is unpleasantly evident that unless the June figures reverse the tendency that began to manifest itself at the beginning of the current quarter the total for the first half of 1930 will be below that of the first six months of last year. On the other hand, imports are still increasing—by £85 595 in May and by £1 017 733 for the first five months of this year—during which period they amounted to £3 858 590, or more than 48% of the value of exports.

G.E.C.'s Good Year.

In the year ended March 31 the General Electric Company made a profit of £1 179 007 compared with £1 084 077 in the preceding year, and this increase, aided by a larger sum brought forward and a decrease in the amount required for interest, depreciation, preference dividends, and pension fund contribution, and after transferring £130 000 as before to reserve, leaves £694 676 available for the Ordinary shares—£107 240 more than in 1928-29. Shareholders are to receive 10 per cent., as in the previous year, together with a special bonus of 4 per cent. and £379 165 is to be carried forward, against £362 072. The company, which now employs nearly 25 000 people—an addition of 2 600 during the twelve months—established a new record by the extent of its activities in 1929-30 and the G.E.C. magnet is still far from having lost its power of attracting new business.

OPENING OF THE WORLD POWER CONFERENCE IN THE KROLL OPERA HOUSE, BERLIN, ON MONDAY.

To the right of the President are Dr. Carl Köttgen (chairman), Sir C. A. Parsons, Mr. G. Malm (Sweden), Director L. Tolloczko (Poland) and Prof. P. S. Ossadtschy (Russia); to the left of Dr. von Miller are Reichskanzler Dr. Bruning (Germany), Dr. Ed. Tissot (Switzerland) the Lord Mayor of Berlin (Herr Scholz), Dr. M. Kamo (Japan), Dr. C. Camsell (Canada), Senhor M. S. Rodrigues (Brazil), and Dr. H. S. van der Bijl (South Africa). Sir A. Page and Sir A. Duncan are in the second row; Mr. Ll. B. Atkinson and Miss C. Haslett in the third.

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SECOND WORLD POWER CONFERENCE.

Opening Proceedings in Berlin—Scope of the Present Conference—Economic Aspects of Power Supply—3 000 Members Representing 50 Nations in Attendance.

By ALFRED ECKSTROM, D.Sc., M.I.E.E., and VIDAR ECKSTROM, C.E.

THE necessity of world co-operation is daily becoming more obvious with the widening scope of the various branches of industry, and every country is beginning to realise how essential it is to learn of the progress and work done in other countries beside their own. Technical journals all over the world are doing a great deal towards keeping those who are interested in touch with every development, but it is obvious that such papers, however excellent, cannot achieve the same result as can verbal discussion between technical representatives and leading personalities from many different countries. Realisation of this fact caused the British Electrical and Allied Manufacturers' Association, under the chairmanship of Mr. Dunlop, to initiate the World Power Conference in 1924.

The first plenary meeting of the World Power Conference, which was held in London in connection with the Wembley Exhibition in 1924, was attended by the representatives of 47 nations. At this meeting 305 papers were read and discussions held on every aspect of power. The tremendous field covered made it unnecessary for such a conference to be an annual event. In view of this fact, it was decided that such plenary meetings need only be held every six years and that sectional meetings, devoted to more particular problems relating to power, should be held whenever considered necessary.

Since the first plenary conference there have been four of these sectional meetings. The first, held in Bâle in 1926, dealt with water power and inland navigation; the second, held in London in 1928, with fuel; the third, held in Barcelona in the spring of 1929, with the utilisation of water power resources; and the fourth, held in Tokyo in the autumn of 1929, with the development of power resources.

As the sectional meetings during the last few years have dealt with the production of energy, the Second Plenary World Power Conference now being held in Berlin is dealing with the distribution and employment of energy. Generally speaking, the conference is more concerned with the economic aspects of power supply.

The patron of this Second World Power Conference is Reichspräsident Von Hindenburg; the Honorary President is Dr. Oskar von Miller who, succeeding the Earl of Derby in this capacity, will hold the position until the next plenary meeting which will probably be held in the United States in 1936. Under the chairmanship of Generaldirektor Dr.-Ing. C. Köttgen, the management of the Conference is in the hands of a Board of which Professor Matschos is the manager.

A number of special technical committees were organised in the winter of 1928–1929, and a series of suggestions regarding discussions were issued and circulated to the National Committees of the various countries. The suggestions related to what was conceived to be the most important problems with which the Conference would have to deal, and were to be used as a guide for the preparation of papers. It was stipulated that any papers for the Conference should reach the Managing Bureau by November 1, 1929, so that those interested could read the details of the papers before the Conference. In order to save time, a general report, giving a short review and critical summary of the papers submitted, has been prepared by the Chairman of each of the 34 sections. The sessions are opened by the reading of one of these reports, the subsequent discussion often resulting in important decisions being made by the Conference.

This conference has made full use of the experience gained at previous ones, especially in regard to the language problem, for it is possible, merely by putting on a headphone, and moving a switch, to hear the speeches, translated by expert interpreters, in any of the three official languages (English, French or German) at the actual time of delivery.

On Sunday evening the Hon. President of the First Conference, Lord Derby, handed over his Presidential Insignia to Dr. Oskar v. Miller at the Reichstag. Members were then received by the new President and the Hon. Chairman, Dr. Carl Köttgen.

On Monday morning, the ceremonial inauguration took place at the Kroll Opera House, and speeches were delivered by the Hon. President, the Reichskanzler and the Chairman of the National Committees, expressing their keen admiration of the important task the W.P.C. has to fulfill. There followed speeches of greeting from representatives of other countries. Sir Algernon Parsons spoke for Great Britain; Dr. Hendrik van der Bijl for South Africa; Dr. Charles Camsell for Canada and North America; and Dr. A. C. Rivett for Australia and New Zealand. Over 3 000 members, representing about 50 nations, attended this meeting.

This was followed by the first of the technical meetings, and in the evening Professor Einstein delivered his address on "The Space, Field and Ether Problems in Physics."

SOME REFLECTIONS.

By D. WINTON THORPE, A.M.I.E.E.

LAST Monday saw the opening of the second Plenary Session of the World Power Conference at Berlin. That is a dull sentence full of rather irritating words. It is a defect of the English language that the word "power" is saddled with too many meanings, and the phrase "world power" has a decidedly unsavoury suggestion about it. I think I prefer the French version, which is Conférence Mondiale de l'Energie. In that title there is something more than a suggestion of the romance which imagination can extract from this Conference. "Plenary Session"—here again the English language breaks down, while the French does more justice to the occasion with "Séance Mondiale." It is only twelve years since German and Austrian scientists on the one hand, and Russian, French, and English scientists on the other hand, were engaged upon the most vicious work to which competition can descend. Now they are engaged upon the closest co-operation which the world has ever seen—and that at Berlin! From fifty nations throughout the world delegates and members have come to pour into the common pool their donation to scientific progress.

Engineers have the reputation of being rather cold-blooded and matter-of-fact folk who feel nothing but the "cold steel" of their work. But engineers who have attended the World Power Conference have, in every case, been sensible to the romantic aspect of pooling the world's scientific knowledge for the benefit of the world. It has no narrow limits, this Conference. Anything which bears at all on the subject of power has a place in its programme. I use the word "programme" in its broader sense and do not refer to the actual schedule of papers to be presented and discussed at the forthcoming Berlin Conference. These papers, formally presented and spontaneously discussed, are essential to the Conference, but it is what is behind these papers which matters—the spirit of giving, the spirit of friendship and the spirit of having a common purpose. I have attended many conferences and I have met some delightful acquaintances at all. In none but the World Power Conference have I made real friends. Every day of the year members of the World Power Conference are in touch with one another throughout the length and breadth of the world, whether it be socially or scientifically. Friendships started and scientific discussions begun during a session do not finish when that session ends, and each formal meeting of the Conference gives proof of this fact in the papers presented, papers which are, in many cases, the fruit of this constant intercourse.

"For aught I know this Watercataster of Siberia Water-power which is after quoted on the next pages, is the first attempt in this direction." Thus an engineer opened his paper which was to be presented to the first World Power Conference. It was, indeed, one of the first attempts to analyse and classify the water-power of Siberia, and the broken English in which the paper was written would have been laughable had it not been so full of goodwill in the common interest. Written in green ink in spidery hand-writing on the most common of paper, it represented indeed the "widow's mite"—none the less acceptable for that.

Of the technical aspect of the Conference much has been written and much will be written, but when engineers read and digest the scientific points which arise they must not forget the romance which lies behind this ambitious scheme. The World Power Conference has not yet reached completion. An organisation so great and so far-reaching takes many many years to build. After the splendid launch in 1924 it has been steadily growing in influence, and the time will come very soon, I am convinced, when it will represent the greatest influence operating for world peace.

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E.C.A. OF SCOTLAND CONFERENCE.

Successful Innovation in Conjunction with the Annual Meeting—Pleasant Week-end at Taymouth Castle—New President on Organisation of Contractors.

(CONTRIBUTED.)

THE Electrical Contractors' Association of Scotland this year combined their annual general meeting with a week-end conference of members and the gathering was held at Taymouth Castle, Perthshire, one of the finest baronial halls in Scotland, from May 30 to June 2.

The party assembled at Taymouth in the course of the Friday morning, and were received by the President, Mr. Johnston Foggo, and his wife. The majority of members travelled to the Conference by car. The opening luncheon party was a very happy affair. Immediately afterwards friends foregathered, and many games were played on the magnificent 18-hole golf course in the Deer Park. The pitching and putting courses were also well patronised.

Later in the afternoon the annual general meeting of members of the Association was held in the Castle Library, the retiring President, Mr. Johnston Foggo, presiding. A detailed report dealing with the Association business for the past year was submitted, and, after an interesting discussion, unanimously approved. The annual accounts showed that the Association was in a very strong financial position. The accounts of the Associated Benevolent Fund, which was instituted two years ago, also show a substantial credit balance. Further contributions to the Benevolent Fund were made from the general funds of the Association, and the hope was expressed that members would take advantage of every available opportunity for raising funds for this praiseworthy object. Arrangements were made for numerous sporting engagements in connection with the Conference to raise additional money for the fund. The results were very satisfactory.

Members of the E.C.A. of Scotland at Taymouth Castle.

The following office bearers for the ensuing year were elected :—

President—Mr. D. H. Morris, Dundee.

Vice-President—Mr. Henry Meighan, Glasgow.

Secretary—Mr. Walter Finlay, W.S., 55, Frederick Street, Edinburgh.

In addition, the branch representatives who make up the new Central Board, are :—

Glasgow—Mr. David Bennett, Mr. Alexander Lindsay, Mr. R. A. Ure, Mr. James Allan, Mr. A. S. Nairn and Mr. Thomas Rigg.

Edinburgh—Mr. Alexander Pratt, Mr. R. E. Douglas, Mr. Johnston Foggo and Mr. George Lyall.

Dundee—Mr. John Smith and Mr. Robert Kilpatrick.

Aberdeen—Mr. J. L. Anderson and Mr. James Bell.

Messrs. Davies Dunn and Co., C.A., Glasgow, were re-elected auditors of the Association.

After dinner on the Friday evening a large whist drive was held for prizes presented by the Glasgow Branch of the Association, and thereafter the party engaged in dancing in the Banner Hall of the Castle. Scotch reels in the appropriate surroundings were much enjoyed.

On Saturday the chief morning engagement was the annual golf match of old standing, East *v.* West, for the trophy presented in 1913 by Mr. Alexander Pratt. The match resulted on this occasion in a win for the East by 9½ matches to 7½ matches. In addition a stroke competition was held, the scratch prize being won by Mr. A. Shand, Edinburgh, with the good score of 78. The handicap prizes were won by Mr. T. Rigg, Glasgow, with a net score of 73; Mr. R. Edgar, Edinburgh, 74; Mr. J. Bathgate, Edinburgh, and Mr. J. L. Anderson, Aberdeen, with 75. A sweepstake on the stroke competition was organised in support of the Benevolent Fund, for a special prize presented by the President.

In the afternoon papers were read by the new President, Mr. Morris; the immediate past President, Mr. Foggo; and a former past President, Mr. Alexander Lindsay.

Value of Union.

Mr. Morris chose the appropriate subject of "The Extension of the Organisation of the Association." He pointed out that this was the first occasion on which the Association had ventured on a week-end Conference, and congratulated those who had initiated the proposal on its success. The members to-day realised the truth of the motto, "United we stand, divided we fall." This was shown by the growth of the Association, which now contained 260 members throughout Scotland. Contractors in the electrical world of to-day were all small men when compared with the great combines and organisations that were to be found in the other branches of the electrical industry. It was all the more necessary, therefore, for the contractors to bind themselves closely together for the legitimate defence of their interests, and also to speak and act unitedly in the councils of the industry.

Mr. Morris pointed out the advantages to be gained by the Association on behalf of its members negotiating appropriate trade agreements. In the future manufacturers would require to do more in recognising the associated strength of the Contractors' Organisations in England and Scotland. Trade abuses could be much more efficiently dealt with by an association than by individuals, and he hoped that before long a definite fair trading agreement would be reached which would place trade on a sounder basis, and, at the same time, strengthen the position of the British manufacturer in the home market. He suggested a forward campaign for the enrolment of additional members both in the large cities and in the provinces, and pointed out that, with the extension of supply in the rural areas, new businesses were starting up. He believed that if the advantages of the Association were clearly brought before the founders of these new businesses a large increase in the membership might be looked for. The Association was primarily a trade association, but in the admission of members the appropriate qualifications for membership must not

Mrs. Morris, the wife of the new president of the E.C.A. of Scotland, presenting the golf trophy to Mr. Pratt of "The East."

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be overlooked. Membership of the Association should also be looked on as a hall mark.

In the course of discussion, in which members representative of all the districts in Scotland took part, suggestions were made that where branches were impossible, circles should be formed, that the Association was of as much use to the rural contractor as to the city contractor, and that public contract and work on assisted wiring schemes should be confined to members of the Association and registered contractors.

Mr. Johnston Foggo took for his subject: "How to Strengthen the E.C.A. of Scotland by Maintaining the Standard and Quality of Installation Work."

He began by mentioning that the types of insulated wires and cables accepted in this country as most suitable for the internal wiring of buildings were :—

1. Rubber and composition sheathed V.I.R. insulated conductors.
2. Lead alloy V.I.R. insulated conductors.
3. V.I.R. insulated conductors contained in steel pipes.

The merits of these three types of wiring had from time to time caused much controversy in the technical Press, and Nos. 1 and 2 had, within recent date, become very popular, not because of their durability, safety and fireproofness, but owing to intensive advertising and the possibility of employing unskilled labour for installation.

Deterioration of Insulation.

The rubber of the rubber-sheathed conductors deteriorated rapidly in sunlight, dry atmospheres, and also in moist situations. The composition sheathed type had, so far, proved more durable in these respects, especially in very moist conditions. If fitted on the surface, as they should be, they required to be fixed at very short intervals and every advantage was taken to avoid this labour cost by concealment under floors and plaster, but this only increased their danger.

Little attention was paid to the terminal ends of the wires and bare conductors were found on woodwork and on lathed walls and ceilings at these points. When fitted on the surface they were a source of joy to the painter, who, when re-decorating, without difficulty detached them from their precarious fittings. Again, as the all-insulated cooker, glass kettle and iron were not yet with us, the present-day appliances must remain unearthed irrespective of their situation, unless a separate earth wire was fitted with the insulated conductors to the socket points—another additional labour and material cost, which was seldom carried out.

Lead alloy sheathed conductors suffered from all the foregoing disabilities, but had the advantage that if suitable junction and outlet boxes were used, continuity of the sheathing might be maintained throughout the installation. One disadvantage experienced, however, was from a breakdown of the V.I.R. insulation and earthing to the metal sheath. In several instances this had been due to lightning discharge and the cost of renewal might be very considerable.

Next he considered V.I.R. conductors contained in steel screwed pipes, for he did not take into consideration pipes other than those capable of being connected together by screwed ends and couplings, because slip jointed pipes or slip jointed pipes with "grip" substitutes for screwing, did not give a permanent and lasting continuity. If a wiring installation was to possess the qualities of safety, to be fireproof, and to allow the wiring to be renewed when necessary without destroying the decorations, then such an installation could only be contained in a system of screwed steel pipes with all bends formed on the pipes and with the minimum number of junction and draw-in boxes. At all the outlet and accessory points iron boxes must be fitted, and where the tubing was concealed these boxes must have their top edges made flush with the surface of the material they were fitted into, so that when the accessory plate or fitting plate was fixed to the box all the wiring was completely enclosed in metal—wood blocks were unnecessary. All pipe holes in boxes must be screwed to receive the pipes, as clearance holes with lock nuts did not form a permanent connection.

Such an installation when carried out by experienced tradesmen and with generous supplies of boxes available, need not be prohibitive in cost, and its advantages far outweighed the weaknesses of the other systems. "Looped in" wiring was sometimes specified, but not always carried out in practice, as very few of those who specified this system know it when they saw it. Again, as the rubber installation must perish in time, why increase the quantity.

If a specification for a screwed steel conduit system of wiring, such as he had outlined was formulated, to which the members of the Association would estimate, it would, he felt sure, be for their good and strengthen the Association.

Mr. Alexander Lindsay, Glasgow, opened the third subject and explained the "Scheme for the Registration of Electrical Contractors." He pointed out that in Britain at present compulsory registration was not practical politics but voluntary schemes of registration had been and were being promoted both in the United States and many of the Dominions. In America the Registration Authority had been appointed by the state with full power to examine applicants and grant or cancel licences. He submitted that it was only by registration that the difficulty of the irresponsible contractor could be dealt with. It had been suggested that as the scheme only concerned contractors it should be entirely worked by them, but he submitted that it was quite fitting and proper that other branches of the industry should be adequately represented on the Registration Authority. He urged every member to become a registered contractor.

In the discussion which followed, strong support was expressed for the scheme by many, while others expressed the view that its voluntary character was its greatest defect.

Business meetings and conferences did not take up the whole time of the representatives present at the conference and they enjoyed a motor car drive round Loch Rannoch. Opportunity was taken to visit, with the kind permission of Messrs. Balfour, Beatty and Co., Ltd., the new hydro-electric station on the shores of the loch.

The Conference ended on the Monday morning and members returned to their districts well satisfied with the first Scottish Conference and with the splendid weather which prevailed throughout the week-end. It seems probable that the E.C.A. of Scotland members' conference will become an annual engagement, but if it grows in size the ideal venue of Taymouth Castle will not be available as the accommodation was taxed to its utmost on this occasion.

FIFTH E.C.A. CONFERENCE.

Programme of Next Week's Meeting at Llandudno—Subjects for Discussion.

NEXT Wednesday the preliminary proceedings in connection with the fifth annual conference of the E.C.A. Allied Associations open at Llandudno at 10 a.m., with the meeting of the Council of the three associations (E.C.A., N.E.C.T.A., Ltd., and N.F.E.A.) at the Town Hall.

Between 10 a.m. and 6 p.m. the registration of delegates will take place at the Grand Hotel, and at 7.30 p.m. the president, Mr. H. Willoughby Ellis, will hold a reception at the hotel. This will be followed by dancing.

The annual general meeting (open only to members) is timed for 9.30 on Thursday morning (Town Hall). Two hours later the Conference will be formally opened with a civic welcome in the Town Hall. After replying Mr. Willoughby Ellis will deliver his presidential address. At 12.30 p.m. the official photograph is to be taken.

The Conference will reassemble at 2.30 p.m., when Mr. C. H. Flower (London) will read a paper on "The Future of Electrical Contracting," which, with the discussion, is expected to occupy the delegates until 5.30 p.m. In the evening there will be a smoking concert in the Grand Hotel.

On Friday the Conference will reassemble at 9.30 in the Town Hall. Mr. W. Cross (Newcastle) will read a paper on "Specifications and Their Problems," which, with the subsequent discussion, will occupy the forenoon. At 12 noon the new president Mr. H. C. Hazel, will be installed, and will give a short address. The business sessions of the Conference will end at 1 p.m. In the afternoon a garden party will be held and there will be a ball in the evening.

Those who decide to remain in Llandudno over the week-end will be able to take part in golf drives if they wish to do so. In the case of ladies who do not care to attend the Conference sessions suitable arrangements for their entertainment will be made.

Llandudno, which has great scenic attractions, stands on the narrow isthmus which joins Great Orme's Head to the mainland. Conway Castle is within easy reach and Snowdon is not far away. In such surroundings, given reasonable luck with the weather, the delegates and the ladies who accompany them will find plenty of interest during their leisure moments. This year's E.C.A. Conference will doubtless mark an advance on the very successful gatherings—successful from both the business and social viewpoints—of previous years.

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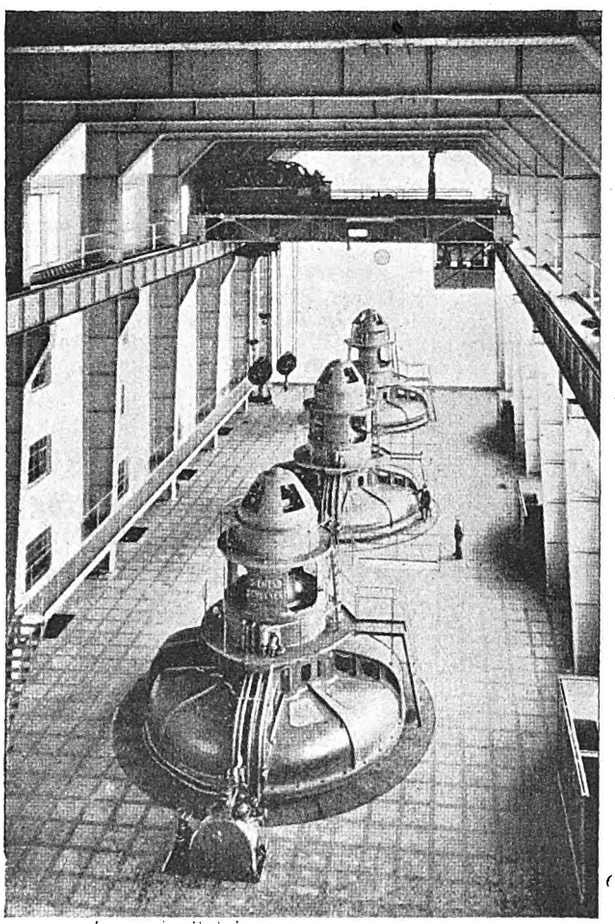
ELECTRICITY SUPPLY IN IRELAND.

Progress of the Irish Free State Electricity Supply Board—Load Building for the Shannon Development—The Belfast Undertaking—Projected Northern Ireland "Grid."

IN the course of the recent visit of the Institution of Electrical Engineers to Ireland, members had an opportunity of seeing something of the two largest electric supply undertakings in the country—the Shannon development of the Irish Free State Electricity Supply Board, which is now distributing current over the greater part of Southern Ireland, and the Belfast Corporation Electricity Department which supplies the greater part of the load in Northern Ireland. It may be remarked in passing that, from the technical and economic points of view, one cannot help regretting that political considerations should have created a frontier which cuts off the



The turbine hall at Ardnacrusha.

Shannon development from the chief industrial area of the island. But facts must be faced and the ultimate fate of the Shannon undertaking must be governed by the outcome of the efforts which are being made to build up an adequate load in the Free State.

Viewed as a technical achievement, the works on the Shannon and the transmission and distribution network that now covers the country are certainly impressive. The weir at Parteen Villa, the large head race canal, 7½ miles long, with an average depth of 32 ft.; the dam at Ardnacrusha, with its three huge penstocks 20 ft. in diameter, and two chasm-like barge locks; and the turbine hall containing the three 30 000 kVA Francis type turbines of the first stage of the development, are imposing structurally and pleasing in the power, neatness and simplicity of design which they display. Provision having been made for duplication of the present installation at Ardnacrusha when required, the cost of installing the second set of three turbines will be comparatively small, but the additional water storage works involved will be expensive. Owing to the exceptional dryness of the past two months in the Shannon basin, there is some slight anxiety as to the adequacy of the present water storage arrangements during the late summer.

The turbines run at 150 r.p.m. and generate three-phase current at 10 500 V. The current generated at Ardnacrusha is stepped up to 110 kV for the main transmission lines to Dublin and Cork—the former is a double circuit line—and to 38 kV for the secondary lines radiating from the power station. There are 66 38 kV sub-stations on the secondary network, which has three main feeding centres—Ardnacrusha, Dublin and Cork. At a later stage a fourth will be added at Maryborough, where there is at present a 38/10½ kV transformer station. The 38 kV system, divided into four loops, two of which can be subdivided via Maryborough, and several short spurs, has a mileage of over 1 000 and the 10½ kV system is almost as extensive. It is claimed that every village with a population of 400 and upwards—apart from a few in the extreme south-west and west—which is within a reasonable distance of the transmission network, has now been connected.

Interesting features of the overhead line system are the use of wooden sleepers instead of concrete as anchorage for the masts, the absence of guarding at crossings and the extensive overhead l.t. distribution system. "Wired wireless" telephone communication has been established between Ardnacrusha and the Inchicore sub-station in Dublin, using one of the 110 kV conductors. Speech is clear and free from noise.

At an early stage of its activities the Supply Board carried out a canvass of possible consumers. Dwellings were divided into five categories, and particulars were also taken of industrial prospects and existing power users. It is stated that an average of over 50% of the consumers noted as possibilities have been connected. The tariffs vary in different districts. In Dublin and suburbs the rates are :—

Lighting :—	Per unit
Private residences, places of amusement, churches, and daily newspapers	4d.
Shops, offices, etc.	4½d.
Shop window and continuous lighting	2d.
Factory lighting (to the extent of 5% of the annual power consumption	2d.

Large consumers pay 4½d. for the first 20 000 units consumed in any year, 4d. for all units in excess of 20 000 and up to 50 000, and 2d. for all units in excess of 50 000.

Heating and Cooking :—	Per unit
Private residences (on flat rate)	1d.
,, ,, (on Poor Law Valuation tariff)	¾d.
Shops and offices	1d.
Hotels and Institutions (Intermittent loading)	¾d.
,, ,, (constant ,,)	½d.
Water heating (domestic supply)	½d.

Motive Power (*l.t. supply*) :—	
For first 3 000 units per quarter	2d.
,, next 2 000 ,, ,, ,,	1½d.
,, any further quantity above 5 000 units per quarter	1d.

Special rates are made for h.t. supply.

An alternative rate is offered for private residences in the form of a fixed annual charge of 30s. plus ¾d. per unit, where the Poor Law Valuation does not exceed £12 and 12½% of the Poor Law Valuation, where this exceeds £12, plus ¾d. per unit. The fixed charge includes meter rent.

In other areas electricity for lighting and domestic purposes is charged for at the fixed amount dependent on the Poor Law valuation of the dwelling, office or shop, plus 1d. per unit. The lighting rate for institutions, churches, schools, courthouses, hotels, etc., is 6d. per unit, and for other domestic purposes 1d. per unit.

Consumers may have their premises wired by the Supply Board on a short-term credit payment system. Under this system a complete electrical installation may be obtained by an initial payment of one quarter of the estimate submitted, the remainder being payable at 6, 12, 18, or 24 monthly instalments, depending on the cost of the installation. For example, an installation costing £9 17s. 6d. may be obtained by a first payment of £2 10s. and six monthly instalments of £1 6s. 3d., these payments including interest at the rate of 5% per annum on the amount outstanding after the first payment has been made, and a charge of 2s. 6d. for fire insurance.

There is also a long-term credit system, applicable only to premises of less than £15 Poor Law Valuation. Under this system consumers may have premises of less than £15 Poor

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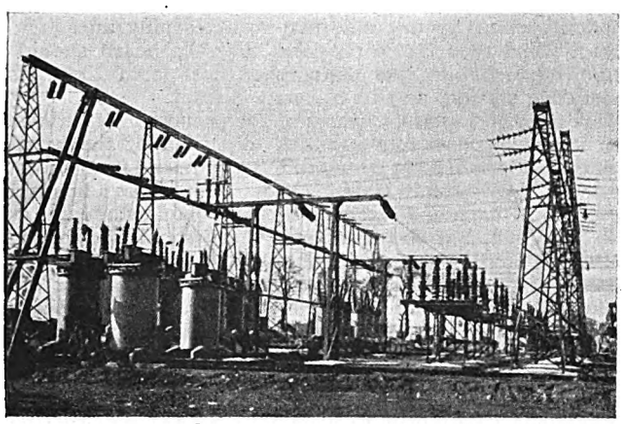
Law Valuation wired by the Board on undertaking to pay for the installation at 6d. per week for a maximum of 60 payments per outlet where the Poor Law Valuation of the premises is less than £7 10s. and the total number of electricity outlets fitted by the Board does not exceed five. In



110 kV transformer station, Inchicore, Dublin.

all other cases the weekly charge is 1s. per week until a maximum of 30 payments per outlet have been made.

The Pigeon House steam generating station at Dublin ceased operating last February, but is being maintained as a stand-by station which can feed the city through the Fleet Street distributing station. This station now receives current by cable from the Inchicore sub-station at the Dublin end of the 110 kV line from the Shannon. At the old Fleet Street station across the road are several Holben generators which supply current for the arc lamps still to be found in some of the principal thoroughfares. The Dublin tramways have not yet come on to the Shannon supply, but are expected to do so before the end of this month. The Guinness brewery has its own generating plant, capable of supplying 1 800 kW.

At Cork, the Fordson Tractor Works are connected, and their normal annual consumption is said to be 16 000 000 units, but at the moment the factory is partly shut down. The city supply at Cork is d.c., so that converters will have to be put in before current from Ardnacrusha can be used. It is expected that Cork will come on to the Shannon load before the end of this year, and the change over from d.c. to a.c. will then be gradually effected.

For the moment the Dublin area provides almost the whole of the load on Ardnacrusha, and during the visit of the I.E.E. party only one of the three generators was at work, though two are used during part of the twenty-four hours. The addition of the Dublin tramways will keep two generators working, though not at full capacity at this season.

The Supply Board claim to be very satisfied with the rate of progress attained, and state that a good cooking load is developing with some advance in water heating. Little has yet been done in the sphere of agricultural machinery, which should in time prove important. The Canadian Moffat cooker appears to be favoured.

As for the economics of the Shannon undertaking, it is difficult to form an accurate opinion. The cost—nearly £6 000 000—is a heavy liability. Yet the Supply Board express confidence that by next year the undertaking will be earning interest and sinking fund charges. It is undoubtedly a courageous enterprise and can hardly be judged by ordinary standards. Possessing a single source of energy which can supply all the electricity required by the entire country, the Irish Free State was confronted with a special case which can hardly be paralleled elsewhere. Whether the optimism of its promoters will be justified and the undertaking will shortly be able to stand on its own feet, must be left to time to disclose, but Dr. T. A. MacLaughlin and his associates deserve success and are undoubtedly setting about attaining it with great energy and enterprise.

Progress in Belfast.

Northern Ireland has few large electricity undertakings, that of the Belfast Corporation being the only one which can be compared with those of the large cities of Great Britain. Rapid strides have been made in Belfast in recent years.

The first section of the new Harbour power station was officially opened, on August 15, 1923, by the Governor of Northern Ireland. This consisted of eight boilers, each of 50 000 lb. capacity, two 6 000 kW sets and one 15 000 kW set. Another 15 000 kW set, with auxiliary plant, was set going on March 16, 1925, and an 18 750 kW turbo-alternator, with auxiliaries, was put into service on November 22, 1928. The M.C.R. of the present generating plant is, therefore, 60 750 kW, and the winter peak load is about 36·000 kW. A scheme for the addition of further plant is under consideration, two boiler units of a maximum capacity of 150 000 lb. per hour each being proposed as the first section of a new boiler house.

The East Bridge Street station, which was the primary generating station before the Harbour station was brought into use, still contains about 9 000 kW of effective plant. It will have to be employed for the winter peak, during the next two winters, owing to the limitation of steam at the Harbour Power Station, and because of inadequate transmission capacity between the latter station and the city.

The number of units sold per head of population in 1920-21 was only 53. This year the quantity has increased to 127. The works cost per unit sold has fallen from 1·31d. in 1922-23 to 0·55d. in the current year, and the coal consumption per unit generated has dropped from 3·44d. to 1·78d. Thermal efficiency has risen from 10% to 17·43% in the past seven years. Units generated have grown from 38 132 457 in 1922-23 to 80 809 500 in 1929-30, and units sold from 31 644 322 to 68 470 739. The load factor is now 25·7%.

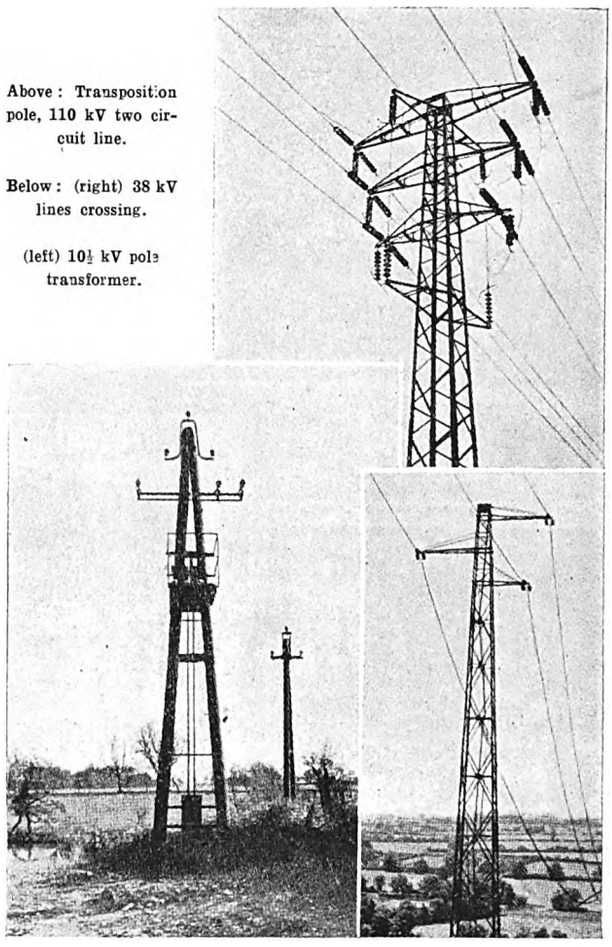
Primary distribution is at present effected at 6 600 V. A scheme for stepping up to 33 000 V is being prepared. This may necessitate a harbour crossing with steel towers and an overhead bus line partly round the city on the north side.

Thirteen rotary converting stations (including three fully automatic and two semi-automatic) for traction and general supply are in use, and there are 46 static transformer sub-stations, including those on consumers' premises. A good

Above: Transposition pole, 110 kV two circuit line.

Below: (right) 38 kV lines crossing.

(left) 10½ kV pole transformer.



Types of overhead lines in the Irish Free State.

deal of changing over to a.c. distribution has been effected in the supply area, many kiosk sub-stations being in use.

Belfast is now operating an assisted wiring scheme, and is seeking legislative authority to give hire-purchase facilities.

C.

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Average rates in the year ended March 31, 1929, were :—
Lighting, 3·874d.; power, 1·046d; tramways supply, 0·82d.

Lighting current is obtainable at rates varying from 1d. to 6d., less 5% for prompt payment of accounts. Power is obtainable by the smaller consumers, up to 10 kW demand, for about 1d. at 20% load factor; larger consumers pay about 0·8d. at the same load factor.

On the rateable value tariff domestic consumers can obtain current on the following basis of charge :—

Fixed charge per annum of 18% on the rateable value of the property up to £60, and 2½% on that portion of any rateable value in excess of £60, no rateable value being reckoned on more than £150 of the valuation, plus ¾d. per unit for energy consumed up to 2 000 units per annum, and ½d. per unit for all energy in excess of 2 000 units per annum. As the Belfast valuation is on the average about half that of most cities in Scotland and England, this tariff is considered equivalent to that of any undertaking having a 10 per cent. fixed charge on the valuation in Great Britain. It is hoped that in the near future the Department will be able to abolish the ¾d. rate, making the unit charge ½d. for all energy.

The City Electrical Engineer and General Manager is Mr. F. H. Whysall, M.I.E.E., who succeeded Mr. Johnstone Wright, M.I.E.E., when Mr. Wright resigned, to take up an appointment with the Central Electricity Board, in 1927.

Recently the Government of Northern Ireland appointed an expert, Mr. J. M. Kennedy, M.I.E.E., to report on the whole aspect of electrical development in Northern Ireland.

Mr. Kennedy's report deals with the area to the south of an imaginary line from Belfast to Dungannon, and to the east of a line from Dungannon to Newry, which extends to approximately 1 200 sq. miles, with a population of 304 000. In this area there are 19 undertakings, three of which, Bangor, Holywood, and Lisburn, take supplies in bulk from Belfast; the remainder operate local generating stations. Mr. Kennedy reaches the conclusion that electricity can be made available at a lower cost than would be possible under the individual development of separate generating stations.

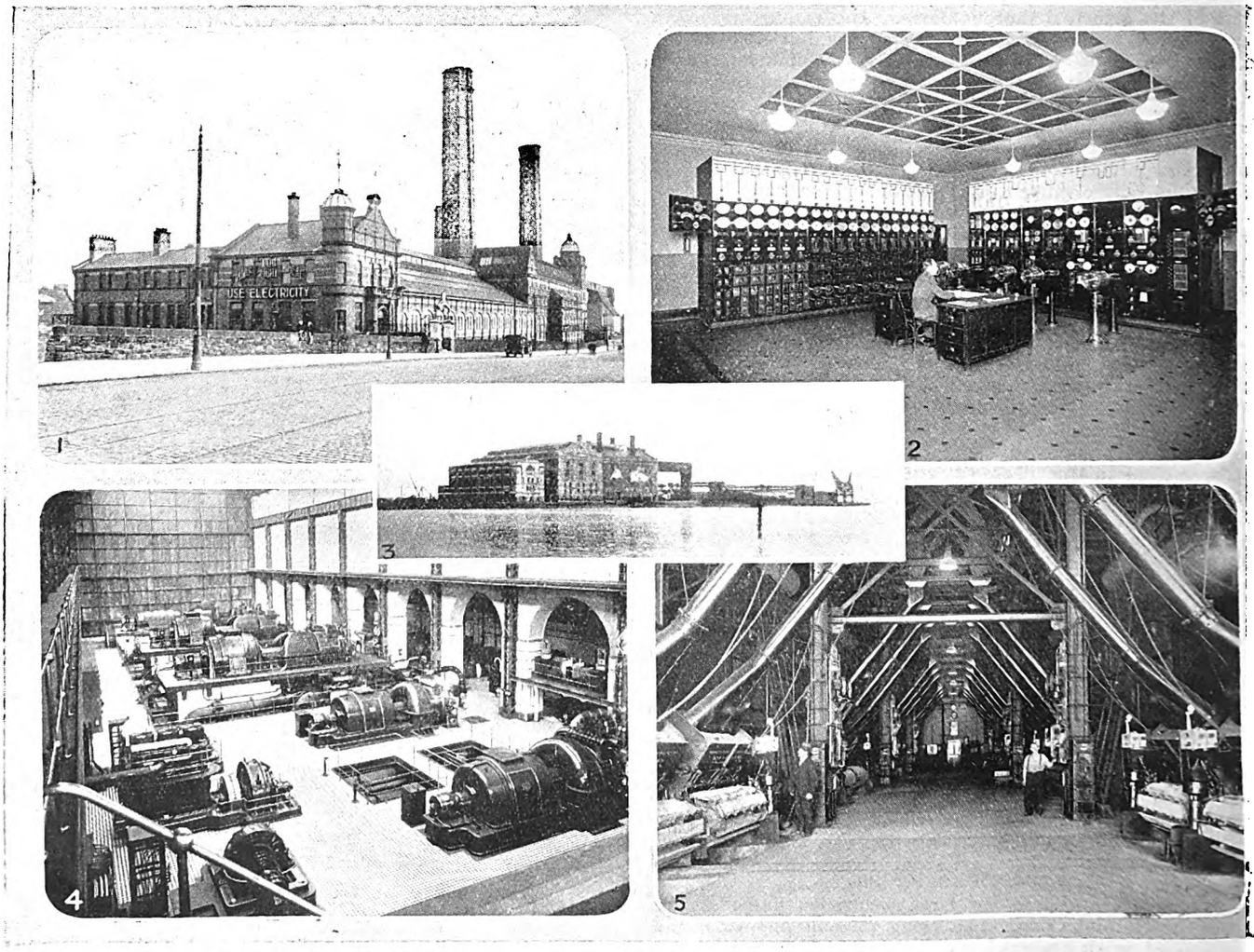
The report elaborates a scheme for the control of the transmission system by a public non-profit earning authority or board. The report also proposes that the board should be empowered to purchase supplies at cost from the Belfast generating station, and to transmit current.

The more important features of the proposed h.t. transmission system are as follows :—An extension of the existing Belfast-Lisburn line via Dromore to Lurgan, and from Dromore through Poyntzpass to Newry. From Poyntzpass a line is projected to Armagh and back to Lurgan via Portadown; it is also proposed that the line from Newry should be extended round the South Coast of County Down to meet an extension of the existing Belfast-Bangor line. The capital cost of the main transmission system is estimated at £245 000. With the capitalisation of interest and the suspension of sinking fund payments during the first five years of development the scheme should be self supporting.

The report recommends that the proposed board should be empowered to take over existing distributing undertakings in the area at a capital cost estimated at a further £250 000.

The Government has decided to adopt the report as a basis for the future electrical development of the area defined, and has accepted the view that the financial success of the scheme is dependent upon it being managed and controlled by a non-profit earning board. The necessary legislative provisions will be laid before Parliament.

BELFAST'S ELECTRICITY UNDERTAKING.



1.—Head office and showrooms, East Bridge Street. *2.—Control room at the Harbour power station.* *3.—The power station.* *4.—The turbine room.* *5.—The boiler house.*

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TRANSPORT FOR CONTRACTORS.

The Three-ton Lorry: Comparison on "Ton-per-Mile" Basis with Other Capacities—Building Up a Fleet for the Future—One Extensive Use for Three-ton Vehicles.

PREVIOUS articles have given detailed running costs of the popular types of delivery vehicles up to two tons capacity, but there are often instances where even the 35–40 cwt. van or lorry is not large enough or not powerful enough for heavy work.

The large-capacity vehicle differs in many ways from the smaller type of commercial van. The former is more of an individual job, while the latter usually emanates from a mass-production factory. The large vehicle is built to last; it is expressly intended to give a long life, and there are lorries on the road to-day with 150 000 miles to their credit still earning a profit for their owners. The average life of the one-ton or 30-cwt. chassis is much shorter. This inherent difference between the two types of vehicles has caused transport accountants to calculate depreciation on an entirely opposite basis, for while the smaller and cheaper vehicle is calculated to depreciate at the rate of 20% per annum, the larger and more solid vehicle is depreciated according to the mileage it has covered. Briefly, the position is this: A one-ton van is written off to nil at the end of five years, irrespective of mileage, while a three-ton vehicle with an estimated life of 125 000 miles and with half of that life used up in five years still remains in the books at half its original cost.

Depreciation, therefore, has become a running cost rather than a standing charge, and if the table reproduced in the adjoining column had been compiled with the sole object of giving the running costs for the three-ton vehicle depreciation would appear along with petrol, oil and tyres; but as the purpose of this article is to compare one type of transport with another, the depreciation item has been retained as a standing charge, despite the fact that it has been calculated on the estimated life, and not the age, of the vehicle.

The table refers to a four-cylinder British chassis weighing 2 tons 4 cwt., unladen, the engine developing 47 B.H.P., and rated at 22·4 H.P., the drive being taken through a four-speed and reverse gear-box to an overhead worm back axle with a gear ratio of 7 to 1. Either solids or pneumatics are fitted, with twin tyres on the rear wheels. The turning circle is 54 ft., wheel-base 13 ft., and body space (measured from back of driver's seat to end of frame) 13 ft. 5 in. As a chassis, the price is £610, the bodywork depending upon individual requirements of the contractor. An open-sided body may be fitted for £30 or £40, but for the purpose of this article it is assumed that a well-built closed body is fitted (arranged to suit the electrical trade, and painted with the contractor's name and address), for which an amount of £170 has been allowed. Details of bodywork were described in THE ELECTRICIAN, April 18.

A motor van of this type classifies the contractor at once as a commerical vehicle user, and as such he is entitled to various discounts which reduce the cost of tyres and in other ways reduce running costs. The table has been compiled on the assumption that such discounts are obtained.

Comparative Efficiency.

Reference to previous tables will prove that the three-ton vehicle does not cost a great deal more to operate than the 35–40 cwt. van. In comparing the efficiency of vehicles of different capacities, it is usual to reduce the running costs to terms of pence-per-ton-miles, and if this test is applied to the various capacities with which this series has dealt, the three-ton vehicle shows up in a most favourable light. The actual figures are as follows:—

PENCE PER TON MILE.

	Miles per annum.		
	5 000	10 000	20 000
1 ton van	14·91d.	8·45d.	5·07d.
35–40 cwt.	8·41d.	4·79d.	2·90d.
3 ton van	5·68d.	3·58d.	2·47d.

In ordinary, everyday experience, however, it is not possible to guarantee full loads, and allowance must be made for many journeys without any load, or with a non-productive load.

As a commercial vehicle user, the electrical contractor will be expected to adhere to any trade union agreements affecting drivers' wages and overtime which may be in force locally, and therefore it may be necessary to alter the allowance for wages shown in the table. Then it may be possible to make an arrangement with the local agents for the vehicle whereby certain maintenance work is done under contract, while the garage allowance may be on the high side in a country district, and the amount set down for insurance premium is a compromise between London and country rates. An alteration in any of these charges is not a serious matter as far as the smaller vehicles are concerned, but when the three-ton lorry is being considered it is most essential to make whatever adjustments are necessary in order to arrive at the actual cost in any given area and for any given type of transport. The table is so arranged that any item can be altered with ease; and in doing so allowance can be made for any difference in the prices of oil, petrol or tyres.

Estimating Ahead.

A comparison between the one-ton and the three-ton, or between the 35–40 cwt. and the three-ton vehicle will indicate which is the more suitable for a contractor's individual requirements. By dissecting the jobs calling for motor transport during the past year or two, and making allowances for any anticipated increase in business, it will be possible to form a rough estimate of what transport will be needed during the coming year or two. It may be that two vehicles each of one-ton capacity will be more convenient than one vehicle of 35–40 cwt., or that a single three-ton vehicle will be more economical than two 35–40 cwt. vans. And in making up an estimate of this kind, it is well to think more than two years ahead. It may be that business will develop quickly and in a large volume, in which case a fleet of three or four vehicles will be essential. If the development does not take place, the vehicles will not be purchased; on the other hand, if the need does arise, consideration devoted to transport to-day will make it possible to add to the fleet to-morrow in an efficient manner and without scrapping a comparatively new vehicle merely because it is no longer economical.

It appears almost a certainty that with most Town Councils booming electricity for heating, power and lighting, and with architects, house furnishers and builders advocating the cleanliness and efficiency of electricity in the home, there will be a great increase in the number of "all-electric" houses within the next few years. Even to-day there are new housing areas requiring extensive supplies of equipment and labour, districts where fifty or a hundred new houses can all be wired and equipped from one temporary store in the area. For delivering stocks to such areas, the three-ton van is the most economical and efficient type of transport, allowing the contractor to reduce transport costs to the minimum, and permitting him to quote attractive prices.

RUNNING COSTS FOR THE THREE-TON VEHICLE.

Petrol.—8 m.p.g., 1s. 4d. per gallon.
Oil.—400 m.p.g., 6s. per gallon
Tyres.—25 000 miles per set, replacement cost, £55 10s.

Chassis price	£610
Allow for bodywork and painting	170
TOTAL INITIAL COST	£780

	NUMBER OF MILES PER ANNUM.					
	5 000		10 000		20 000	
	Actual Cost.	Cost per Mile.	Actual Cost.	Cost per Mile.	Actual Cost.	Cost per Mile.
RUNNING EXPENSES:	£ s. d.	d.	£ s. d.	d.	£ s. d.	d.
Petrol	41 13 4	2·00	83 6 8	2·00	166 13 4	2·00
Oil	3 15 0	0·18	7 10 0	0·18	15 0 0	0·18
Tyres	11 2 0	0·53	22 4 0	0·53	44 8 0	0·53
	£56 10 4	2·71	£113 0 8	2·71	£226 1 4	2·71
STANDING CHARGES:						
Tax	32 0 0	1·53	32 0 0	0·76	32 0 0	0·38
Insurance ..	20 0 0	0·96	20 0 0	0·48	20 0 0	0·24
Garage	50 0 0	2·40	50 0 0	1·20	50 0 0	0·60
Depreciation (see text)	31 4 0	1·49	62 8 0	1·49	124 16 0	1·49
	£133 4 0	6·38	£164 8 0	3·93	£226 16 0	2·71
TOTALS:						
Running expenses	56 10 4	2·71	113 0 8	2·71	226 1 4	2·71
Standing charges	133 4 0	6·38	164 8 0	3·93	226 16 0	2·71
Allow for wages ..	156 0 0	7·48	156 0 0	3·74	156 0 0	1·87
Allow for repairs ..	10 0 0	0·48	15 0 0	0·36	20 0 0	0·14
TOTALS ..	£355 14 4	17·05	£448 8 8	10·74	£628 17 4	7·43

NOTE.—Owing to differences in local conditions and in different types of traffic, tyre wear, petrol consumption, insurance and wages are varying factors, and the above figures are compiled on an average basis, for contractors to adjust to meet their individual requirements. Information in the text will enable any contractor to make such adjustments as may be necessary.

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ROUND THE JOBS.

Signs of Returning Activity—Power Factor as the Froth on the Beer—A Small Circuit-Breaker—Craze for Black Enamel—Llandudno Conference—Loyalty and Price-cutting.

By "CONTRACTOR."

WORK has been very slack for electrical contractors during the past few months. Though a few firms may have been fortunate, the majority have suffered from the general depression. A very good barometer of trade generally is to be found in the class of wireman who offers himself for employment. When trade is brisk it is naturally difficult to find very good men. On the other hand, at times, such as the present, the best of workmen are unable to find employment. I was talking to a doctor the other day who remarked that he also had been particularly slack, not, he suggested, from any climatic peculiarities or absence of epidemics, but purely and simply because no one seemed to have the money to be ill. If the medical profession has been "feeling the draught," electrical contractors may well extract what comfort they may from the thought that if the public has no money to be ill it certainly has no money to spend on electrical installation work. Now that the summer is upon us contractors are faced with the usual inactivity in jobbing work. However, after a slump there is commonly a reaction and it is to be hoped—indeed there are signs of it already—that general building work which has been conspicuous by its absence will now begin to materialise.

* * *

The electrical contractor is frequently called upon to explain, or try to explain, to his customer some of the technical details of electrical supply. In such cases he usually falls back upon analogy and, in particular, upon the water analogy. Straightforward elementary problems can, in most cases, be roughly explained by taking the flow of water as analogous to the flow of electricity, but there are undoubtedly certain features of the behaviour of electricity which cannot be explained by this means. It would, for instance, be extremely difficult to find a water analogy which would satisfactorily convey the idea of power factor to the lay mind. In this connection I am reminded of an extremely amusing and sound analogy which was published some years ago in the "Clyde Valley Magazine." In this the author took for the medium of his analogy, beer. He added the rather naïve remark that he presumed his readers knew what beer was. He took the case of a glass of beer, of which half was froth, and pointed out that in a particularly heady beer, where half of the volume was froth, it would be necessary to have two glasses in which to serve one glassful of pure beer, each glass being occupied as to half of its contents with beer, and as to the other half with froth only. Froth he explained, was analogous to wattless current. The nearer home you get with any analogy the more readily will the listener understand it, and I seriously commend this analogy of beer and froth to anyone who is faced with the explanation of power factor or wattless current to a layman.

* * *

Some time ago a manufacturer produced a small circuit-breaker rated at 10 amps. for use in domestic installations. Although the design was open to a certain amount of criticism the idea seemed to me to be so good that I am surprised that nothing seems to have been made of it. At all events I have not come across this circuit-breaker in use in any installation. One criticism was that it would be necessary, in order to satisfy the regulations, to have a main switch in addition to the circuit-breaker, but even so the great convenience of not having to change a main fuse would have made the appliance well worth while. Another criticism was that it had evidently been designed by a switchboard designer and was so constructed that it could only be mounted on some form of board, whereas in ordinary domestic installations it is necessary to mount such a switch direct on to the wall, having a top or bottom or side entry for the cables. However, a point like this could very easily have been corrected.

* * *

Is there any real reason why conduit accessories and ironclad switchgear of the domestic variety should always be finished in black enamel? Black is nearly always the most unsightly and most inappropriate colour—if it can be called a colour—which could be chosen. Personally, I always advocate to my customers the painting over of switchgear in a colour which harmonises with the surroundings, even though those surroundings may be the back passage. In the case of conduit which is run upon the surface of walls and ceilings (and this is, after all, a very common practice, especially in office installations), white is a far more appropriate colour, and indeed the tubing usually has to be painted white after it is erected. To get a good effect on the black background necessitates several coats of paint, all of which puts up the cost of the installation. Alternatively, some people whitewash their tubes, but if the black enamel is chipped anywhere—and there are usually apt to be one or two such chips—the tube rusts at this point and shows itself in the form of an ugly brown smudge on the whitened tube. The argument that white conduit would very soon get dirty in the handling can be answered by saying that even if it did get dirty it would only be necessary to give the tubing one coat of white enamel or white paint when in position, as against the several coats which it is necessary to give it now that it is finished in black as a standard. Another point which occurs to me on the same subject is the persistence with which manufacturers use an unbroken white for the standard finish for white wood blocks. It is very rare to find such an unbroken white harmonising with the background. Blocks of this sort should, I think, be finished in a cream, or, at any rate, a broken white. The present type of white wood block fitted to the average skirting board is just as unsightly as a teak block would be. It does not match the skirting board and it does not match the white porcelain of the switch base or plug base.

* * *

It is to be hoped that as many contractors as possible will have made up their minds to make a point of being present at the Electrical Contractors' Association Conference at Llandudno this month. I know that there are many who scoff at conferences, saying that the world to-day is too full of conferences, and that the papers presented could be given equally effective publicity in the columns of a newspaper. I do not agree with this view a little bit, but I do regard the papers presented at a conference as the least important part of that conference. The real object is to bring together the members of the Association in a pleasant atmosphere of geniality and even gaiety, so that while competition, that essential factor in trade, shall continue unabated, mistrust as between one electrical contractor and the next shall be entirely eradicated. The most important thing which the Association demands of members is loyalty to that Association, that is to say, loyalty to one another. That loyalty must not be confined to a few, or even to the majority, but must be one hundred per cent. efficient. This is, perhaps, a "counsel of perfection," for it is a goal which is quite out of reach. At the present time this quality of loyalty is undoubtedly absent in some of the members of the Association. Though some, who, having set their hand to the plough do not look back but work stedfastly for something which is more than an association in name, there remain the few whose membership of the Association is confined to falling back upon it when they are in difficulties. These same people fail to see the disloyalty as well as the foolishness which attaches to such practices as price-cutting. For this reason I say that I hope all members of the Association will year by year make a real effort to attend the Annual Conference. After you have met a man at dinner and danced with his wife you are more likely in your business to observe the rules under which competition flourishes.

* * *

There are two sorts of price-cutters. There is the man who cuts his price below the published price in order to secure an order which he thinks would otherwise go to a competitor. There is the other man who, especially when things are bad, considers that it is better to take a small profit than no profit at all, and, in order to increase his turnover, cuts the prices. There is among some contractors a feeling that while they would never cut the price of lamps or any other commodity, concerning which they have signed an agreement, yet they are quite prepared to cut prices in other standard products, oblivious to the fact that their very membership of the N.E.C.T.A. constitutes an agreement not to indulge in these evil practices. Price-cutting is bad enough in the man who holds aloof from any form of association and refuses to sign any agreement with manufacturers, but in a person who has joined an association, of which one of the chief aims is the elimination of unfair competition, it is nothing short of criminal.

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UNEMPLOYMENT AND WORK—VIII.

The Employer's Responsibility.

By SIR ERNEST J. P. BENN.

THE unemployed is, of course, always a worker. The dole is only paid to that class of person who still reserves to himself the title of "a working man," and thus it comes about that the discussion of unemployment tends in the main to mean a discussion of the so-called working man, his habits, his failings or his qualities. Such a discussion leaves out of account the larger part of the problem considered as a whole. Unemployment is as much, or more, concerned with the doings of employers as with the actions of those whom they employ.

When the first quarter of this century is old enough to be fit material for the historian, somebody will point out the biggest of the movements which have characterised recent years. Whereas in the nineteenth century public opinion looked to the business classes for the supply of the material needs of life, it is unquestionably the fact that the people of the twentieth century have so far inclined to the view that the politicians could be of more use to them than the merchants and manufacturers. The country is looking to the political method rather than the private enterprise method, and still seems to think that through political action a solution of our economic difficulties may be found. That is a false view, the error of which is slowly dawning upon the people. They will in time learn again, what they should never have forgotten, that so far from the Government being able to take the place of private enterprise in trade, the continuance of the Government itself depends absolutely and entirely upon the well-being and prosperity of trade conducted by private persons which can be taxed for Government support.

In the meantime, however, we find on examining the matter closely that the habit of depending on the Government, so disastrously prevalent in the working classes, is also developed to a highly dangerous degree among employers and all other classes. There is some excuse for it. The Government has pretended, and goes on pretending, to be able to develop trade. We still have a Department of Overseas Trade, although the Geddes Committee on two occasions reported in favour of its abolition. This Department goes on growing and goes on fussing about at home and abroad, keeping card indices and issuing reports, and in its innocence imagining that in some way or another it is helpful to the interests of British industry. Parliament appears to remain firm in this false opinion, notwithstanding the disturbing fact that trade gets worse and worse as the Department of Overseas Trade gets bigger and bigger.

It seems to be forgotten that the presence of a lot of salaried officials in any market drives out of that market all the free and independent business men. It is Gresham's currency law over again. Very little thought is necessary to understand how natural this is. The independent business man, making his own enquiries into the possibilities of a market for his specialities in Rumania or Finland, will feel a nervousness which is, perhaps, stupid but none the less natural, if he knows that Government officials are ferreting about in the same market, producing information and reports which may or may not be any good, but which will be available for everybody else in the trade. In these circumstances, the individual not unnaturally leaves the market alone. The element of competition between him and other people in the trade is eliminated, and without competition trade can do nothing but wither and decay.

Present Day Disadvantages.

The modern employer requires a much more highly developed sense of responsibility than was ever asked from his predecessor. He has to work under disadvantages that were unknown to previous generations. They had incentives left to them of which he has been robbed. It requires much more pluck in these days for a successful manufacturer to undertake an extension of his business than was necessary even a few years ago. Mr. Snowden's Budget has sown the seeds of another big batch of unemployment by adding to the numbers of successful men who are now faced with the new danger that they may worsen their position by adding to their prosperity. There are many hundreds of leading employers full of experience and knowledge anxious and willing to use it in the extension of the trade of the country, now faced with the necessity of spending their remaining years in getting their resources into a condition which is liquid enough to meet the heavier demands of the new death duties. All these people, unless, as I say, they possess a very highly developed sense of public duty, are stopped from performing their natural functions as the providers of employment. Government interference thus works both ways. On the one hand, it discourages a man from undertaking new enterprise by pretending to do it for him, and, on the other hand, it makes it clear to him that if he does it himself he will be punished for so doing.

The spirit of the dole, the spirit of dependence, of helplessness, the mentality which leaves everything to the arrogant claims of official authority, is as deadly in its effects upon the employing classes as upon any of the rest of us. It is hard to estimate how much of the business brains of the country has been diverted from the natural study of markets to the study of the more complicated problems of subsidies, guarantees, tariffs, safeguards and other political substitutes for work and effort.

Position of Manufacturers.

It would, I think, be extremely useful if more emphasis were laid upon the profession of employing and if more study were given to the functions of an employer as distinguished from a merchant or a manufacturer. The man who sets up in business assumes a variety of responsibilities. He puts up a sign on the front of his premises which announces him to be a manufacturer of something, and the public is inclined to think of him wholly in connection with the something which he sells. That, however, is a rather limited view of the average manufacturer. He not only makes an article but he employs a number of people in so doing. The best among our manufacturers think a good deal more of their responsibilities as employers than of their work as mere business men. It is their function to organise the work of a number of other people and to adjust the markets on both sides, and all the incidents associated with the undertaking for which they are responsible, to the requirements and the convenience of the people whom they employ. It would, of course, be absurd to claim for manufacturers as a whole that this side of their natural function is always uppermost in their minds, but few will be found to deny its weight and its importance with the better type of employer. There are some trades, such as large scale contracting and railway building, where no employer could ever pretend to be responsible for his workpeople for the period of their lives. The very nature of the work requires that a number of people shall undertake it for a limited time. But that, after all, is a mere fraction of our trade, and most of it can be done, as much of it is already done, with a view to the constant employment of a given number of people who have developed in them a due sense of the unity of interest between employers and employed.

There is another way in which the responsibility of employers has tended to drop into the background in recent years. If a return could be compiled showing the number of hours spent in recent years by business men sitting on committees to deal with futile political obstruction, and if it were at the same time remembered that all those hours might have been spent by those same business men in calling on customers, a better conception of the real reason of our industrial plight would be secured. This committee habit is beginning to wane, because, after all, business men still have a certain sense of the value of their time. They are beginning to rebel at weary hours spent in considering documents which will in due course be sent on to some other advisory body only to waste, as they proceed from authority to authority, more valuable time on the part of others, and in the end to achieve nothing.

Mention of the committee habit brings out yet another aspect of this question of the employer's responsibility for unemployment. The war did one good piece of work for us in that it perfected the habit of consultation between members of a given trade. The trade union, the trade asso-tion and the joint council were for war purposes brought to the point of the highest efficiency, but it is on the consciences of many business men that that efficiency tends to be used in the interests of the trade as distinct from the interests of the community. Just as we have trade unions which deliberately limit the right of the rest of us to undertake certain classes of work, so we have developed trade associations and joint councils which tend to be afflicted with the same unsocial

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folly. The case for the trade union and for the trade association and for the joint council disappears entirely unless these bodies are prepared to accept their responsibilities as citizens, to remember that their trade is a service to society as a whole, and to use their powers to extend, develop and facilitate that service. The moment when any of these organisations begins to play the trust or combine, and tends to create scarcity in order to enhance price, it becomes a social evil. It not only robs the rest of us of the enjoyment of products which might be ours, but fills its own pockets with inflated prices at the cost of the unemployed to whom it denies the right to work. We have followed far too closely and taken too literally the old adage that "union is strength." We forget that such strength may be used for evil as well as for good. We overlook the warlike implications in "union is strength." No one can doubt the truth of the saying when it is a question of war. There is some doubt in my mind whether the natural tendency of union is not to use its strength for war, and whether, therefore, all these unions, of whatever kind, do not tend to make war upon the rest of us. If that is so, then we arrive at another of the many explanations required to account for the unemployment difficulties which we are discussing.

Many of our employers have yet to understand that high prices do not necessarily mean prosperity. A good deal of our difficulty arises from the present clinging of some of our employers' associations to inflated or unnatural prices. This difficulty is perhaps most notable in connection with associations of retail traders. It is evident when one looks at the index figures of wholesale and retail prices. Manufacturing and wholesale trades have done much more than their retail colleagues in the difficult work of getting back to normality. The result is that wholesale prices and wages have in many cases come near to reason, only to find that when their products reached the retail market the old inflated figures remained. There is probably no one cause which has more to do with unemployment to-day than this. We really must give up the theory that wealth can be secured out of small quantities and high prices. Money, it is true, may be got that way, but always at the cost of suffering to others. Real wealth, which consists in goods and services, can only be got and developed by a policy of increased production at an ever decreasing price. If these basic principles were properly understood by employers and employed, we have to-day, with all the machinery of trade organisation, wonderful opportunities for increasing the wealth of the community and raising the standard of living. What is wanted is a change of heart, an alteration in the point of view. One by one our traders must begin to re-absorb the old spirit of service. They must recognise that they exist for the purpose of supplying the needs of others, and no other excuse can be found for their activities. They must realise that in the long run wealth and prosperity will come to them from an expression of this view, and that any temporary gains obtainable from its denial can never be anything but very temporary in their nature.

STROBAESTHESIA.

Physiological Effects of Electrostatic Charging—Experiences with Electric Cushions—Feeling through a "Time-Microscope."

By DR. R. HEILBRUN and A. J. MAKOWER, M.A.

IF two persons connect themselves, with due precautions, in series through their arms on a 220 V a.c. supply, completing the circuit between the two persons by touching the backs of their hands together, they will experience an unpleasant pricking sensation on the backs of the hands that are in contact. This pricking increases with the current, and becomes so strong at about 10^{-3} ampere that the experiment must be stopped. The current may be conveniently varied by means of a variable condenser of several hundred centimetres capacity, and the current may be measured by a rectifying valve and a d.c. meter of suitable range. If the hands are stroked lightly across each other, instead of being kept in stationary contact, a new phenomenon occurs, which is easily distinguished from the pricking sensation.

Fig. 1.—Corduroy effect produced by stroking with finger tips.

With such *stroking contact* the pricking sensation, for which a minimum current of about 10^{-5} ampere is necessary, disappears, and in its place a new sensation arises, which we call the "corduroy sensation." The surfaces of the skin, which without the electrification feel smooth, now feel hard and rough, as if ridges and depressions exist at right angles to the direction of motion. It feels as though the smooth skin has been replaced by a corduroy material. This corduroy sensation can still be felt if the current is reduced to 10^{-8} ampere, or even to still lower values. Clearly the effect is produced by electrostatic charging of the surfaces of the hands by the a.c. supply, and not by the passage of current.

The necessary conditions for the appearance of the corduroy sensation are in the first place the use of a.c.—with d.c. it is not produced—and in the second place the stroking contact between the hands—nothing is felt with small currents and stationary contact. The sensation is felt with stroking contact between other surfaces, such as between finger tips or finger nails of one observer and the neck, forehead, ear or dry lip of the other.

A single observer suffices if he connects his body to one pole of the a.c. supply and holds by an insulating handle an electrode connected to the other pole through a condenser. His skin then experiences the corduroy sensation when he passes the electrode along it with a stroking contact. Such contact in the neighbourhood of the ear is attended by a humming tone. It is necessary in all cases that the skin surface be dry. The smallest amount of dampness causes the sensation to disappear.

It is not surprising that the effect is unequally felt by different observers. The same is well known for other electrophysiological effects. Such differences may arise from the condition of the skin, the layer of fat under the skin, or from other bodily differences. At any rate the corduroy effect is very definite and always reproducible, although we have not found any pervious mention of it.

The effect may be rendered visible by dusting the surface of the skin with lycopodium powder, preferably after browning the powder by heating it in a porcelain crucible over a Bunsen flame. If now the stroking contact is made in any of the above ways, the powder ranges itself in stripes in a very striking manner. The picture shown in Fig. 1 was produced by making three strokes with a finger tip at the same velocity. Similar pictures may be produced on the finger nails or other parts of the body.

From the foregoing it might be supposed that the corduroy sensation must be a very rare occurrence owing to the great improbability of a person without set purpose connecting himself to one pole of an a.c. circuit and stroking the skin with a suitably insulated electrode. Nevertheless the phenomenon is by no means rare and forced itself upon our notice in a series of instances in connection with the greatly increasing use of electrically heated cushions.

Various reports reached us that slight feelings of electri-

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fication had been experienced during the use of the cushions. These could not be explained by leakage and another reason had to be sought. In fact we found that an electrically heated cushion constitutes a condenser. The heating wire and the user form its two plates, and the fabrics between them the dielectric. Calculation and test give results in close agreement considering the variable nature of a condenser of this type. The capacity of a "milliwatt" electric cushion under normal conditions of use may be taken to lie between 170 and 190 cm., which capacity, when used on a 220 V 50-cycle supply, allows a current to flow of the order of 10^{-5} ampere, or the lower limit of current that just suffices to give rise to the corduroy sensation.

Suppose that the electric cushion is controlled by a single-pole switch, which is open, so that one end of the winding is connected to an unearthed pole of the a.c. mains, the other end being disconnected from the mains. The cushion lies on the body of an invalid, who is well insulated in bed. The doctor stands by the bed and shakes the patient's hand, or passes his own hand over the patient's forehead. By so doing he establishes a stroking contact between his slightly earthed hand and the patient, who is connected to one pole of the supply through the capacity between himself and the cushion. If the doctor's and patient's skins are dry all the necessary conditions exist for a distinct feeling to be experienced.

The origin of the corduroy feeling must be ascribed to the phenomenon described by Johnsen and Rahbeck before the Institution of Electrical Engineers on May 26, 1921 ("Journal I.E.E.," Vol. 61, July, 1923; "E.T.Z.," 1922, p. 587; "Zeitschrift f. Techn. Physik," 1921, p. 315). They describe an unexpectedly large electrostatic attraction between a conductor and a semi-conductor placed in contact with each other and connected to the two poles of an electric supply. The conductivity of the semi-conductor enables electric charges to reach the surface of separation between the semi-conductor and the conductor, but the passage across the gap is prevented by the high insulating property of the separating surface. Thus a condenser is formed with a very thin dielectric and large electrostatic attraction is produced between the materials that are in contact. Johnsen and Rahbeck find that for plane surfaces in good contact, the effective thickness of the dielectric is equivalent to about 10^{-3} cm. of air, and that the force of attraction between the surfaces at 220 V is several hundred grammes per sq. cm.

The presence of moisture at the separating surface between the conductor and semi-conductor destroys the high insulating property of the gap and the electric charges at the separating surface disappear. This explains the absence of the corduroy effect when the skin is moist. In the case of contact between two persons, as described above, the conductor and semi-conductor of Johnsen and Rahbeck are replaced by two semi-conductors, otherwise the conditions are similar.

The effect between two semi-conductors is shown in Fig. 2, produced by photographing the ordered deposit of lycopodium powder upon the surface of a slate slab connected to one pole that has been stroked at various speeds by a piece of slate connected to the other pole of the alternating current supply.

Similar effects are produced if the stroking pole consists of a piece of carbon, a finger, a metal rod covered with leather, a piece of bone, or a fresh plant-stem or leaf. The quicker the motion of the electrode the greater is the distance between the deposited rows of powder.

Pendulum Experiments.

That the rows are, indeed, produced by the alternations of the current was proved by pendulum experiments in which the speed of passage of the electrode along the slate slab was calculated and from this the distance between the rows of powder deduced from the known frequency of the supply.

In order to ascertain whether the lycopodium powder was deposited at moments of maximum or minimum potential a pulsating direct current was produced by a rotating contact with adjustable speed and length of contact. When rotating the contact slowly, it could be seen by means of a lamp connected in series that the passing electrode swept away the powder at periods of maximum potential, no doubt by reason of the increased pressure between the electrode and the slab, and that the powder was left at rest during the periods of zero potential.

If only one semi-conductor is used and the conductor and semi-conductor are interchanged, for instance by stroking a thin

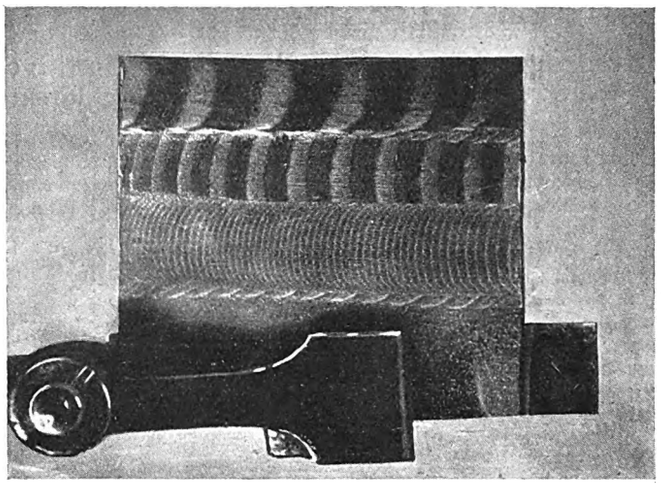

Fig. 2.—Effect produced on surface of slate slab by stroking.

sheet of metal (zinc of 0·3 mm. thickness), by a slate rod, a distinct chattering noise is produced, which was already noticed by Johnsen and Rahbeck. The rod is evidently caused to strike the slab periodically by the periodic increase of force produced by electrostatic attraction between them.

The optical presentation of the phenomenon that we have described reminds us closely of the stroboscopic effects produced by the periodic illumination of a moving body by an a.c. lamp. The moving body then assumes a corduroy appearance. By analogy we call the sensation which we have been dealing with strobaesthesia, the motion producing an interrupted feeling in place of an interrupted vision. The skin feels, so to speak, through a time-microscope so that the maxima and minima of attractions, which would be superposed upon each other, are separated so as to be distinctly felt.

I.E.E. CONVERSAZIONE.

Birthday Congratulations to Colonel Crompton.

MORE than 1 600 guests were present at the Conversazione of the Institution of Electrical Engineers in the Natural History Museum, South Kensington, on June 12. Col. Sir Thomas F. Purves, O.B.E., the President, Lady Purves and the Council received the company, who found much to interest them in the portions of the Museum which were open, by the kind permission of the Trustees.

The string band of the Royal Engineers, playing in the Central Hall, was greatly appreciated, and the concert in the Reptile Gallery—a very fine "crocodile" was formed by the arriving guests between the cloak rooms and the reception hall—also proved attractive. The performers were Miss Hetty Bolton, Mr. Robert Easton, Mr. Melsa, Miss Sylva van Dyck and the Salisbury Singers—Mr. Victor Maesters, Mr. John Collett, Mr. Arthur Frith and Mr. Leonard Salisbury. Mr. Edward Brightwell was the accompanist.

In the course of the evening the opportunity was taken by Sir Thomas Purves to present to Colonel Crompton a vellum diploma conveying the congratulations of the President and Council of the Institution on the occasion of his 85th birthday. The diploma read as follows:—

"The President and Council of the Institution of Electrical Engineers desire to convey their heartiest congratulations to its esteemed Past-President, Colonel Rookes Evelyn Bell Crompton, on the occasion of his eighty-fifth birthday, on the 31st May, 1930, and cordially wish him 'ad multos annos.'

"His pioneer work in the advancement of Electrical Science and Engineering and their applications, which is universally recognised, entitles him in the fullest degree to the respect and admiration of Electrical Engineers.

"As a mark of appreciation of the great services rendered by Colonel Crompton to the Electrical Engineering Profession during his 50 years' membership of the Institution, he was elected one of its Honorary Members in 1923, and was awarded its Faraday Medal in 1926.

"Witness our hands and seal at Westminster this twenty-ninth day of May, 1930."

T. F. PURVES, President.
W. M. MORDEY, Member of Council.
P. F. ROWELL, Secretary.

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THERMAL STORAGE COOKERS.

Advantages for Domestic Purposes—The Seves Stove—Time Saving—Comparison of Current Consumption.

By HILDA L. DOVER, B.Sc.

FOR some years now the usual method of heating saucepans by conduction from enclosed and open hotplates has been recognised as too long in comparison with gas heating. When high power hotplates are used the high load demand on the distributing system is inconvenient and the upkeep of the hotplates is too expensive. The hotplates warp badly and often the leads break at the connections, necessitating a new hotplate. In order to avoid high loads the idea of storing heat evolved electrically was conceived. This has been put into practice by storing heat in a suitably shaped iron block surrounded by a good heat insulating material. The idea has been so perfected as to produce the Seves stove, which is manufactured in Sweden and is largely used in Stockholm. A diagram of a section of the cooker is shown in Fig. 1.

The stove consists of an iron block containing two heating elements which are supplied with current so as to produce an average temperature of about 500 deg. C. or 900 deg. F. The iron block is imbedded in a well insulated box and fitted with a light insulated cover. A thermostat is connected to the block which operates a mercury switch controlling the current passing through the elements. When the temperature of the iron block reaches about 500 deg. C. the current is automatically switched off, and when the temperature falls slightly the current is automatically switched on. The current is being switched on and off through the whole 24 hours. By supplying the iron block with heat at a low rate over a long period it becomes as effective as an ordinary 2 kW boiling plate. The two elements are of the same power, about 350 watts. These are connected to two plugs so that either one element or both elements may be used as desired. When little or no cooking is being done one element only need be in the circuit. On the other hand when much cooking is being done the two elements are switched on. From the foregoing it will be seen that a *hot* hotplate is always available and the difficulty of rapid heating has been overcome. Two pints of water will boil in less than three minutes. When the hotplate is required for use the cover is raised. The saucepan, which should have a perfectly flat bottom, is put on this. The saucepan bottom

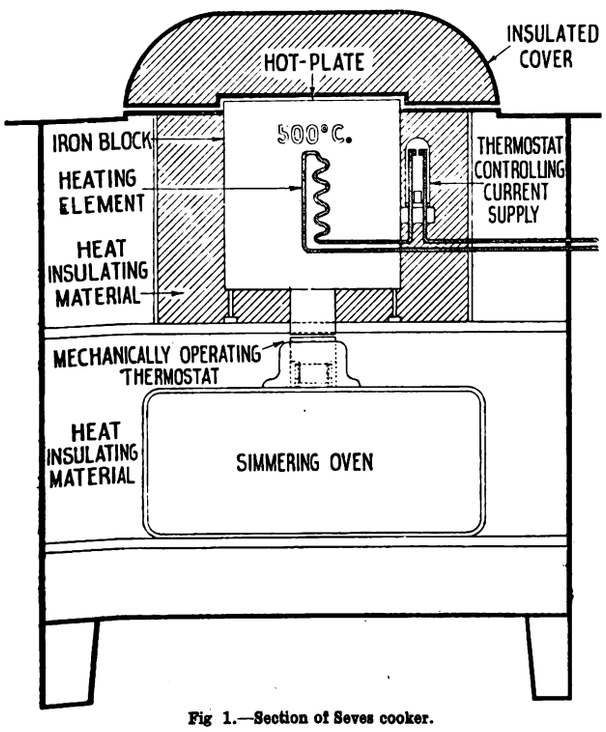

Fig 1.—Section of Seves cooker.

and the hotplate must be kept scrupulously clean to ensure good conduction. For the same reason the saucepans should be of heavy engine turned aluminium. If the contents of the saucepan boil too rapidly, the saucepan is raised slightly from the hotplate by turning a knob in front of the stove.

Passing to the lower chamber, which is called a " simmering oven " and is surrounded by good insulating material, heat is transferred from the iron block to this chamber by a mechanical device, and by thermostatic control the temperature of the oven is maintained at about 90 deg. to 95 deg. C., i.e., just under the boiling point of water. There has been much re-

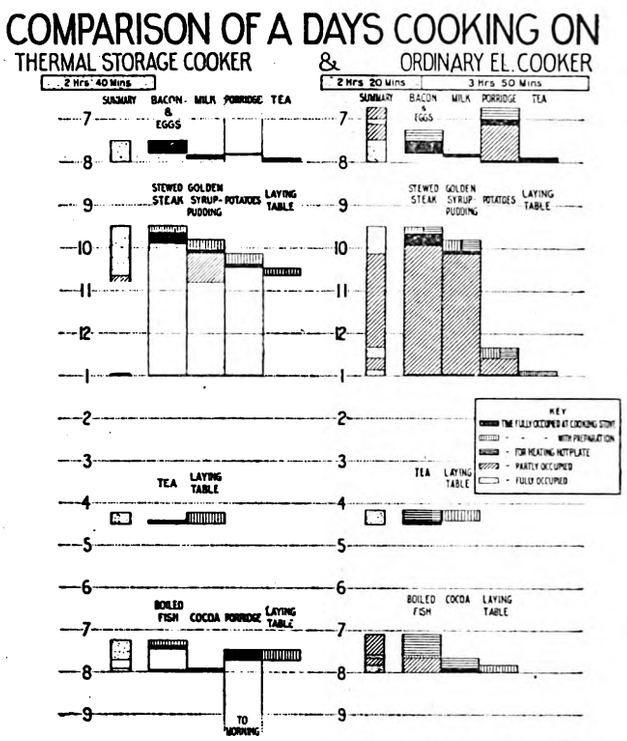

Fig. 2.—Cooking costs with thermal-storage and ordinary electric cookers.

search on the most suitable temperature for cooking food in the most nourishing way and it has been agreed that slow boiling or simmering is the best method. This requires a temperature of about 90 deg. to 95 deg. C., and is the temperature of the simmering oven. At this temperature volatile aromatic substances are not lost in the steam and the cooking is not violent enough to dissolve out appreciably nourishing salts. When the saucepan of food has been boiled on the hot-plate and the food throughly heated through the saucepan containing the food (which is fitted with an airtight lid) is put into the simmering oven to simmer. As there will be no evaporation, no stirring or burning, the food during cooking will require no further attention until it is dished up. The time required on the hotplate after the food has been boiled depends upon the texture of the food. The time required for the food to be thoroughly cooked in the simmering oven again depends upon the texture of the food. It would be as simple to teach women to cook by this method as with the ordinary electric cooker. Education in the use of electricity for cooking is necessary, and the best method—the one which saves time, labour and money—should be the one that is advertised and taught.

Besides boiled food, braised meat and vegetables can be cooked by the hotplate and simmering oven. The meat is browned in the casserole on the hotplate, which coagulates the albumen, thus preventing the juices from escaping from the meat. Then the casserole is fitted with an airtight lid and put into the simmering oven. This method of cooking makes the meat very tender and juicy; thus the cheaper varieties of meat can be used.

It has been found that over 50% of the usual cooking can be conveniently done by the hotplate and simmering oven. It may be of interest to know that scientific investigation has proved that slow cooking for several hours in an airtight saucepan at a temperature of 94 deg. to 97 deg. C. will by no means spoil the value of the food. Experiments with raw, restaurant and slowly cooked food show that slowly cooked food is the most nourishing.

For roasting and baking a separate high-temperature oven is necessary, and whilst this is in use the heating elements of the

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thermal storage cooker are switched off, thus keeping the load low.

The diagram in Fig. 2 represents the time spent on one day's preparation of food and cooking for a family of six to eight persons when using (1) a thermal storage cooker, (2) an ordinary electric cooker. A very simple wholesome menu for a working class family has been taken to show that the thermal storage cooker is of service to the poor. The diagram shows that when the thermal storage cooker is used the housewife has $3\frac{1}{2}$ hours more time during the day when her thoughts are free from all cooking. During the morning alone the housewife has two whole hours in which she can do her shopping, housework or needlework without fear of the dinner being spoiled or insufficiently cooked, for it has been found that by bringing the potatoes to boil on the hotplate at 10.45 a.m. and putting them at once into the simmering oven they are in no way overcooked by 1 o'clock. Taking an ordinary week's menu the time saved averages 13 hours per week, which is equivalent to 676 hours per annum. Should the meal time be delayed the food will in no way dry up or spoil.

The all important question of the consumption of electrical energy is by no means alarming. A relationship has been derived experimentally for the average energy consumption per annum. Thus if P = number of persons in the household, W_s = energy consumption per annum for the thermal storage cooker, W_o = energy consumption per annum for the ordinary electric cooker, then

$$W_s = 1\,850 + 165P$$

$$W_o = 1\,000 + 275P$$

For example, for a household of three persons the annual consumption will be 2 345 kWh with a thermal storage cooker, and 1 825 kWh with an ordinary cooker. For a household of nine persons the annual consumptions are 3 335 kWh and 3 475 kWh respectively, averaging 1·02 and 1·06 kWh per person per day.

Supply undertakings should be able to give a better tariff for thermal storage cookers than for ordinary cookers on account of the low maximum demand and high load factor Under these circumstances the annual cost of the thermal storage cooker will always be lower than that of the ordinary cooker.

BOOK-KEEPING FOR ELECTRICAL CONTRACTORS—VIII.

Recording Cash Payments and Discounts Obtained—Keeping and Balancing the Accounts of Creditors—An Alternative Method.

By S. HOWARD WITHEY, F.C.I.

PAYMENTS made in the form of legal tender, whether to creditors or as expenses, will be entered in the " cash " column on the credit side of the contractor's cash book, giving the date and the name of the account to be debited in the ledger, while all payments by cheque will be detailed in the " bank " column. If the contractor is entitled to deduct a discount in respect of prompt payment of a creditor's account, the amount of such discount should be inserted in the " discount " column on the credit side of the cash book, on the same line as the particular cash item to which it relates. Failure to record a discount item would make it impossible to reconcile the balance of the personal account with that shown on the monthly statement as rendered, consequently care should be exercised to ensure that all discounts are booked.

Both the cash and the discount transactions will have to be posted to the debit side of their respective purchases ledger accounts. This may be effected by means of two entries in each case, reading " To Cash " or " To Cheque " and " To Discount," or as one entry reading " To Cash and Discount " or " To Cheque and Discount." For the purpose of facilitating all future references to details, it is better to show the cash and the discount as separate items, thereby avoiding the constant turning up of the cash book records. At the end of each month the total of the discount columns of the cash book should be transferred to a discounts account in the impersonal ledger.

The expenditure incurred in carrying on the business—such as wages, advertising, carriage and cartage, postages and stationery, rent, rates, taxes, insurance, etc.—should be posted from the cash book to the debit side of suitable expenses accounts, each item showing the date of payment and the cash book folio. All expenditure, however, which has the effect of increasing either the number or the value of the assets employed by the contractor or electrician for profit-earning purposes should be capitalised by debiting the amounts involved to the particular asset accounts kept in the private or general ledger.

It is very necessary that the contractor should be constantly aware of the total sum owing to creditors and trade suppliers, and for this reason the personal accounts kept in the purchases ledger should be balanced and ruled off at the end of every month, and a complete list of all outstanding balances made out. For the most part, the amounts appearing on the credit side of any particular account will represent the invoiced prices of products and components supplied, as detailed in the purchases book, the folio of which will be shown against each item. On the debit side of the account will be recorded the various amounts of cash paid by the contractor from time to time, either in settlement or part settlement, and the discounts obtained, while if any goods or articles have been returned or any allowances have been made by the supplier, the value of same will also appear on the debit side.

To balance a personal account, the two sides should be added up, and if the credit total is greater than the debit total, the difference will represent the sum actually owing to that person, firm, or company. This difference should be inserted as the last entry on the debit side of the account, with the balancing date and the words " To balance carried down," after which the two totals will agree with each other. When this has been checked, the totals should be ruled off opposite each other, and the balance brought down on the credit side as the opening entry for the next month or period, giving the balancing date and the words " By balance brought down." In some cases, owing to an account being overpaid or an insufficient amount of discount deducted, the debit total will be higher than the credit total, and when balancing such an account the difference should be inserted as the last entry on the credit side, reading " By balance carried down," enabling the totals to be ruled off on the same line as each other and the balance brought down as the first item on the debit side for the following period. When the two totals of an account are seen to correspond with each other, they should be ruled off at once to show no balance outstanding. This will avoid the constant adding of the same figures month after month. It is a good plan to show all ledger balances in red ink, and to compare the amounts with the figures brought down at the end of the previous month.

Where possible, the purchases ledger should be balanced independently of the other ledgers. To do this a reconciliation account should be prepared showing, on the credit side, the total of the balances outstanding at the end of the previous month, followed by the cost of the purchases made during the month—as shown in the purchases book—and on the debit side the total of the cash paid and the discounts obtained, as per cash book, and the value of the returns outwards and allowances as detailed at the end of the purchases book, or in the returns and allowances book, as the case may be. Apart from unusual transactions—which would have to be allowed for—the difference between the two sides of the reconciliation account will correspond with the total of the ledger balances outstanding at the end of the month, providing no clerical errors have been made.

In those cases where the contractor obtains his products from a limited number of sources, a simple but effective method of keeping the creditors accounts may be adopted. All the invoices received from the same suppliers could be pinned together, or otherwise attached, as soon as the details have been checked, to await the receipt of the monthly statement of account. The credit notes received in respect of returns or allowances should be attached to their invoices, and at the end of each month or quarter a list of accounts owing should be made out, the total of this list being recorded on the credit side of a " Sundry Creditors' Account." Each payment made by the contractor on account of these balances should be posted from his cash book to the debit side of the " Sundry Creditors' Account," the balance of which at any given time will correspond with the total of the unpaid bills on the file.

The next instalment of this series will show the method of keeping and balancing the different management and working expenses accounts, and the accounts of assets and liabilities.

(*To be continued.*)

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Research and Wireless.

[To the Editor.]

Sir,—It is always a thankless undertaking to offer any criticism on statements made in scientific journals or reported utterances of any scientific man, because it will at least be regarded with disfavour if not met with excuses. There are, however, occasions in which it is necessary in the interests of historical accuracy,

Dr. Eccles set himself a difficult task in his recent presidential address to the Institute of Physics to deal in a brief hour with such an extensive subject as the influence of physical research on the development of the wireless art. It is not easy to say exactly where the pure research ends and the technical invention begins, for many inventors have also been physical investigators of the first rank.

It is not always possible sharply to divide achievements into pure research which have provided the raw material and subsequent inventions, because much that had its beginnings in merely scientific curiosity often has to be done over again more carefully when once it is seen to be likely to have some useful application. Dr. Eccles begins his address, according to published reports (see The Electrician May 30, also "The Times," May 28, and "The Engineer," May 30), with the remark that the (electric wave) "detectors discovered by Lodge, Branly and Minchin in 1889 and 1890 were essential apparatus to any prospective practical application," and he adds, "after these purely scientific investigations had provided the means and materials, wireless telegraphy was born at the British Association meeting at Oxford in 1894, when Lodge sent Morse signals by a spark apparatus worked by a telegraph key, and recorded them on a moving paper tape by receiving apparatus at a distance." One naturally asks why the prior scientific discoveries of D. E. Hughes, a physicist of high rank, are not included? He made, in 1878–79, metallic filings and carbon-steel coherers with which he detected signals by means of a telephone, due to electric waves, and his results were mentioned by Crookes in 1892 in a remarkable forecast of the achievements which might be expected from wireless telegraphy as the result of Hughes' work. Hughes' apparatus, rescued from loss by Campbell Swinton, is now on view in the National Science Museum, London. Moreover, it is by no means certain that the coherer before it had received the scientific improvement due to Marconi in 1896 (and probably also to Sir Henry Jackson) could have been used to send intelligible messages by electric waves to which alone the term "telegraphy" is applicable.

Sir Oliver Lodge himself in his interesting book "Talks About Wireless" says (p. 38): "In August 1894, I exhibited this method of signalling at the British Association at Oxford. None of us ever, so far as I know, unless it was Sir Henry Jackson, actually applied these waves to anything that could be called practical telegraphy" . . "The first strenuous effort at actual telegraphy was made by Senatore Marconi."

One could not have better testimony than this to the fact that wireless telegraphy was not "'born' at Oxford in 1894," but that its true birthplace was Bologna in 1895, when Marconi there sent his first intelligible messages in Morse code.

Another section of Dr. Eccles' reported address is headed "The Thermionic Valve," but although this is claimed as the "work of physicists," there is a curious absence of any reference to all my own papers in the journals of the Physical Society or Royal Society on the subject, for example:—

"Molecular Shadows in Incandescent Lamps," "Phil. Mag," August, 1885.

"Electric Discharge in Vacua," "Proc. Roy. Soc.," 1889.

"The Physics of an Electric Lamp," "Proc. Roy. Inst.," 1890.

"Edison Effect in Glow Lamps," "Phil. Mag.," 1896.

"Conversion of Electric Oscillations into Direct Currents," "Proc. Roy. Soc.," 1904.

All of which, purely physical researches, led me to the invention in 1904 of the two-electrode thermionic valve, the necessary precursor of the amplifier, as held by Mr. Justice Sargant in 1918.

Dr. Eccles says the "Grid" was traceable to the experiments of a German physicist in 1902. If Dr. Eccles will pay a visit to the National Science Museum at South Kensington he will see a valve there made by me and described in a paper to the Physical Society on March 27, 1896, which contains a "grid" made exactly as subsequently used by de Forest, and long prior to any German publication.

Then, surely, any discussion of the influence of research on wireless should have contained some brief reference to Marconi's great scientific discovery of the influence of daylight on long-distance wireless. It was that which led to Heaviside's suggestion as to the so-called Heaviside layer in the atmosphere.

The whole subject of short wave propagation round the world was for years the work of Marchese Marconi in his voyages in his yacht "Elettra," and full details were given by him of this purely scientific work—in papers read to the American Institution of Electrical Engineers in New York in June, 1922, and to the Royal Society of Arts in London in July, 1924.

Sir Oliver Lodge pays a handsome tribute to this work in his book "Talks on Wireless" (p. 41), where he says:—"It is needless to emphasise the world-wide character of Mr. Marconi's subsequent developments, his discovery of the power of ether waves to curve round the earth to immense distances, his discovery of the adverse effect of sunshine, and the more recent discovery that short waves can travel efficiently to the antipodes, the theory of which travel by reason of the peculiarities in the atmosphere has been given both by Dr. Eccles and Sir Joseph Larmor."

These researches though conducted with the world as a laboratory were purely scientific, and the essential preliminaries to the great inventions by Marchese Marconi and Mr. Franklin which evolved the Beam system of wireless. It is also a notable feature of Dr. Eccles's address that, whilst Hertz's experimental demonstration of electric waves is taken as a starting point, the name of James Clerk Maxwell, who first conceived their existence, is not mentioned. Neither is Lord Kelvin's classical paper in 1853 on electric oscillations of a Leyden Jar, nor Lodges' experimental researches on this subject—which almost anticipated Hertz's work. These were all epoch-making physical researches which surely helped to lay the foundations of wireless.

It seems necessary also to offer a word of respectful protest against the tone of an article and leader in The Electrician of May 23, 1930, on this subject of priority in the invention of electric wave telegraphy. It is not very obvious why it should have been necessary to reproduce now statements in that journal made in 1897, which, to say the least, were based on an imperfect knowledge, nor why it should claim approval for having "championed" the cause of one or other inventor.

The chief duty it would seem of scientific journalism is to record fairly and without bias actual achievements, and leave to posterity or the law courts the more difficult task of assigning to the various contributors to the upbuilding of a new art or industry the share of the credit which properly belongs to them.—Yours faithfully,

Ambrose Fleming.

June, 1930.

[*We print Sir Ambrose Fleming's letter with pleasure, in spite of his criticism of certain passages in our issue of May 23, for no one is better qualified than the inventor of the thermionic valve—the keystone of the immense progress made by wireless methods of communication in the past decade—to write with authority on the development of the various inventions which have contributed to the progress of the new art. We feel, however, that he has rather exaggerated the significance of the quotation from* The Electrician *of September 17, 1897. This was reproduced, purely as a matter of historic interest, in the brief reference to the past activities of this journal contained in the Jubilee History of Benn Brothers, which was included in our issue of May 23.*—Ed.]

BOOKS RECEIVED

"Autobiographical and other Writings." By Alan A. Campbell Swinton. (London: Longmans, Green and Co.) Pp. ix+181. 10s. 6d. net.

"Regulations and Syllabuses for Examinations in Electrical Subjects for the Session 1930–1931." Issued by the City and Guilds of London Institute. (London: John Murray.) 1s. net.

"The Electrical Heating and Ventilation of Bourne and Hollingsworth's Premises, Oxford Street." By A. H. Barker. With an abstract of the discussion upon the paper. Edited by H. H. Jeffcott. (London: Institution of Civil Engineers.) Pp. 44.

Electricity Commissioners' Return of Engineering and Financial Statistics relating to Authorised Undertakings in Great Britain for the year ending March 31, 1929 (or May 15, 1929) for Public Authority Undertakings, and December 31, 1928, for Company Undertakings. (London: H.M. Stationery Office.) Pp. lxxii+602. 15s. net.

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NEWS IN BRIEF.

Burton-on-Trent and Overhead Line Insulators—The Advertising Convention—Electrical Women at Wimbledon—The Scottish Regional Broadcasting Station.

HULL municipal telephone department made a gross profit of £38 156 for the past year, and a net profit of £11 968.

The annual outing of the Clyde Valley Electric Power Company took the form of a visit to Tarbert by the steamer "Duchess of Argyll," when 500 employees attended.

It was stated at a meeting of Inverness Town Council that the cost of their opposition to the West Highland hydro-electric scheme was £1 087 and £400 for the Grampian scheme.

Signed by 43 electricity consumers, a petition, asking reconsideration of the decision refusing to replace battery eliminators rendered useless by the change-over from d.c. to a.c., has been received by Burnley Electricity Committee.

A mains assistant is required in Watford Corporation's electricity department.

The L.M.S. Railway Co. is considering a scheme for the electrification of Cathcart Circle, a Glasgow suburban line.

A Kirkham Council has appointed a special committee to consider replacing existing street gas lamps with electric lighting.

Douglas (I.O.M.) Electricity Committee has authorised the borough electrical engineer to purchase a power factor meter at a cost of £60 10s.

The accounts for the year ended March 31, of the Douglas (I.O.M.) electricity undertaking are now practically complete and a substantial profit is indicated.

Dumfries Town Council has adopted an assisted wiring scheme, and the electrical engineer is arranging with contractors for the adoption of a uniform specification.

Burton-on-Trent Corporation has offered a reward for information regarding malicious breakage of insulators on e.h.t. overhead lines supplying districts around the town.

A large party of members of the Electrical Association for Women visited the Wimbledon electricity works and showrooms on June 4. The party was received by the Chairman of the Electricity Committee, Ald. Hickmott and Mr. McKenzie, chief engineer and manager.

It is reported that, as soon as permission is obtained from the Post Office, the erection of the Scottish regional broadcasting station will be commenced at Falkirk. When it is completed the stations at Glasgow, Edinburgh and Dundee will close down. It is possible that the Aberdeen transmitter will remain in commission.

The inquiry as to whether imported motor vehicles and parts should be required to bear an indication of origin, which was to have been held on July 7, has been postponed, and will be held in September or October. The goods concerned are :—(*a*) Motor-cars, motor-vans, motor-lorries, motor-trucks, and other motor-vehicles ; (*b*) internal combustion engines of all descriptions ; (*c*) chassis units, parts or fittings for the above ; (*d*) magnetos, batteries, and ignition plugs of all descriptions.

The fifth annual sports meeting of the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., was held at Hersham on Saturday, June 14. The enthusiastic efforts of the staff fully justified the decision to abolish all open events this year. Under the presidency of Mr. W. W. Hughes, the keen interest shown should prove extremely helpful in work and play. The cycling, pillow-fight and tilting the bucket items were very popular and amusing. After an extremely interesting afternoon in glorious weather, Mr. W. W. Hughes distributed the prizes. An innovation which proved helpful in organising the sports was the installation of loud speakers round the field, this equipment providing music meanwhile.

Manchester Health Committee recommends the provision of an electric lift at the Crumpsall Institution, at a cost of £2 700.

The staff of James Bros., electricians, of Devizes, Trowbridge, Chippenham, and Marlborough, held their annual outing on May 28, when upwards of 50 visited Portsmouth and Southsea.

Herbert Terry and Sons, Ltd., held their works annual outing on May 31, the record number of 780 taking part in the programme arranged. The party left Redditch at 8 a.m., and made its way by road to Llangollen. After lunch a trip across the mountains was made via the Horseshoe Pass.

Rotherham Education Committee has asked the Secretary for Education to invite tenders for the installation of the electric heating apparatus at the Thorpe Hesley Council school.

The summer meeting of the Institution of Engineers and Shipbuilders in Scotland and the North-East Coast Institution of Engineers and Shipbuilders will take place in Holland from June 21 to 28.

The inhabitants of Langenburg (Germany) have commenced a boycott of gas and electricity, and are reducing the use of water to the lowest limit, as a protest against increases in the rates levied by the municipality for these commodities.

About 90 members of the North Western Branch of the Institution of Mechanical Engineers recently visited the works of Hopkinsons, Ltd., Huddersfield. The members were entertained to luncheon at the George Hotel, and then proceeded to the works. Under the guidance of members of Hopkinsons' staff, a tour was made of all departments.

The priority permit, for the development of the White Mud Fall, Northern Manitoba, issued last year to the British Dominion Power Company, has been renewed for a year.

The Anglo-Australian telephone service was extended to Adelaide (South Australia) yesterday (Thursday). The charge is £6 for the first three minutes and £2 for each additional minute. Calls will be accepted for places in South Australia beyond Adelaide subject to a preliminary test proving successful.

It is reported that a company has received from the New Zealand Government a concession for the use of water power to a maximum of 50 000 H.P., in the neighbourhood of Milford Sound, for a hydro-electric scheme, associated with the electro-chemical industry. Unless an expenditure of £100 000 is made by January, 1933, the concession will be forfeited.

The sixth annual convention of the Advertising Association will be opened by Sir James Parr, at Hastings, to-morrow, Saturday. Over 1 200 delegates are expected to attend and 27 different speakers will take part. The general theme of the convention will be increasing trade by advertising, and among the speakers will be Sir Ernest Benn, Mr. E. A. Gatehouse, who will preside over the Industrial Press Section, and Mr. C. Pinkham.

Ten years ago on Sunday, Dame Melba made her memorable broadcast on 2 800 metres from Chelmsford. The transmitter, rated at 6 kW, was at the Marconi Works, and was later substituted by a 15 kW set, which radiated two daily programmes. In 1921 the well-remembered Writtle station was brought into being, to be followed later by 2LO at Marconi House. It is interesting to note that the Marconi Works is now the site of G5SW, the short wave station, and was the first home of 5XX before its removal to Daventry.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of June 19, 1880, recorded that a network of underground telegraphs had been completed, connecting Berlin with all the more important inland and frontier towns of the western half of Germany. Most of the underground cables contained seven conductors.*

Speaking at a meeting of the British Association of Gas Managers, Mr. C. Hunt said that the electric lamp for ordinary indoor purposes had yet to be invented. No advance whatever had been made towards the adaptation of the light to domestic requirements.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of June 23, 1905, stated that radical improvements in incandescent electric lamps had been a long time coming, but now seemed to be coming thick and fast. Dr. Louis Bell and Professor W. L. Puffer had expressed the opinion, after testing tantalum lamps, that it would be more economical to use these lamps at a cost of $1 each than carbon lamps costing nothing at all, assuming the cost of current to be between 6 and 10 cents per unit.*

Tests of a 400 kW Westinghouse turbo-alternator showed a steam consumption of 17½ lb. per kWh at full load, and it was stated that the lowest steam consumption then recorded was believed to be 14·4 lb. per kWh in the case of a 3 000 kW Brown, Boveri-Parsons turbo-generator installed at Frankfort-on-Main.

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PERSONAL.

COLONEL Blunt-Mackenzie, Satle Leod, has been re-elected a director of Ross-shire Electricity Supply Co.

Mr. James A. Spence, Broughty Ferry, and Mr. Robert W. Murray, Dundee, have each been awarded a £150 scholarship for the study of electricity.

Major J. T. Rodwell, of the Cordoba Central Railway, writing from 9, Haldon Avenue, Teignmouth, South Devon, advises us that he is home on leave from the Argentine.

Mr. Lawson, who has been in charge of the radio side of Brown Brothers, Ltd., since 1922, has been appointed controller of sales with Radio Instruments, Ltd.

The Council of the Institution of Civil Engineers has awarded a Telford Premium to Dr. E. G. Coker, F.R.S., professor of civil and mechanical engineering at University College, London.

Dr. F. G. Donnan, F.R.S., will be awarded the honorary degree of D.Sc at the Convocation to be held at Durham University next week. He is the author of innumerable papers dealing with electro-chemistry.

Mr. C. H. Rayner, who has been with the Manchester Corporation electricity department for 36 years, has been appointed chairman of the Manchester branch of the Incorporated Sales Managers' Association.

Since his retirement from Birmingham, Mr. R. A. Chattock is frequently meeting friends in the electrical industry who are not aware that he has moved to London. We are pleased therefore to publish his address as 14A, Marlborough Place, St. John's Wood, London, N.W.8.

The James Scott Prize (1927-1930) of the Royal Society of Edinburgh has been presented to Professor Niels Bohr, of the University of Theoretical Physics, Copenhagen, who was described by the president (Professor Sir E. A. Sharpey-Schafer, F.R.S.) as chief among the contributors to the physical theory.

Mr. H. T. Tizard, F.R.S., Rector of the Imperial College of Science and Technology, is to be president of the Association of Special Libraries and Information Bureaux for the year 1930–1931, in succession to Sir Joseph J. Thomson. His year of office dates from the Annual Conference of the Association to be held at New College, Oxford, in September.

The honorary degree of M.Sc. has been conferred by the Council and Senate of the University of Liverpool on Mr. George Hinde Nisbett, managing director of the British Insulated Cables Ltd., Prescot, since July, 1928. He joined the firm in 1894 as chief engineer, became chief engineer and manager in 1902, and was appointed director and engineer in 1924.

The L.C.C. Establishments Committee has recommended that, as from dates to be arranged, Mr. A. H. Sears, senior assistant in the chief engineer's department, and Mr. J. R. Walker, senior technical assistant in the electrical branch of the tramways department, be promoted to be assistant engineers in the chief engineer's department, at commencing salaries of £700 and £750 a year respectively, rising by annual increments of £50 to £900 a year.

Mr. G. H. Lake, recommended for appointment as chief engineer and general manager of the Nottingham electricity undertaking.

Mr. G. H. Lake was last week recommended by the Nottingham Electricity Committee for appointment as chief engineer and general manager to the city electricity department. Mr. Lake was selected from 41 applicants, 11 of whom were interviewed by the committee. Mr. Lake has been connected with Derby Corporation in various capacities for over 30 years. He was appointed deputy borough electrical engineer and general manager in 1917, and promoted to his present position of borough electrical engineer in 1926.

Mr. E. T. Goslin, general manager of the Clyde Valley Electrical Power Co., was the subject of an appreciative sketch in "The Glasgow Evening News" last week, when a brief sketch of his career was given. Mr. Goslin, a native of Ramsgate, was employed by the Electric Lighting Co. of Hove before joining the staff of the County of London Supply Co., under whose auspices he laid the high ing mains in the centre of the city. After a while spent with the British Electric Traction Co. he went to Glasgow as mains engineer to the Corporation Tramways, rising to be chief engineer. In March, 1920, he succeeded Mr. (now Sir) Archibald Page as general manager of the Clyde Valley Co.

A pen and ink sketch of Dr. Oskar v. Miller, of Austria, Hon. President of the World Power Conference, 1930 to 1936.

Owing to additional duties and responsibilities placed on certain members of the Liverpool electricity department, in connection with the Clarence Dock power station, the Corporation has voted special payments per annum during the period of construction of the station, but for not exceeding two years, such payments to form part of the engineering expenses, to the following: Mr. J. Hamilton, generation engineer, £100; Mr. E. L. Morland, distribution engineer, £50; Mr. H. Midgley, chief technical assistant, £125; Mr. L. Breach, chief electrical assistant, £75; Mr. H. Pryce Jones, assistant technical engineer, £30; Mr. A. C. Hansen, engineer's secretary, £50; Mr. H. A. Williams, station superintendent, £50; Mr. K. M. Ferguson, assistant boiler house superintendent, £50; Mr. S. R. Hollway, shift engineer, £40.

Obituary.

MR. PERCIVAL JOHN PRINGLE, June 10, aged 60 years. He was general manager and chief engineer of the Electric Supply Co. of Victoria, Ltd., Australia. He served his time with Dubs and Co., Glasgow, and was afterwards appointed by Prof. G. Forbes on research work. At the age of 20 he was appointed works manager of Drake and Gorham, Ltd., later becoming assistant engineer to the Brush Co. In 1900 he was appointed resident engineer of the Midland Electric Power Corporation to represent the consulting engineers, Messrs. Kincaid, Waller, Manville and Dawson. In 1903 he became borough electrical engineer and tramways manager to Burton-on-Trent Corporation.

MR. JACK CAVE, on June 14, aged 57 years, one of the earliest of the Marconi Company's employees. His special knowledge of glass blowing and his skill as a master instrument maker led to his appointment in 1897 to the personal research staff of the Marchese Marconi. He was thus the first mechanic to be associated with the commercial development of wireless telegraphy, and under him in those early years the art of coherer manufacture and testing reached a high degree of performance. He began his work at Bournemouth and it was continued at Poole, and in 1899 commercial manufacture was begun at Chelmsford. With the advent of the magnetic detector superseding the coherer, Mr. Cave was appointed in 1907 a foreman of the machine shop. In 1922 he was appointed chief rate fixer, which position he held at the time of his death.

MR. WILLIAM G. GORDON, on May 13, aged 53 years. After graduation from Cornell University in 1899, he was employed in the Railway Engineering and Constructional Department of the Canadian General Electric Co., which position he held until 1905. Between 1905 and 1907, he acted in the capacity of railway engineer with the Australian G. E. Company; from 1907 to 1908 as manager and engineer of the North Melbourne Traction and Lighting Company; from 1908 to 1909 as chief engineer of the National Electrical and Engineering Co., and from 1909 to 1913 in the same capacity with Brisbane Tramways. Since 1913, with the exception of eight months in 1918 during which time he was a member of the firm of Malm, Gordon and Co., Ltd., Mr. Gordon was associated with the Canadian General Electric Co. In 1919, he was appointed manager of the Railway and Traction Engineering Department, which position he held at the time of his death.

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SUPPLY IN GREAT BRITAIN.

Points from the Electricity Commission's Latest Return.

SOME of the salient features of the "Return of Engineering and Financial Statistics relating to Authorised Undertakings in Great Britain," for 1928 and 1928–29, issued by the Electricity Commission (Stationery Office, 15s. net), are dealt with in our leading article this week. Below we give other interesting points brought out by the statistics:—

The stage of development attained by the public supply undertakings in Great Britain in 1928–29 was represented by the following average figures per head of estimated population in 1928, namely, a connected load of approximately 225 watts, a maximum demand of about 92 watts and the sale to consumers of 176 units per annum.

Of the total generating plant installed over 95% was of a.c. type, this figure including plant of 12 different frequencies. Over 79% of all a.c. plant was of the standard accepted frequency of 50 cycles, the two predominating non-standard frequencies of 25 and 40 cycles accounting for 13% and 6% respectively. In 1928–29 a.c. supplies of 15 different frequencies were being distributed and the declared voltages at consumers' terminals for low and medium pressure a.c. and d.c. supplies taken collectively numbered 44.

Nearly 82% of the total public supply was sold to consumers, the remaining 18% being accounted for by the works requirements of undertakers and by losses in transmission and distribution. Sales of electricity for lighting and domestic purposes increased by 328 000 000 units and for power purposes by 389 000 000 units. There was an increase during the year of more than 394 000 consumers, or about 15%. Intersales of energy in bulk between undertakings for distribution to consumers accounted for 20·2% of the total public supply as compared with 18·4% in the previous year.

Combined maximum load on public supply undertakings, and on units generated and/or purchased, was of the order of 4 077 000 kW, and that on the generating stations of authorised undertakers was of the order of 3 369 000 kW. The capacity of the generating plant installed was about 72% in excess of the combined maximum demand. The load factor was of the order of 30% in the case of public authorities and 34% in that of companies, giving a combined figure of about 31·6%.

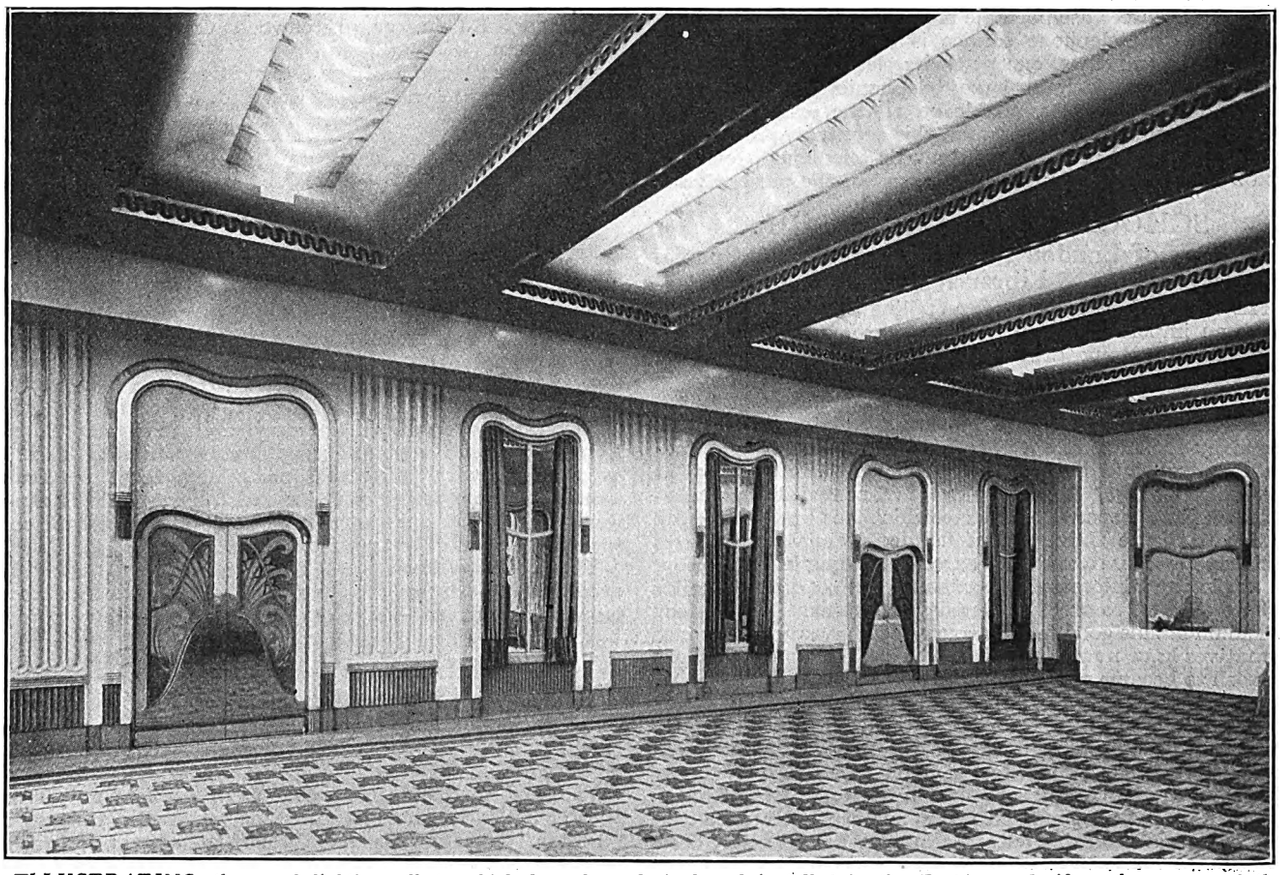
Economies continued to be effected in the utilisation of fuel. Public supply undertakings consumed over 8 200 000 tons of coal and coke in 1928–29. The average cost amounted to 15s. 7d. per ton, against 17s. 10d. in 1927–28.

The total expenditure charged to capital account by authorised undertakings at the end of 1928–29 amounted to about £297 677 000, 41% being in respect of generation and 59% in respect of transmission, distribution, etc. The average expenditure for all purposes per kW of generating plant installed was £51. During 1928–29 new capital expenditure amounted to over £28 670 000, an increase of more than 10%.

The total revenue of £55 454 000 represented an average of 1·37d. per unit sold against 1·49 per unit in 1927–28. Average revenue for £100 of capital expenditure was £18·6, but this figure is reduced to £16·9 if revenue from the intersale of energy in bulk is excluded. Average working expenses for £100 of capital expenditure amounted to £10·5.

In the case of public authorities, the gross surplus of £25 855 000 was appropriated to the extent of 35·1% for interest charges, 48.4% for repayments of loans and transfers to sinking funds and to reserve and renewals funds, 10% for capital expenditure and 2·7% in relief of local rates, the latter item representing a net contribution of £414 509. The remaining 3·8% (about £598 000) represented increase in the balances on net revenue account.

In the case of company undertakers the gross surplus was appropriated to the extent of 60% for interest charges and dividends and 33·4% for transfers to depreciation and reserev funds. About 3·4% (£350 535) represented increases in balances on net revenue account. The average ratio of preference and ordinary dividends, calculated on the capital at the end of 1928, were 5·41% and 7·36% respectively.



ILLUSTRATING the novel lighting effects which have been devised and installed in the Empire and Alexander rooms of the Trocadero Restaurant, London. The fittings employed comprise hollow fluted glass tubes approximately one-third inch in diameter, mounted horizontally on almost invisible frames. These frames are suspended below the rows of lamps which are thus obscured from view, and the refraction of light produces an illumination in the form of continuous bands—rays, soft and subdued from which all glare is eliminated. The lighting effect is efficient and restful, and at the same time blends with the modern scheme of decoration. The whole of the fittings were manufactured by the British Central Electrical Co., Ltd., 6 and 8, Rosebery Avenue, E.C.1, under licence from the patentees.

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IN PARLIAMENT.

Points from Replies to Recent Questions in the House of Commons.

PRESS telegrams can be sent to Buenos Ayres at a cheaper rate via New York than if sent by the direct route of the Imperial and International Communications Co. The Postmaster-General has communicated with the Imperial Communications Advisory Committee on the matter.

The salary of the chairman of the British Broadcasting Corporation is determined by resolution of the Corporation, subject to a maximum of £3 000 a year.

If there is a desire by members of the Opposition in the House of Commons for conversations on the subject of permitting the use of the broadcast for controversial politics to be resumed, the Prime Minister will be glad to comply with the request.

Following on progressive improvements in the trunk telephone service designed to accelerate the growth of traffic, it was possible last year to put in hand works estimated to cost £750 000 in addition to the authorised programme for that year, and this year to accelerate the expenditure of a further £750 000.

The International Institute of Scientific Management is recognised by the International Labour Office, and receives support from that body in the form of premises and staff.

There is no reason to think that the number of errors in telegrams transmitted by telephone is materially greater than in telegrams transmitted by Morse or other telegraph instruments. The Postmaster-General has no evidence of any general dissatisfaction with the telephonic method of transmission.

The Lord Privy Seal is aware of the increase in the quantity of foreign electrical goods imported into this country during the last year. The difference as compared with the previous year was about 2%. It is in the main due to increased imports of the smaller type of appliance bought by the private user of electricity and wireless.

The number of wireless receiving licences in force on April 30 last was 3 117 000. There are no statistics available showing how many licensees use portable receiving sets.

Personal call telephone service is available with all the 23 European countries, except Switzerland, with which subscribers in Great Britain have telephonic communication. Personal calls are also available on all the extra-European services available to subscribers in this country.

Three or possibly four new automatic telephone exchanges will be opened in London before the end of the present year.

SCHOOL OF LIBRARIANSHIP.

University of London Diploma Scheme for Special Librarians.

THE electrical industry needs no telling that special libraries are an important organ in the research departments and information bureaux attached to the large technical and industrial corporations, and also to the great scientific and other learned societies. To train competent librarians to run them is an urgent problem, which has been anxiously considered by the Association of Special Libraries and Information Bureaux, and also by the School of Librarianship at University College, London. The last-named has, in consequence, just prepared a scheme which has been passed by the Senate of the University of London to enable graduates in science to receive a suitable course of training in one session, and attain the Diploma of Librarianship on conditions similar to those allowed to other university graduates. The present curriculum stands good for every type of librarian, but certain alternatives have now been introduced for the benefit of those who wish to become special librarians. The separate subjects, Library Organisation and Library Routine, have been modified and combined into the new subject, Library Economy (omitting those features to public library administration); the History of Science is given as an alternative to Palæography and Archives; and a new subject, Special Library Services, dealing with the point of view and the scope of special libraries and information bureaux has been introduced. These regulations come into force at once, and a course of instruction is being provided for the session beginning in October, 1930, when the new courses will start, provided that a fair number of persons desiring to train for work in special libraries enrol themselves before the middle of July. Further information can be obtained from the Secretary, University College, Gower Street, London, W.C.1.

THE NATIONAL REGISTER.

Further Applications for Registration Approved at June Meeting of Committee.

THE Executive Committee of the National Register of Electrical Installation Contractors, at a meeting held on June 6, received thirty-three applications from electrical installation contractors for registration, of which number one application was withdrawn, nine were declined, and twenty-four accepted.

The names and addresses of the successful applicants are given below :—

Saraikin, S. P., The Triangle Electric, 1A, Great Western Street, Moss Side, Manchester.

Gazard, W. A., and Son, Stechford Electrical Depot, Stechford Lane, Ward End, Birmingham.

Roberts, Charlie, Electraville, West Ardsley, Nr. Wakefield.

Terry, Sidney, 88, St. Dunstan's Street, Canterbury.

Oates, Edgar, Ltd., 17, Clegg Street, Oldham.

Bentley-Hunt, James E., 4, Wood Street, Queens Square, Bath.

Frank Craven (trading as Holt, W. P., and Co.), 14, Chester Street, Bradford.

Milne, Alex., and Co., Blythswood Chambers, 180, West Regent Street, Glasgow.

Smith, Joseph, 34, Blanche Street, Preston.

Greenwood, Denis, 128, Main Street, Bingley.

Smith and Lomerton, 3, St. Aldate Street, Gloucester.

Mountford, Harry H., 33, Carrs Lane, Birmingham.

Carter, Jaley, 27, Wade Street, Thornton Road, Bradford.

Edwards and Godding, Ltd., The Market Place, Newbury, Berks.

Nash, Herbert, 1, High Street, Notting Hill Gate, London, W.11.

Fraser and Borthwick, Ltd., 59, Pitt Street, Glasgow.

Trapnell, Gordon H., 106A, Albion Street, New Brighton.

Dargue, Arthur E., 33, Stringhey Road, Wallasey.

Exors. of R. J. Atkins, 28/32, Halesowen Street, Oldbury.

The Central Electric Co., Washbrook Road, Rushden, Northants.

Butcher, Edwin, 24, Birchwood Crescent, Sparkbrook, Birmingham.

Hamilton, Claude, Ltd., 71, Otago Street, Hillhead, Glasgow.

Cambridge Electric Supply Co., Ltd., 4, Market Hill, Cambridge.

OVERSEAS TRADE.

Five Months' Trading Shows Exports Over £4 000 000 in Excess of Imports.

IMPORTS of electrical apparatus, machinery and materials into the United Kingdom during May were valued at £704 280, as against £618 685 for the same month last year, an increase of £85 595. Similar imports during the five months of this year amounted to £3 858 590, as against £2 840 857 during the corresponding period of 1929, the increase being £1 017 733.

Electrical apparatus, machinery and materials shipped, from the United Kingdom during May amounted to £1 618 320 as compared with £1 850 244 during May, 1929, representing a decline of £231 924. For the five months of this year exports were valued at £8 032 491, as against £7 973 835 for the corresponding period of last year, an increase of £58 656.

These figures show that electrical exports during May exceeded imports by £525 972, and for the five months the favourable balance was £4 173 901.

TRADE PUBLICATIONS.

A special booklet relative to "Steeloscopes" has been published by ADAM HILGER, LTD., 24, Rochester Place, London, N.W.1. The publication is highly descriptive and very well produced.

The Foster Engineering Co., Ltd., of "Apex" Works, South Wimbledon, manufacturers of "Apex" switchgear and "Foster" transformers, have issued an attractive brochure to mark the completion of 25 years progress in electrical engineering. From quite small beginnings, "Foster's" development has necessitated frequent extensions to their works, and it is interesting to note that they have made over 80 000 transformers up to 2 000 kVA. The brochure is well produced and profusely illustrated. Anyone writing direct to the sales manager will be sent a copy free of charge.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

CARDIFF CORPORATION.—Electric light installation in Spottlands Branch Library extensions, Cardiff. Specifications from the City Electrical Engineer, The Hayes, Cardiff.

THANET JOINT HOSPITAL BOARD.—Installation of electric light at Thanet Isolation Hospital, near Ramsgate. Specification, etc., from Mr. S. Shea, clerk, 19, Cecil Square, Margate; deposit £2 2s., returnable.

WEETON CHURCH.—Electric light installation. Schedule from Mr. H. E. Gilbert, Briarfield, Huby, near Leeds.

Lamps and Fittings.

OLDHAM PUBLIC ASSISTANCE COMMITTEE, June 20.—Supply of electric lamps and fittings, for the Poor Law Institution. Tender forms from the Public Assistance Officer, Town Hall, Oldham.

BENFLEET URBAN DISTRICT COUNCIL, June 23.—Three vertical spindle centrifugal pumps, with electric motors and automatic control, etc. Specification from Mr. W. E. Blezard, 9, Victoria Street, Westminster, S.W.1; deposit, £2 2s.

CENTRAL ELECTRICITY BOARD, June 23.—Supply and erection of 66 000 V and other cables in connection with Mid-East England Electricity Scheme. Specification (M.E.E.-G.C.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

DUKE OF LEEDS HOTEL, NEWMILL, NEAR HUDDERSFIELD.—June 23.—Electricians' work in connection with erection of hotel. Plans, etc., can be seen at the offices of Messrs. Abbey and Hanson, 11, Cloth Hall Street, Huddersfield.

GLASGOW CORPORATION, June 23.—Electric light installation work at M'Nair Street rehousing scheme, and Quarrybrae (intermediate) housing scheme. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow, C.3.

DUNDEE CORPORATION, June 25.—Supply and erection of e.h.t. switchgear and bus-bar reactors. Specification from the General Manager, Electricity Supply Department, Dudhope Crescent Road, Dundee; deposit £2 2s.

EAST RIDING AND CITY OF YORK JOINT SANATORIUM COMMITTEE, June 25.—Repairs and renewals to electric lighting installation at Raywell Sanatorium, and supply and installation of electric motors in the sanatorium laundry. Tenders to the Joint Clerks, Sanatorium Committee, County Hall, Beverley.

SALFORD CORPORATION, June 25.—Supply and delivery of one 1 000 kVA step-down Scott connected transformer bank, ratio 6 600 V three-phase, 50 cycles, to 3 130 V two-phase. Specifications, etc., from the City Electrical Engineer, Electricity Department, Frederick Road, Salford.

CENTRAL ELECTRICITY BOARD, June 27.—Supply and laying of pilot cables in connection with the Central England Electricity Scheme. Specification (C.E.-S.C.1), etc., from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

MANCHESTER CORPORATION, June 27.—Supply and erection of three-phase 6 600 V switchgear, sheet steel cubicle type, specification No.279. Supply and delivery of supervisory control gear at Cumberland Street sub-station (Specification No. 280). Specifications, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester; deposit, £1 1s. for each specification, returnable.

DUNDEE TOWN COUNCIL, June 30.—Supply, delivery and erection of e.h.t. switchgear and e.h.t. busbar reactors to the main generating station at Carolina Port. Specifications, etc., from Mr. D. H. Bishop, general manager and engineer, Dudhope Crescent Road, Dundee; deposit £2 2s., returnable.

METROPOLITAN WATER BOARD, June 30.—Supply and fixing of two 120 kW steam-driven electric generators, switchboard, piping, etc., at Deptford pumping station. Specification from the Chief Engineer, 173, Rosebery Avenue, London, E.C.; deposit £1 1s.

SALFORD CORPORATION, June 30.—Electric lighting installation for new nurses' home at Hope Hospital. Tenders to Mr. H. H. Tomson, town clerk.

WEST RIDING EDUCATION COMMITTEE, June 30.—Electric lighting at Kippas Council School. Specifications, etc., from Mr. H. W. Powell, Education Offices, Garforth.

CARDIFF CORPORATION, July 1.—Supply of h.t. switchboard (Contract No. IV); h.t. switchboard (No. V); transformers (No. VI); and battery and charging plant (No. XV), for the Llandough Hospital, now in course of erection. Specifications from Messrs. Plevin and Jenkins, 4, Working Street, Cardiff; deposit £2 2s. for each. Only manufacturers on the King's National Roll are invited to tender.

BIRMINGHAM CORPORATION, July 1.—Electric lighting and power installation at Uffculme Mental Hospital, King's Heath; deposit £5.

KINGHORN CORPORATION, July 1.—Electric wiring, etc., in 40 houses to be erected on Baliol Field site. Specification from Mr. J. Gentles, surveyor, Central Chambers, Kirkcaldy.

KILKEEL RURAL DISTRICT COUNCIL, July 2.—Supply of 30-38 B.H.P. crude oil engine generator, booster, switchgear, etc. Specifications (5s.) from the clerk, Mr. J. J. Bell.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, July 3.—Electric lighting installation at a block of tenement dwellings. Specification, etc., from Mr. David J. Keep, town clerk, Town Hall, Cambridge Road, E.2; deposit £2 2s. Technical inquiries may be made of Mr. H. W. Couzens, 9, Old Queen Street, London, S.W.1.

LOUTH CORPORATION, July 4.—Electric lighting and power installation at Town Hall. Specification, etc., from Messrs. Burstall and Monkhouse, 14, Old Queen Street, Westminster, S.W.1; deposit £3.

BELFAST CORPORATION, July 5.—Manufacture, supply, delivery and erection of (*a*) h.t. armour clad switchgear (specification No. W.108); and the manufacture, supply and delivery of (*b*) transformer kiosks with h.t. and l.t. switchgear (specification No. W.109); (*c*) static transformers (specification No. W.110). Specifications from Mr. F. H. Whysall, city electrical engineer and general manager, East Bridge Street, Belfast; deposit £2 2s. (returnable) for each specification.

SUNDERLAND CORPORATION, July 7.—Manufacture and supply of (1) paper insulated, lead sheathed cable for general main-laying requirements; (2) rubber insulated wire; (3) consumers' meters; and (4) gasfilled and vacuum lamps, for 12 months. Specifications, etc., from the General Manager, Electricity Department, Dunning Street, Sunderland; deposit 10s. for each.

BEDFORD CORPORATION, July 10.—Supply and erection of coal handling plant and extension of sidings at Bedford electric generating station. Specification and form of tender from the Borough Electrical Engineer, Electricity Offices, Prebend Street, Bedford; deposit £2 2s. Only British manufacturers in the United Kingdom are invited to tender.

DUNDEE CORPORATION, July 12.—Supply of six 300 kVA outdoor type transformers. Specification from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD., July 14.—Supply and erection at Dunston-on-Tyne power house of 12 water tube boilers, with economisers, stokers, etc. Specification (No. N. 243) from the Company's Offices, Carliol House, Newcastle-upon-Tyne; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, July 28.—Supply and erection of 132 kV transmission line crossing of the river Thames. Specification (No. S.E.E.-P.L.3) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

INDIA STORE DEPARTMENT, June 23.—Supply and erection of 11 000 and 400 V a.c. and 220 V d.c. switchgear, power and control cables, etc., at Shanan power house. Forms of tender (£3 15s., not returnable) from the Director General, Belvedere Road, London, S.E.1.

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, June 24.—Supply of 110 kV outdoor steelwork and switchgear for Waitaki power scheme—section 71. (Reference B.X. 6 238.)

NEW ZEALAND POSTS AND TELEGRAPH DEPARTMENT, June 24.—Supply and delivery of telephone cords. (Reference B.X. 6 848.)

CAPE TOWN MUNICIPALITY, June 25.—Supply of single phase transformers (specification No. 495/1930). (Reference B.X. 6 378.)

EGYPTIAN MINISTRY OF THE INTERIOR, June 25.—Pumping machinery, electric motors, etc., for waterworks at Abou-Tig-Nekheila. (Reference A.X. 9 509.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of condensers (P. and T. 151/2 240). (Reference B.X. 6 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, June 25.—Supply of 100 000 3¼ in. and 30 000 2 in. lead clips. (Reference B.X. 6 375.)

JOHANNESBURG MUNICIPALITY, June 26.—Electricity meters and time switches (contract No. 405). (Reference B.X. 6 449.)

EGYPTIAN PORTS AND LIGHTHOUSES ADMINISTRATION, ALEXANDRIA, June 28.—Four portable electric drills, one portable electric planer, one two-ton electric batter truck, etc. (Reference A.X. 9 676.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, June 30.—Supply and maintenance of an electric generating unit, with motors, transmission lines, etc., at Tor Quarantine, on the Gulf of Suez. (Reference B.X. 6 466.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 1.—Supply of 110 kV suspension insulators, for Waitaki power scheme—section 63. (Reference B.X. 6 443.)

POWER SECURITIES CORPORATION, LTD., July 1.—Supply of (*a*) 4—3 000 kVA transformers (specification E.28, price 15s.); (*b*) indoor 11 kV switchgear (E.23, price 22s. 6d.), for Pykara, Madras, hydro-electric scheme. Specifications (on payment of above fees and 3s. 6d. for general conditions of contract), from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

CAPE TOWN MUNICIPALITY, July 2.—Supply of paper insulated, lead covered, impregnated, lead sheathed and armoured cable. (Reference B.X. 6 426.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 8.—Supply of earthing transformers, for Arapuni power scheme. (Reference B.X. 6 304.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 8.—Supply of telephonists' telephones. (Reference B.X. 6 352.)

MELBOURNE CITY COUNCIL, July 9.—Supply of totally enclosed, metal-clad switchgear (specification No. 1 024). (Reference B.X. 6 401.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, July 15.—Supply and erection in Northern Nile Delta of 15 electric pumping stations, with machinery, etc. Specification, etc., from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

INDIA STORE DEPARTMENT, July 16.—Supply of 70, 20 and 15 kVA transformers, with motors and switchgear. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

MELBOURNE CITY COUNCIL, July 16. (extension of time).—Supply and installation of electric traffic control signals (contract No. 2 787). (Reference B.X. 6 492.)

NEW ZEALAND GOVERNMENT RAILWAYS, July 16.—Supply of two overhead electric, 30 cwt., underhung, travelling jib cranes, with 12 ft. jib, for goods sheds at Wellington and Auckland. (Reference A.X. 9 442.)

NEW ZEALAND GOVERNMENT RAILWAYS, July 17.—Supply of cable, switchgear and junction boxes. (Reference B.X. 6 385.)

EGYPTIAN MINISTRY OF THE INTERIOR, July 26.—Supply and erection of cooling tower, construction of concrete well and basin; supply of electrically-driven and centrifugal pumps, electric motors, switchgear, etc., at Assiout electric power station. (Reference A.X. 9 627.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 28.—Supply and erection of 23 electric lifts at new Railway Building, Johannesburg (tender No. 1 673). (Reference A.X. 9 623.)

CHILEAN STATE RAILWAYS, July 29.—Supply of electric clocks (one master clock and up to 50 wall clocks). (Reference B.X. 6 472.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 29.—Supply of auxiliary turbines and generating sets for Arapuni power scheme—section 305. (Reference B.X. 6 356.)

VICTORIAN RAILWAY COMMISSIONERS, July 30.—Supply and erection of turbo-alternators, condensing plant and control gear. (Reference B.X. 6 355.)

VICTORIAN RAILWAY COMMISSION, July 30.—Supply of renewals for caustic soda primary cells (contract No. 43 701). (Reference B.X. 6 441.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, August 6.—Two pumping units, for Ameria pumping station, including two Diesel engines, two centrifugal pumps and two small d.c. generators, electrically driven compressor, 10 kW auxiliary d.c. generator, with engine, etc. Specifications (£1 0s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 11.—Thirteen 4-ton electrically driven portal jib cranes: tender No. 1 653. (Reference A.X. 9 683.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 12.—Supply of 11 000 V metal-clad switchgear and accessories, for Mangahao power scheme—section 239. (Reference B.X. 6 455.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, August 17.—Supply and erection of 15 electric pumping stations, with pumps, motors, switchgear, etc., at the isolated basins between Esna and Aswan. (Reference A.X. 9 594.)

MELBOURNE POSTS AND TELEGRAPHS, August 19.—Supply and delivery of telephone jacks. (Reference B.X. 6 477.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 19.—Three single phase transformers, to step up from 22 000 V to 57 600 V between phases, for Penrose sub-station, Arapuni power scheme, section 308. (Reference B.X. 6 427.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 2.—Supply of 110 kV switchgear, steelwork and controlling equipment, for Mangahao power scheme. (Reference B.X. 6 452.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 9.—Supply of 110 kV switchgear and controlling equipment, for Mangahao power scheme—section 217. (Reference B.X. 6 454.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 13.—One set of 50 000 V switchgear, for Mangahao power scheme. (Reference B.X. 6 486.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 16.—Supply of 110 kV switchgear, steelwork and controlling equipment, for Mangahao electric power scheme (section 221). (Reference B.X. 6 453.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 50 kV switchgear and steelwork, for Arapuni power scheme—section 276. (Reference B.X. 6 451.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 7.—Supply of 110 kV and 50 kV switchgear and protective system, for Arapuni power scheme (section 273). (Reference B.X. 6 450.)

Tenders Accepted.

SYDNEY (N.S.W.) CITY COUNCIL.—Johnson and Phillips, Ltd., heavy power cable, £30 000 (approximate).

BLACKBURN CORPORATION.—British Thomson-Houston Co., Ltd., supply of Mazda gasfilled and vacuum lamps, for one year.

ELTHAM SCHOOL.—W. H. Gaze and Sons, Ltd., electric wiring and fitting of new school, Henwick Road, Eltham, £763.

BIRMINGHAM EDUCATION COMMITTEE.—Ellis and Ward, electric light installation at Trescott Road (Northfield) Council School, £630.

WORTHING CORPORATION.—W. H. Allen, Sons and Co., Ltd., centrifugal pump and electric motor, for new borehole at Broadwater pumping station, £1 370.

BEXHILL-ON-SEA CORPORATION.—Hewittic Electric Co., Ltd., rectifying plant for Little Common sub-station, £1 490, and for proposed sub-station in Terminus Road district, £1 490.

HULL CORPORATION.—English Steel Corporation, Ltd., supply of make-up pump for cooling tower, £133 10s.; City Electrical Engineering Co. (Hull), Ltd., electrical installation at Technical College, £1 805 1s. 3d.

BRIGHTON CORPORATION.—Richardsons, Westgarth and Co., Ltd., provision of steam air ejector and pump, for turbine, £850; General Electric Co., Ltd., lighting improvements in Grand Junction Road and Madeira Drive, £780 10s. 1½d.

GLASGOW CORPORATION.—A. Reyrolle and Co., Ltd., supply of switchgear, £5 567 8s. 6d.; Bruce Peebles and Co., Ltd., supply of a transformer, £194; Johnston, Park and Co., Ltd., electrical installation at St. Andrew's Hall, £1 239 18s. 7d.

LONDON COUNTY COUNCIL.—A. Dean, wiring and fittings for electric lighting at Columbia Market and Old Church Road schools. Also tendered: J. Briggs, £251; H. J. Cash and Co., Ltd., £281; Electric Installations, Ltd., £283; Burdette and Co., Ltd., £353.

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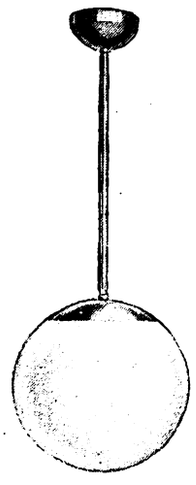
DOMESTIC ELECTRICAL APPLIANCES.

New Fires and Heating Apparatus for the Contractor—Charging Equipment for Battery Service—Another Mains-Valve.

THE well-known range of "Magicoal" imitation coal fires produced by BERRY'S ELECTRIC (1928), LTD. (85-87, Newman Street, Oxford Street, London, W.1) has now been supplemented by the "Magiclog"—an imitation log fire of the open hearth type. This realistic fire has some genuine, partially-burnt logs and some that are skilfully made of metal, treated with a special solution—which helps to deceive the eye and at the same time assists in reflecting the warm red light. The flame effect is produced by three amber lamps on the same principle as in the "Magicoal" fires, and reflection is aided by the metal base supporting the various logs and the lamps. The 3 kW cylindrical heating element is horizontal, and arranged to slide up or down two vertical bars placed near the back of the fireplace chimney. The element can thus be slid into such a position as to be just concealed by the sloping front portion of the fireplace, according to the size and shape of the particular one that is being converted. A parabolic reflector is used in a similar manner to that employed in the firm's "York Adam" fire. The "Magiclog" is supplied with or without fire dogs.

The HOTPOINT ELECTRIC APPLIANCE CO., LTD. (24, Newman Street, Oxford Street, London, W.1), have sent us particulars of their handbasin water heater which may be fixed over the wash-basin by means of two brackets rivetted to the back of the cylinder. A rubber hose is provided for connecting the cold water tap to the inlet pipe at the bottom of the heater so that plumbing work is unnecessary. This type of heater is convenient for household and office use, for the full capacity of the tank when switched on at full heat attains a temperature of approximately 100° F. in 15 minutes. The low heat position of the switch is sufficient for normal hot water output during the day. The capacity of the heater is three gallons; it is cylindrical in shape and the size is approximately 9½ ins. diameter by 21 ins. high. The heater is constructed of heavy gauge copper, tinned on the inside and finished in white cellulose enamel on the outside. It is operated on the "push-through" system, incoming cold water displacing hot water. An internal siphon arrangement is fitted to prevent dripping. The heating element is a Hotpoint sheathed-wire immersion heater, which has a loading of 2 kW and is wired up for control by a three heat switch mounted at the base on the front of the cylinder. The heater is supplied complete with hot water swivel outlet pipe, and 3 ft. of rubber connecting hose.

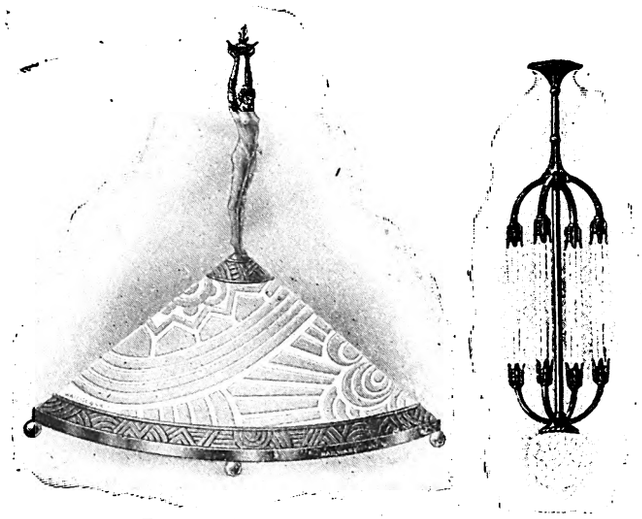
The Hotpoint electric hot water radiators are similar to those used on the low pressure heating system, with a central boiler, but as the heating is electrical, boilers, flues, pipes, etc., are dispensed with. The radiators are installed in small units and fitted preferably under windows. They give hygienic warmth and even distribution of heat and are suitable for installing in bedrooms, offices, halls, etc. They are arranged so that excessive temperatures are not reached and when in normal use they require filling with approximately half a pint of water every heating season. The radiators are made up of a number of well finished cast iron sections and are fitted with Hotpoint immersion heaters, water filler, relief valve and water level test cock. The smaller size is rated at 1 000 W and has single heat control, the larger takes 2 000 W and has three-heat control.



An attractive lighting unit by Philips' Lamps Ltd.

Another of the Hotpoint domestic fittings is an electrically heated towel rail. These heaters warm and dry towels without any danger of scorching. Hot water is used, but no water piping connections are required. The rails are constructed of hard drawn copper tubing and all parts are finished in polished nickel-plate. Each type is supplied complete with immersion heater, water filler, relief valve and water level test cock.

In THE ELECTRICIAN of March 21 was described the "Davenset" starter charger of PARTRIDGE, WILSON AND CO., Leicester. This charger was intended for charging motor car starter batteries, but the gasfilled valve rectification system employed by the firm is also applied to other charging apparatus, among which may be mentioned the "Davenset" high-tension accumulator charger, type H.T.2. In this device the bi-anode gasfilled valve is mounted in a vertical position in the top centre of the panel. On each side of the valve are two pairs



Two new fittings by Hailwood and Ackroyd, Ltd.

of resistance lamps, and the transformer for heating the filament is directly beneath the valve platform. The anodes are not transformer fed, but obtain their supply directly from the mains, the current which they rectify being limited by the sequence of the resistance lamps, one or more of which is always in series. Two pairs of output terminals provide two separate circuits for charging, and each is independently controlled by its four position rotary switch. The current flowing in each circuit is measured on a Ferranti moving coil milliammeter, by plugging in to the respective jack. It is worth noting that, owing to a bi-anode valve being used, no back-feed can occur from one bank of cells of a high voltage on one circuit to a bank of cells of a lower voltage on another circuit.

The number of wireless set owners who have been converted to the principle of deriving their power for operating purposes from the supply mains will probably be increased now that the Osram PX4 valve has appeared upon the market. This, as its nomenclature denotes, has a nominal filament rating of 4 V, is designed to work in all-mains sets without a l.t. battery, and is made by the GENERAL ELECTRIC CO., LTD., London.

While in the ordinary valve the heater and the cathode are the same, in each of the M series of valves the cathode encloses a separate heating element, so that it may be connected to the mains by means of the secondary winding of a transformer of suitable ratio without introducing any appreciable hum. Until the advent of the PX4, it was necessary, where larger power was required than that with which the ML4 could successfully cope, for the users of Osram valves to adopt the expedient of utilising power valves of the standard type with a different filament voltage rating. Although this difference presents no difficulties in many cases, there are instances in which the same voltage for the valve filaments throughout the set is an advantage. The PX4 is stated to differ from other power valves in that it has been developed specially for the last stage of a.c.-mains receivers using indirectly-heated cathode valves in the early stages. In order to furnish the required emission for a large power output it is fitted with a heavy filament, consuming 0·6 A—which may seem to be a somewhat large consumption for a single stage of a wireless set until it is remembered that such a current is negligible when taken from the mains. The characteristics of the PX4 have been designed to provide a power output between that of the P625A and the LS5A power valves, and its stability and resources can be gauged by the claim that it can be allowed to dissipate 10 W at its maximum anode voltage of 200. The amplification factor of the valve is 3·8 and its impedance 1 450 ohms measured at approximately 100 V with the grid at zero potential.

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ELECTRICITY SUPPLY.

Mains and Plant Extensions—Wigan and Rate Relief—Salford's Good Year—Kenley and Coulsdon Housing Schemes—Electrical Development at Birkenhead—Swiss Hydro-electric Stations—Chester Public Lighting.

DARTFORD Electricity Committee has obtained sanction to borrow £2,569 for mains and plant.

Dorchester Lighting Committee is seeking sanction to borrow £500 for meters and £500 for mains development.

Hull Electricity Committee has obtained sanction to borrow £110 858 for additional supply mains in various parts of the city.

Hastings Electricity Committee is seeking sanction to borrow a sum of £10 000 for prospective expenditure on electricity meters.

South Shields Electricity Committee has obtained sanction to borrow £5 000 for house wiring installations with prepayment meters to be let on hire.

Stoke-on-Trent Electricity Committee is to extend mains at a cost of £1 050 to supply an estate being developed by the Sutton Trustees in Trent Vale.

Bradford Tramways Committee has granted the application of the city electrical engineer to instal automatic circuit breakers at Bankfoot and at Bolton depot.

On the year's working, a profit of £16 960 has been made by Wigan electricity undertaking out of which the sum of £4 400 has been allocated to the relief of rates.

West Lancashire Rural Council has received the sanction of the Electricity Commissioners to borrow £27 337 to inaugurate a supply for Tarleton, and the contractors have been requested to proceed with the laying of cables.

Middlesex County Council has voted £2 600 for the main cables required in connection with the electricity supply for the Middlesex County Hospital and Colony at Porters Park and £412 for fire alarms, electric bells, telephones and wireless.

Warrington Electricity Committee has received an application from the Warrington Electrical Co., Ltd., for special terms for current in connection with the proposed new showroom in Bridge Street. The matter has been referred to the engineer.

Carlisle Electricity Committee has obtained a Fringe Order to supply in the rural districts of Brampton and Carlisle. The Committee is to seek sanction to borrow £5 000 for assisted wiring schemes; £15 000 for mains and services, and £5 000 for transformers and sub-stations.

A net profit of £24 898 has been made by the St. Helens electricity undertaking. Of this amount £5 000 has been transferred to the renewals account, £11 864 spent on special expenditure and revenue contributions to capital, and the balance of £8 033 carried to the reserve fund.

Liverpool city electrical engineer has been authorised by the Tramways and Electric Power and Lighting Committee to instal two 750 kVA transformers and l.t. boards in Lodge Lane sub-station, and to advertise for tenders for high tension and low tension switchgear for static sub-stations.

Westminster (London) City Housing Committee recommends the provision of time switches to control the electric lights on the staircases and balconies of the eight blocks of dwellings on the Ebury Estate. Two time switches on each staircase, one to control the outside and balcony lights and one to control the staircase lights of each block, are suggested.

Blackburn T.C. has decided to extend the supply main at Clayton-le-Dale, and to change the d.c. supply to Little Harwood to a.c. The Town Council has approved the supply of current to Hall Street Mill Co., necessitating the laying of sub-station equipment, etc., at a cost of £1 200. The council has also approved amended terms for the supply of current to Messrs. Livesey's Ewood Mills.

Hampton General Purposes Committee has received from the London and Home Counties Joint Electricity Authority, the terms upon which the Joint Advisory Committee is prepared to recommend the lighting of streets in the district by electricity and it has been decided to instruct the surveyor to present a report upon the capital expenditure which would be involved in substituting electricity for gas, and upon the annual cost of the maintenance supply as compared with the present system.

The gross income of the Salford electricity undertaking during the year ended March 31 last, amounted to £318 218 as against £307 669 the previous year. The undertaking has made a net profit of £26 689, compared with £29 825 the preceding year. Out of profits the sum of £10 000 has been added to the reserve fund, plus £4 659 representing interest, etc., bringing the total reserve to £80 350. The balance of profits has been utilised for the purchase of cookers, appliances, meters, etc.

Coulsdon Housing Committee has received correspondence from the County of London Electricity Supply Co., Ltd., in which the company expresses its willingness to undertake the free wiring of council houses on the Kenley and Coulsdon housing schemes, subject to 80% of the tenants being willing to take a constant supply of current and to the execution of landlord's and tenant's agreements. The Committee agreed in principle with the suggestion of the company and instructed the clerk to negotiate with the company upon the matter.

Eastbourne Electricity Committee has received application for a special rate for the supply of current to houses to be erected on the Downlands Estate, in which it is proposed to use electricity throughout for all purposes. This would not be an economic proposition at the proposed flat rates of 8d. per kWh for lighting and 1½d. per kWh for other purposes and the electrical engineer suggests that in this and similar instances for " all-electric " houses a two-part tariff should be adopted, the fixed charge on the premises being 20% of the rateable value and a charge for electricity consumed of 1d. per kWh, with a minimum consumption of 500 kWh per quarter. The suggestion was approved.

Birkenhead Corporation electricity undertaking, which now supplies twenty-eight parishes in addition to the urban areas of Bebington and Bromborough and Neston and Parkgate, has just connected Greasby Village with the Corporation mains. There are nearly 300 miles of h.t. and l.t. mains in an area of over 70 square miles. Six years ago there were 8 000 domestic consumers while to-day there are over 21 000. The consumption last year was 24 593 680 kWh as compared with 10 534 270 in the year 1925. Over 12 000 fires, cookers and other appliances are in use. Overhead lines to supply current from Greasby to the Wirral Council's sewerage works at Saughall Massie are being erected.

The electrical engineer of Guildford reports that, owing to the rapid growth of the supply in the Guildown area, the mains which were laid many years before the Corporation acquired the undertaking are now inadequate. He recommends that an overhead transmission line be erected from Shalford Road across the meadows, crossing the river at St. Catherine's, and that an underground line be laid up Ferry Lane, and along Portsmouth Road and Chestnut Avenue to Guildown. The estimated cost of the scheme, including transformers and the conversion of consumers' appliances, is £2 350. The Electricity Committee has approved the proposal, and is asking the consent of Hambledon R.D.C. and the Ministry of Transport to the erection of the overhead lines.

A report published by the Swiss Federal Water Board states that in 1929 three power stations with 94 000 H.P. were put into operation, making the total capacity of Swiss hydro-electric stations 2 236 000 H.P. At the end of the year there were six stations in course of construction, which will have an aggregate capacity of 328 000 H.P. The total production of electricity in the Swiss hydro-electric stations last year was approximately 5 300 000 000 kWh, or 1 300 kWh per head of the population. The increase in the quantity generated showed an increase of about 159 000 000 kWh. At the end of 1929 permission had been given for the export of 446 614 kW, but the plant in operation would only have enabled 274 074 kW to be exported. Only 990 000 000 kWh, or 26·4% of the energy available to third parties, was actually exported.

Chester Corporation has authorised the carrying out of the scheme for public lighting approved by the Watch Committee at an estimated cost of £13 000, and the electrical engineer has been authorised to purchase from the Revo Electric Co. the necessary standards and fittings in accordance with the drawings approved by the Watch Committee, and arrange for the carrying out of the necessary work of erection and installation of standards and fittings and the laying of cables. The electrical engineer having reported that the electricity department, in collaboration with Ferranti, Ltd., has been experimenting with electricity on the heating of comparatively large quantities of water, with satisfactory results, and advised the adoption of a commercial tariff for the supply of electricity for heating water during off-peak load periods. It has been decided to supply electricity for water heating at a charge of ½d. per kWh net.

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ELECTRICAL PICTURES OF THE WEEK.

Attractive new showrooms have been opened by the Birmingham Electric Supply Department at 23, Lordswood Road, Harborne, a rapidly growing suburb, by means of which the department hopes to increase the domestic load. Externally the premises present a smart appearance and the initial window displays were devoted to vacuum cleaners, bowl fires and small appliances. A large vertical illuminated sign is placed over the shop, and can be seen a considerable distance away, while two bracket lights finished in bronze illuminate the shop front. Inside, the walls are lined with oak panelling, and there is one large show case, running the entire length of the shop, in which is displayed a full range of domestic appliances. At the rear, a room has been equipped with a range of cookers, as supplied by the department on hire or hire-purchase, water-heaters of various sizes, and wash boilers. Arrangements are made for all of these to be demonstrated at any time.

A panoramic view of Chicago by night with the Wrigley building in floodlight on the left. In the centre are the Liquid Carbide, the London Life and Guarantee buildings, and the Chicago Motor Club. On the right is the Pureol building, with the famous West Walker drive in the foreground. The photograph was taken from Clarke Street Bridge.

The City Hall, Belfast, was subjected to floodlight during the visit of the Institution of Electrical Engineers on the occasion of their summer meeting, and, as the picture on the left shows, the beauties of the building lost nothing by the experiment. The right-hand picture was also taken during the summer meeting, and shows Mr. T. J. Monaghan, chairman of the Irish Centre, passing up the gangway of the s.s. "Musgrave" prior to casting off for a cruise round Belfast Harbour.

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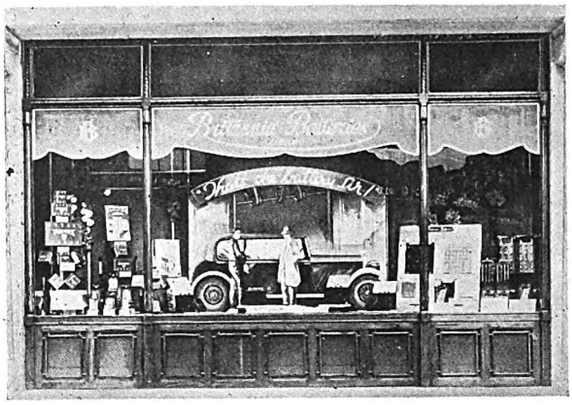
BUSINESS ITEMS.

IN connection with the illustration on page 773 of our last issue, of the electrically operated incubators at the Absol Park Farm, BLACKSTONE AND CO., LTD., advise us that two 32 B.H.P. spring injection heavy oil engines of their manufacture are included in the installation.



A WINDOW display of "Pertrix" batteries in the window of Britannia Batteries, Ltd., in Shaftesbury Avenue, London, W.

On and after June 21, the whole of the business of RADIO INSTRUMENTS, LTD., 12, Hyde Street, London, W.C.1, will be transferred to new premises comprising works, offices and showrooms, which have been built in Purley Way, Croydon, where all future goods and correspondence should be sent. The new telephone number is Croydon 3211 (3 lines) and the telegraphic address "Instradio, Croydon."

The ENGLISH ELECTRIC CO., LTD., has received a contract from the Central Electricity Board for transformers for the Mid-East England Scheme. The contract is for 16 units totalling 130 000 kVA and comprises six 10 000 kVA, 66kV transformers, two each for Kirkstall, Harrogate, and York; two 10 000 kVA, 22 kV transformers for Huddersfield; four 7 500 kVA, 33 kV units, two each for Peterborough and Barnsley; four 5 000 kVA, 33 kV transformers, two each for Rotherham and Doncaster. Each unit will be complete with "English Electric" on-load tap changing gear. The English Electric Co. believe themselves to be the only manufacturer to have in hand transformers for all the regional schemes for which orders have been placed.

METAL AND CHEMICAL PRICES.

TUESDAY, June 17

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£54 0 0	—	£5 10s. 0d.
Electro Wirebars	,,	£56 0 0	—	£5 10s 0d.
H.C. Wire, basis	per lb.	8½d.	—	⅛d.
Sheet	,,	9½d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	11½d.	—	⅛d.
Brass (60/40)—				
Rod, basis	per lb.	8½d.	—	—
Sheet ,,	,,	8¾d.	—	—
Wire ,,	,,	9d.	—	⅛d.
Pig Iron—				
Cleveland Warrants	per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£19 5 0	—	5s. 0d.
Foreign or Colonial	,,	£17 15 0	—	5s. 0d.
Tin—				
Ingot	per ton	£133 10 0	—	£5 15s. 0d.
Wire, basis	per lb.	1s. 10½d.	—	¼d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£16 10 0	—	5s. 0d.
Mercury	per bottle	£22 10 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10s.
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £31 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2¼d.
Sodium Bichromate—Per lb., 3¼d.

Rubber—Para fine, 7½d.; plantation, 1st latex, 6 11/16d.

∴ The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

According to James Forster and Co., the market has been quiet and, in spite of some official support, values have tended to sag away and close at the lowest. Closing prices on June 12 were £17 16s. 3d. for June, £17 17s. 6d. for July and August, and £17 18s. 9d. for September.

I.E.E. COMMITTEES.

Officers of Meter and Instrument, and Wireless Sections for Next Session.

NO nominations having been received from the general body of members of the Meter and Instrument Section to fill the vacancies which will occur on the Section Committee of the I.E.E. on September 30, those members nominated by the Committee are, under the Section's Rules, duly elected. The Committee for 1930-31 will therefore be:—CHAIRMAN: Mr. E. Fawssett. ORDINARY MEMBERS OF COMMITTEE: Messrs. F. A. East, A. J. Gibbons, E. W. Hill, W. Holmes, F. C. Knowles, W. Lawson, C. W. Marshall, E. H. Miller, William Phillips, G. F. Shotter, R. S. J. Spilsbury and Dr. C. V. Drysdale; a Member of Council (to be selected by the Section Committee), the President, I.E.E. (*ex officio*), the Chairman of the I.E.E. Papers Committee (*ex officio*).

No nominations having been received from the general body of members of the Wireless Section to fill the vacancies which will occur on the Section Committee on September 30 next, those members nominated by the Committee are under the Section's Rules elected. The Committee for 1930-31 will therefore be:—Mr. C. E. Rickard, Chairman; the President, I.E.E. (*ex officio*); the Chairman I.E.E. Papers Committee (*ex officio*); a representative of the I.E.E. Council; a representative of the I.E.E. General Purposes Committee; Lt.-Col. A. S. Angwin (nominated by the Post Office); Mr. R. H. Barfield, Mr. F. S. Barton (nominated by the Air Ministry); Mr. G. W. N. Cobbold; Mr. A. J. Gill; Capt. J. W. S. Dorling, R.N. (nominated by the Admiralty); Prof. E. Mallett; Mr. B. E. G. Mittell; Mr. E. B. Moullin; Mr. L. C. Pocock; Mr. E. H. Shaughnessy; Mr. G. Shearing; Commdr. J. A. Slee; Mr. L. B. Turner; Mr. P. K. Turner and Major J. S. Yule (nominated by the War Office).

Institution Premiums.

The Council of the Institution of Electrical Engineers have awarded the following premiums for Meter and Instrument Section papers and also for Students' papers for the Session 1929–1930:—METER AND INSTRUMENT SECTION.—SILVANUS THOMPSON PREMIUM to Messrs. E. H. Rayner, W. G. Standring, R. Davis and G. W. Bowdler. A Premium to Messrs. A. E. Moore and W. T. Slater. STUDENTS' PREMIUMS to Mr. E. W. Connon, J. C. Emerson and J. W. Moffatt, L. E. C. Hughes, C. S. T. Paul, W. G. Thompson, C. H. Bradbury and S. M. Lejeune. THE STUDENTS' PRIZE, SESSION 1929–30. The Students' Prize of £10 offered by the Council for the best paper on the subject of "The Relations between Economics and Engineering," submitted by a Student, or Graduate under the age of 28, during the Session 1929–30, has been awarded jointly to Mr. V. A. H. Clements and Mr. A. K. Robinson for the papers submitted by them, the amount of the prize being divided equally between these two authors.

COMING EVENTS.

Saturday, June 21.

SHEFFIELD ILLUMINATION SOCIETY.—Annual Outing, Belle Vue, Manchester.
THE ADVERTISING ASSOCIATION.—Sixth Annual Convention, Hastings. Opening ceremony by Sir James Parr. 4.30 *p.m.*

Saturday, June 21—Saturday, June 28.

INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.—Summer meeting in Holland.

Monday, June 23.

THE ADVERTISING ASSOCIATION CONVENTION.—Hastings. "Increasing Trade by Advertising." Speakers include Lord Riddell, Lord Luke of Pavenham, Sir Stanley Reed and Sir Ernest Benn. 10.30 a.m. Invtaition Luncheon. 1 *p.m.*

Monday, June 23—Wednesday, June 25.

INSTITUTION OF HEATING AND VENTILATING ENGINEERS.—Grand Hotel, Eastbourne. Annual Summer Meeting.

Tuesday, June 24.

THE ADVERTISING ASSOCIATION CONVENTION.—Hastings. Industrial Press Luncheon. Chairman: Mr. E. A. Gatehouse. 1 *p.m.* "The Service Expected from a Trade Journal," by Mr. C. Pinkham. Official Banquet, White Rock Pavilion. 7 for 7.30 *p.m.*

Wednesday, June 25.

ELECTRICAL CONTRACTORS' ASSOCIATION.—Llandudno. Annual Conference.
ELECTRICAL CONTRACTORS' ASSOCIATION (WEST OF LONDON SUB-BRANCH).—Ordinary meeting.
ELECTRICAL CONTRACTORS' ASSOCIATION (BELFAST BRANCH).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*
ROYAL SOCIETY.—Burlington House, London. Conversazione.

Thursday, June 26.

ELECTRICAL CONTRACTORS' ASSOCIATION.—Town Hall, Llandudno. Annual Conference. Annual General Meeting, 9.30 *a.m.*; Presidential Address by Mr. H. Willoughby-Ellis, 11.30 *a.m.*; Paper by Mr. C. H. Flower on "The Future of Electrical Contracting." 2.30 *p.m.*

Friday, June 27.

ELECTRICAL CONTRACTORS' ASSOCIATION.—Town Hall, Llandudno. Annual Conference. Paper by Mr. W. Cross on "Specifications and their Problems," 9.30 *a.m.*; short address by the new President, 12 *noon*; ball and supper, Grand Hotel, 9 *p.m.*

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FINANCIAL INTELLIGENCE.

Electrical Companies' Profits for 1929, with Appropriations and Percentages to Capital.

By "AUDITOR."

THE results of 25 electrical manufacturing and equipment companies for the last financial year are tabulated below, showing the sums distributed in the form of dividends; the reserves, etc., allocated; and the amounts of other appropriations, together with percentages indicating the relation of each item to the issued capital. Current or recent prices are given, with the yield :—

	Issued Capital	Brought Forward		Profit		Total		Dividends Distributed		Reserves, etc., Allocated		Other Appropriations		Carried Forward		Total		Ann. Divs.	Par Val.	Recent Price	Yield
	£	£	%	£	%	£	%	£	%	£	%	£	%	£	%	£	%				
Assoc. Elec. Industries ..	3 498 900	101 850	2·15	261 812	5·53	363 662	7·68	239 148	5·05	15 273	0·32	—	—	109 241	2·31	363 662	7·68	6	£1	25/-	4·80
,, ,, 8% Cum. Pref. ..	1 233 050	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	£2	28	6·09
	4 731 950																				
Automatic Telephone ..	500 000	93 483	13·35	118 802	16·97	212 285	30·32	74 500	10·64	19 500	2·79	—	—	118 285	16·89	212 285	30·32	12½	£1	35/9	6·99
,, ,, 6% Cum. Pref. ..	200 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	20/-	6·00
	700 000																				
Brit. Insulated Cables ..	1 666 666	250 089	9·38	636 550	23·87	886 639	33·25	307 500	11·53	298 333	11·19	—	—	280 806	10·53	886 639	33·25	15	£1	76/-	3·95
,, ,, 6% Cum. Pref. ..	500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	23/9	5·05
,, ,, 5½% Cum. Pref. ..	500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5½	£1	21/-	5·24
	2 666 666																				
British Thomson Houston ..	2 000 000	203 066	5·80	166 196	4·75	369 262	10·55	164 000	4·69	—	—	—	—	205 262	5·86	369 262	10·55	5	£1	—	—
,, ,, 7% Cum. Pref. ..	1 500 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	£1	23/6	5·96
	3 500 000																				
Brush Elec. Eng.	487 430	—	—	58 988	12·10	58 988	..	48 743	10·00	5 413	1·11	4 832	0·99	—	—	58 988	12·10	10	£100	121	8·26
	487 430																				
Chloride Elec. Storage		69 833	12·24	283 624	49·72	353 457	61·96	156 132	27·37	111 500	19·55	—	—	85 825	15·04	353 457	61·96	—	—	—	—
,, ,, "A" Ord. ..	395 550	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	£1	62/6	9·60
,, ,, "B" Ord. ..	112 907	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	£1	62/6	9·60
,, ,, 6% Cum. Pref. ..	62 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	21/-	5·71
	570 457																				
Clifford (Charles)	60 000	44 773	49·75	14 483	16·10	59 256	65·85	10 800	12·00	9 260	10·30	—	—	39 196	43·55	59 256	65·85	15	£1	59/6	5·04
,, ,, 6% Cum. Pref. ..	30 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	19/6	6·16
	90 000																				
Clifford Motor Components ..	85 000	—	—	8 241	9·70	8 241	9·70	3 400	4·00	1 000	1·18	2 500	2·94	1 341	1·58	8 241	9·70	5	2/-	1/3	8·00
	85 000																				
Craigpark Elec. Cable	37 500	2 200	2·59	22 525	26·50	24 725	29·09	6 600	7·76	13 500	15·88	1 000	1·18	3 625	4·27	24 725	29·09	10	£1	25/3	7·92
,, ,, 6% Cum. Pref. ..	47 500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	£1	16/6	7·27
	85 000																				
Crystalate Gramo. Record ..	150 000	13 920	5·57	66 539	26·61	80 459	32·18	53 000	21·20	8 840	3·54	6 037	2·41	12 582	5·03	80 459	32·18	33⅓	1/-	3/-	11·11
,, ,, 8% Cum. Pref. ..	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	10/-	9/6	8·42
	250 000																				
Currys (1927)	300 000	2 114	0·42	40 332	8·07	42 446	8·49	30 000	6·00	10 000	2·00	—	—	2 446	0·49	42 446	8·49	5	10/-	—	—
,, ,, 7½% Cum. Pref. ..	200 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	£1	—	—
	500 000																				
Davis & Timmins	70 000	21 316	12·54	26 068	15·33	47 384	27·87	20 500	12·06	4 912	2·89	1 153	0·68	20 819	12·24	47 384	27·87	20	£1	44/6	8·99
,, ,, 6½% Cum. Pref. ..	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6½	£1	20/-	6·50
	170 000																				
Edison Bell	150 000	9 780	3·26	28 146	9·38	37 926	12·64	26 250	8·75	—	—	3 000	1·00	8 676	2·89	37 926	12·64	10	£1	21/-	9·52
,, ,, 7½% Cum. Pref. ..	150 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	£1	15/-	10·00
	300 000																				
Edison Bell (Int.)	225 000	—	—	5 620	2·50	5 620	2·50	—	—	—	—	—	—	5 620	2·50	5 620	2·50	—	£1	7/6	—
	225 000																				
Edison Swan Elec.	191 435	18 929	6·49	50 965	17·48	69 894	23·97	26 644	9·14	30 000	10·29	—	—	13 250	4·54	69 894	23·97	10	4/-	13/6	2·96
,, ,, 7½% Cum. 1st Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	£1	24/4	6·17
	291 435																				
Electric Construction ..	300 000	5 888	1·62	14 874	4·10	20 762	5·72	19 395	5·34	—	—	—	—	1 367	0·38	20 762	5·72	5	£1	13/2	7·59
,, ,, 7% Cum. Pref. ..	62 780	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	£1	21/3	6·59
	362 780																				
Enfield Cable Works	350 000	31 650	5·75	129 409	23·53	161 059	29·28	102 500	18·64	25 000	4·54	—	—	33 559	6·10	161 059	29·28	25	£1	86/-	5·81
,, ,, 7½% Cum. Pref. ..	200 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	£1	26/-	6·00
	550 000																				
Ever-Ready (Gt. Britain) ..	542 800	30 696	4·13	244 555	32·93	275 251	37·06	209 980	28·27	31 272	4·21	—	—	33 999	4·58	275 251	37·06	35	5/-	17/7	10·00
,, ,, 7% Cum. Pref. ..	200 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	£1	30/-	6·6
	742 800																				
Garrard Eng. & Mfg.	65 000	17 356	12·39	69 899	49·93	87 255	62·32	40 000	28·57	30 000	21·43	—	—	17 255	12·32	87 255	62·32	50	1/-	4/10	10·35
,, ,, Preferred ..	75 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	£1	22/9	8·79
	140 000																				
Hopkinsons	350 000	19 311	2·76	78 627	11·23	97 938	13·99	47 600	6·80	31 000	4·43	—	—	19 338	2·76	97 938	13·99	10	£1	30/8	6·52
,, ,, 7% Cum. Pref. ..	350 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	£1	23/6	5·96
	700 000																				
Johnson & Phillips	600 000	80 903	13·48	102 514	17·09	183 417	30·57	60 000	10·00	—	—	—	—	123 417	20·57	183 417	30·57	10	£1	37/-	5·41
	600 000																				
London Elec. Wire & Smiths ..	644 070	22 759	2·18	110 620	10·59	133 379	12·77	78 305	7·50	25 000	2·39	—	—	30 074	2·88	133 379	12·77	7½	£1	23/9	6·32
,, ,, 7½% Cum. Pref. ..	400 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	£1	23/9	6·32
	1 044 070																				
Kolster-Brandes	1 166 000	—	—	24 794	2·13	33 044*	2·84	—	—	—	—	30 296	2·60	2 748	0·24	33 044	2·84	—	£1	3/8	—
	1 166 000																				
Lesser (S.)	100 000	7 663	3·07	25 150	10·05	32 813	13·12	22 000	8·80	—	—	6 352	2·54	4 461	1·78	32 813	13·12	10	10/-	—	—
,, ,, 8% Cum. Pref. ..	150 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	£1	20/-	8·00
	250 000																				
Nat. Elec. Construction ..	85 000	5 604	6·59	17 850	21·00	23 454	27·59	8 233	9·69	10 000	11·76	—	—	5 221	6·14	23 454	27·59	12½	10/-	23/2	5·39
	85 000																				

* Including other income £8 250 (0·71%).

The issued capital of above 25 companies ranking for dividend aggregates £20 293 588. Summary of Appropriation Accounts :—

Brt. Fwd. from 1928	£1 053 183	Divs. Distributed ..	£1 715 230
Profits, 1929 ..	2 607 183	To Reserves, etc...	719 803
Other Income ..	8 250	Other Appropriations	55 170
		Carried Fwd. ..	1 178 413
	£3 668 616		£3 668 616

The percentage of profit realised in relation to issued capital works out at 12·85%, while the percentage allocated to reserves, etc., was 3·55%. Dividends actually distributed on ordinary and preference capital averaged 8·45% of the invested capital, and "other appropriations" absorbed 0·27%. The sum brought forward from the previous accounting period was 5·19% of the capital, and the sum carried forward to the next appropriation is 5·81%. "Other Income" was 0·04% of capital.

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COMPANY NEWS.

Dull Market in Electrical Securities—General Electric Dividend and Bonus—Motor Accessories Companies' Arrangement—Meeting of British Electric Traction Company.

THE market in electrical securities during the past week has again been dull, and the changes in quotations have been for the most part in a downward direction. County of London Electric Supply ordinary have dropped nearly 2s. to 45s. 7½d.; the 7% preference, however, have maintained last week's rise of 6d. Hydro-Electric Securities and International Holdings have continued to decline, the former having receded from 44¼ to 41 and the latter from 5⅜ to 5¼; Metropolitan Electric Supply ordinary have declined from 41s. 3d. to 40s., Scottish Power ordinary from 29s. to 28s., Victoria Falls Power ordinary from 60s. 7½d. to 60s., Whitehall Electric Investments debentures from 103 to 102 and Yorkshire Electric Power ordinary from 33s. 1½d. to 31s. 3d. A bright spot in the electricity supply section is the increase in Adelaide Electric Supply 6½% preference stock from 104 to 106.

London Electric Railway preference having dropped a point to 70, Metropolitan Railway consolidated ordinary a point to 64½, while the 3½% preference have suffered a similar decline to 63½, and Rio de Janeiro Tramways 50-year bonds have receded from 89½ to 88½. Metropolitan District ordinary have shed a half, and stand at 76.

In the manufacturing section, Henley's Telegraph Works ordinary advanced a sixteenth to 123s. 9d. and General Electric ordinary from 47s. 6d. to 48s. 9d., while Associated Electrical Industries 8% preference have retained last week's rise of nearly 2s. and Crompton Parkinson 8% preference have also remained at last week's increased figure of 25s.

American Telephone and Telegraph have continued to slump, having dropped a further $10 to $220, and Cables and Wireless stocks are also still on the down grade, A. and B. ordinary and 5½% preference each having dropped half a point. Eastern Telegraph 3½% preference have fallen from 64½ to 63½, Eastern Extension 4% debenture stock from 78 to 76½; International Telephone and Telegraph from 58¼ to 50, Marconi International Marine from 36s. 3d. to 33s. 9d. and Radio Corporation from 42½ to 40¼.

Last Annl. Divd.%	Description.	This Week.	Last Week	1926 to 1929 Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98¾
6½	" " "C" 6½% Cm. Pf. Stk.	106	104	117½	98¾
15	B'mouth & Poole El. S. Ord. ..	57/6	57/6	78/-	29/9
6	" " 6% Cm. Pf.	22/-	22/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/-	32/6
5	" " 5% Cum. Pref.	20/-	20/-	23/3	19/10
4	Central Electricity Board 4% Stk.	82	82	81	77½
4	Central Elec. Sup. 4% Deb. ..	93½	93½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	28/-	28/-	51/-	24/3
4½	" " " 4½% C.P. (£1)	18/-	18/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	" " " 6% C.P.	23/-	23/-	24/3	21/6
8	Clyde Valley Electl. Power Ord. .	38/1½	38/1½	44/6	26/6
8	" " " 8% Pref.	28/6	28/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/-	23/-	25/6	19/-
11	County Lon. Elec. Sup. Ord. ..	45/7½	47/6	68/6	25/9
6	" " " 6% C.P.	23/6	23/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/6	24/6	27/-	21/6
(g)	Electric Supp. Corp. Ord.	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	22/-	22/-	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/-	35/-	47/4	26/9
4	Fife Tram. Lt. & P. Ord.	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	90	90	92	80½
—	Hydro Electric Securities ..	41	44½	87	20
—	International Holdings	5⅜	5⅜	35⅜	6
(e)	Kensington & K'bridge Ord. (£1)	27/-	27/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	25/-	25/-	32/9	22/10
6	" " " 6% C. 1st Pref.	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/-*	27/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	29/6	29/6	37/6	23/-
5	London Power Co. 5% Deb. Stk. ..	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	170	170	182	150
10	Metro. Elec. Sup. Ord.	40/-	41/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	27/-	27/6	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	25/-	25/-	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord.	22/6	22/6	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/-
6	Notting Hill 6% C.P. (£10) ..	10⅜	10⅜	11¼	9¼
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(c)	St. James' & P.M. Ord. (£1) ..	28/-	28/-	28/6	23/6
8	Scottish Power Ord.	28/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/-	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92*	94	98½	86¼
7	Urban E.S. Ord.	32/6	32/6	46/6	18/-
5	Victoria Falls Power Ord. ..	60/-	60/7½	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	94½	93½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	" " " 6% Pf. Stk.	132½	132½	133	103½
6	Calcutta Trams Ord.	12/6	12/6	24/-	14/-
5	" " " 5% Cum. Pf.	12/6	12/6	15/9	13/-
(h)	Cent. Lon. Ry. Ord. Stk. (asstd.)	77	77	74½	54
4½	" " " 4½ Pf.	80½	80½	85½	78
4	" " " 4% Deb. ..	79	79	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	78½	78½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	" " " " 4% Pf. Stk.	70	71	77	68
4	" " " " 4% Deb. ..	79	79	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95	95	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	78	78	75½	62
5	" " " 5% Deb. ..	82½	82½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	64½	65½	81	54½
3½	" " 3½% Pf. Stk. ..	63½	64½	76	60½
3½	" " " 3½% Deb. ..	71	71	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	76	76½	81½	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	88½	89½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
(i) 9	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/-	23/-	28/6	11/-
5	Winnipeg Elec. Refg. Mt. Stk. ..	87	87	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb.	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	23/9	25/6	58/6	26/3
8	" " " 8% C.P.	52/6	52/6	56/9	49/6
4	" " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	99/4½	56/-
6	" " " 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref.	23/-	23/-	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	120½	120½	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/-
7½	" " 7½% B. Pref.	26/10½	26/10½	28/3	25/-
12	Consolidated Signal Ord. ..	35/-	35/-	52/-	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	19/-	19/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	13/1½	13/1½	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	20/-
4	" " 1st Mt. Deb. ..	69½	69½	75	68
20	Enfield Cable Works Ord. ..	85/-	85/-	112/6	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	3/9	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	5/-
5½	" " 1st Mt. Deb. ..	89	89	103½	86
6	" " Conv. Deb. ..	67½	67½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	16/9	17/6	92/3	17/10½
10	" " 7% Partic. Pref. ..	29/6	29/6	34/2	23/9
6	Ferranti 6% Pref.	19/6	19/6	19/4½	16/9
10	General Elec. Ord.	48/9	47/6	81/3	26/6
6½	" " "A" C.P. ..	23/9	23/9	26/-	22/-
7½	" " "B" C.P. ..	26/-	26/-	27/9	22/9
7	" " 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	123/9	122/6	136/10½	69/3
12½	International Auto. Telephone Ord	32/6	32/6	50/6	35/-
10	Johnson & Phillips Ord. ..	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref. ..	23/9	23/9	25/6	22/3
12½	Nat. Elec. Construction (10/-) ..	23/1½	23/1½	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	23/9	23/9	36/6	23/6
10	" " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " Deb. Stk.	92½	92½	95	88½
10	Telegraph Const. Ord. (£12) ..	18½	19½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph.				
9	Amer. Tele. & Teleg. Cap. Stk. .	$220	$230	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk	103½	103½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo-Portuguese Tele. Ord. ..	21/10½	21/10½	26/-	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	37½	38	90½	73½
—	"B" Ord. Stk.	17½	18	104	33
—	5½% Cum. Pref. Stk. ..	88½	89	99	90
3½	Eastern 3½% Pref. Stk. ..	63½	64½	70½	58½
4	" 4% Deb.	78	78	81½	73
4	Eastern Extension 4% Deb. Stk.	76½	78	80½	73
22	Great Northern Telegraph (£10)	30	30	43⅜	26
—	International Teleph. & Teleg. ..	$50	$58½	161½	48½
15	Marconi Int. Mar.	33/9	36/3	90/-	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	99½	102½	95
12	Oriental Telephone Ord.	55/-	55/-	65/-	41/-
—	Radio Corporation of America ..	40½	42½	115⅝	18⅜
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/-	81/3
	Western Tel. 4% Deb. Stk. ..	78	78	82	75

(a) 19/16d. per share. (b) 1s. 9·2d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·477d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. (g) 2s. 2⅜d. per share. (h) 88s. 2·136d. (i) 9%, plus special bonus of 30% from sale of omnibus company's shares. * Ex dividend.

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Directors' Reports, etc.

MIRRLEES, BICKERTON AND DAY, LTD.—A final div. of 7% less tax, is announced.

SOCIETA GENERALE ELETTRICA DELL 'ADAMELLO, MILAN.—Div. of 14 lire, agst. 18 lire, is announced.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Div. of 1¾% on pref. stk. for qtr. ended June 13, 1930, is announced.

TELEPHONE RENTALS CO., LTD.—Fin. div. of 2½%. Net rev. for past year £50 748. Pfts. earned by subsidiary companies, £68 020.

ASSOCIATED ELECTRICAL INDUSTRIES, LTD.—Div. for half year ending June 30, 1930, on 8% cum. pref. shs. will be payable on July 1.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—Directors have declared regular qtrly. div. of 50 cents. p. sh. payable July 15.

KANSAS GAS AND ELECTRIC CO.—An issue of $16 000 000 1st mtge. 4½% bonds of this company was made in NewYork on May 26.

EASTERN TELEGRAPH CO., LTD.—Payment of div. at the rate of 3½% per annum, less income tax, on the pref. stock for quarter ending June 30, will be made on July 15.

BIG DEAL IN NORWEGIAN CABLE MAKERS' SHARES.—The Standard Electric Co., of Oslo, has acquired a majority holding in the Scandinavian Cable and Rubber Manufacturing Co.

ELECTRIC AND GENERAL INVESTMENT CO., LTD.—Fin. div. of 5% on ord. shs., makg. 10% for year to May 31 (same) and div. on dfd. shs. of 200%, agst. 100%. The divs. will be payable on July 1.

GENERAL ELECTRIC CO., LTD.—Pfts. for year ended March 31 last, £1 179 007; an increase of £94 930 compared with previous year, when the high level attained in 1926–27 of £1 076 809 was exceeded. Proposed to pay a bonus of 4 % in addition to the 10 % div. on ord. shs. For two precedg. years div. was at 10 % per annum, without bonus.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Net rev. for 1929, $2 759 674, increase $146 362. Fixed div. of 7% and participatg. div. of 1% on pref. cap. and div. of 1% on ord. shs. were paid during year. Surplus, includg. $413 159 brt. in, $1 159 099. Divs. of 2¾% on pref. and 1% on ord. shs. were paid in March, 1930. Prospects for currt. year are stated, on the whole, to be good.

DUDLEY, STOURBRIDGE AND DISTRICT ELECTRIC TRACTION CO., LTD.—Mtg. of shhldrs. is to be held for purpose of passg. resolutns. for winding-up company voluntarily. Birmingham and District Investment Trust will forthwith hand to company sufficient funds to enable it to purchase for cancellation any or all of outstandg. £103 140 6% deb. stk. at par, with accrued int. up to July 15. Whole system of tramways worked by co. was discontinued on March 1 last.

JAMES KEITH AND BLACKMAN CO., LTD.—Amt. of business done during year ended March 31, 1930, exceeded that of previous year. After providg. for deb. int., paymt. of pref. div. and makg. allowance for depreciatn. and reserves against doubtful debts, accts. show available blce. at credit of the pft. and loss acct., £55 369. It is proposed to declare div. on ord. shs. at rate of 17½%, less tax at 4s. 6d. in £, absorbing £27 125; to transfer to res. acct., £12 000; and carry fwd., £16 244.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—In presentg. half-yrly. statemt. regardg. co.'s tradg., directors regret that results for first half of currt. year have not come up to their expectatns. Trade conditns. in their industry, in common with many others, have been very difficult and have adversely affected certain sectns. of their business. Other sectns., however, are maintaining both output and pfts. and directors are takg. energetic steps to develop these departmts. and, if necessary, to restrict or even abandon others which hamper their progress. From past experience directors look for usual improvemt. in second half of co.'s year, and have decided that pref. div. due July 1 shall be paid on that date. Sh. registers are closed until June 30.

S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—Company announces that it has sold to Messrs. Joseph Lucas the electric lighting and starting and magneto portn. of its business. It is stated that this sale will enable both companies to concentrate their efforts on those lines in which they have specialised for many years. There is no question of any amalgamatn. between the two firms, but arrangemts. are being considered by which the servicing of Smith instrumts. will be carried out at the depots and service stations of Messrs. Lucas throughout the country, as well as at the present Smith depots and service statns. It is stated that the demand for the new lines introduced last year by S. Smith and Sons (Motor Accessories), Ltd., will more than fill the loss in turnover created by the sale of their lighting and starting business.

Company Meetings.

ELECTRAMONIC CO., LTD.—An extraordinary general meeting of this company was held at the Cannon Street Hotel, London, E.C., on June 11. Mr. A. Jerrold Nathan (chairman), who presided, said that in consequence of the shareholders' decision at the last meeting to accept the resignation of the then directors and to appoint the present board as a committee of inspection, it to-day placed before them the report and accounts of the company as at October 31. The present directors were not responsible for a single item therein. To go into the details of the document, said the chairman, was unnecessary, nor would it advance the purpose they had in hand to criticise individual members of the past board. Mr. Nathan attributed the position in which the company now found itself in part to the fact that shortly after the commencement of manufacture some new models came on the market, which caught the fancy of the public. The Electramonic Board had either to alter the models already made or to scrap them. It was decided to adopt the former course, and this had cost the company thousands of pounds. A great deal of money would have been saved had the directors exercised that amount of caution so essential in the first years of a company's life. Mr. Nathan then put to the meeting resolutions providing for the winding up of the old company, and for the registration of a new undertaking to be called the Electramonic Co. (1930), and for the appointment of Mr. George E. Seaman as liquidator. The resolutions were put to the meeting and carried with one dissentient, and the meeting concluded.

ELECTRIC SUPPLY CORPORATION, LTD.—Speaking at the annual general meeting of this company on June 12, Mr. J. G. B. Stone (chairman) said the number of the undertakings in their hands was reduced by the exclusion of Jedburgh, Dollar and Exmouth. The list of company undertakings was the same as last year, with the exception of Wellington, with which they had parted. The lamp connections of their own undertakings showed an increase of 28 504, which was a normal figure. As to the other company undertakings, Hendon showed a steady increase; Steyning figures for 1928 had been omitted, as before acquisition of the company the records were kept differently. Haywards Heath could not extend rapidly until a bulk supply from the Central Electricity Board was forthcoming; Petersfield, which changed over to bulk supply in the latter part of the year, showed a gratifying increase; Alton was also progressing, with an increase of nearly 50 %; Newhaven and Seaford was developing rapidly; and Peterhead, which operated only during the latter part of the year, had made a good beginning. The capital account of the company increased by £16 715 during the year. At Chelmsford the expenditure had been on mains, in Dumbarton on mains and additional converting plant, in St. Andrews the figure was trifling, and in Hitchin mains and transformers accounted for the outlay. The statements of capital and of reserve accounts called for no special comment. The exclusion of figures for Dollar, Exmouth, and Jedburgh, which appeared in the 1928 revenue account, was responsible for the reduction under the headings of working costs and revenue, but by the investment of funds received from the sale of these undertakings there was an increase in the amount of the interest received. They had made some alteration in the arrangement of accounts since last year by bringing the interest and rent items and the transfer fees into the revenue account. They previously took these items into the net revenue account. An actual comparison with 1928 showed that in that year their own undertakings, revenue exceeded working costs by £40 316; for 1929 the figure was £35 119. In 1928 the interest on investments amounted to £15 151, whereas in 1929 it was £21 028. Taking these two items together, they had £55 467 in 1928, against £56 147 in 1929. Transfer fees and interest payable accounted for the difference between this last figure and the balance carried to net revenue account. Finally, they carried to the balance-sheet £43 289, against £38 902 in 1928. The directors recommended a transfer of £5 373 13s. 9d. to the repairs, renewals, and depreciation fund, bringing it up to £75 000. This fund was now relieved of any provision on account of Exmouth Undertaking, on which they had expended £52 490. The directors recommended also the distribution of a final dividend of 7 % on the ordinary shares, which was the same as last year, and they proposed to carry forward £20 415 17s. 3d., compared with £17 012 18s. 11d. brought in from 1928.

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BRITISH ELECTRIC TRACTION CO., LTD.

Increase of £56 000 in Profits During Past Year—Sale of Pelotas Undertaking—The Position of the Deferred Stock—Sales of Omnibus Interests.

THE thirty-fourth ordinary general meeting of the British Electric Traction Co., Ltd., was held on Monday, June 16, at Winchester House, London, E.C.

Mr. J. S. Austen (chairman) said that the profits during the past year had increased by £56 000. That figure had been arrived at after the deduction of income tax, which meant that they had really had to make £70 000, which, for a company which derived its income from dividends of a miscellaneous character, was a very considerable sum. He did not know what the shareholders had expected, but personally it was larger than he had anticipated.

There were two events of the past year to which he must draw attention, and the first was the sale of the undertaking which they had always called the Pelotas undertaking, which had been an unremunerative electric concern in Brazil. Part of the purchase money had been paid, and the rest was payable by instalments. The net effect of the transaction was that £300 000, which had hitherto been unproductive, now came gradually into bearing. The other event was the sales which had taken place of their various omnibus interests by their allied company, the Tilling and British Automobile Traction Co. and themselves. He might mention that their own interests had been insignificant. The only comment he would make on that was that it was his belief that the community of interests between the omnibus companies and the railway companies which had now been created would ultimately redound to the benefit at any rate of the 'bus companies. Otherwise those sales did not immediately affect the company. Since the end of the year, however, their subsidiary, the Birmingham and District Investment Trust, had carried out a very large deal.

Dealing with the position of the deferred stock, the chairman said that the real object of its creation had been so that by that means the stockholders might recover the serious losses of capital which they had sustained. Therefore, they must not look for any increase in dividends on that stock, at any rate, this year. So far, their present system had worked extremely well, but it could not go on for ever, and sooner or later they must see whether they could not form some other scheme by means of which they could extract from the company the very last ounce of capital value which was inherent in it. When that time came they would know a little better than they did to-day exactly how they stood. He would like to give them an indication of its present value based on the earning power of the company. In the first place he had assumed a value of 1 500%. Then he multiplied the present amount of stock by 15, and, as a result, they got £2 500 000, as being the capitalised value of that stock. To pay 6% on a sum of £2 500 000 took £150 000 a year. Comparing that with the income of the past year, by putting that income on a gross basis, that was before deduction of tax, he found they had £109 000, which left a deficiency of £41 000. They must not be disappointed with that deficiency, because, since the end of the year, their subsidiary, the Birmingham and District Investment Trust, in which they held £847 000, had declared a bonus of 100% in 6% preference shares which would bring them in a very comfortable £50 000 a year. Those figures, he thought, indicated that a value of 1 500% for the stock was justified, without taking into account the future possibilities of the company. But that was regarding the stock simply as an ordinary dividend-paying proposition; it indicated that the break-up value was considerably more. If they could put the company into liquidation and pay off their debentures and their preference and preferred ordinary stocks, he had not the slightest doubt that they would get nearer 2 000 than 1 500 for their stock, but unfortunately, that was an impossible proposition, because the preponderating vote was held by the preferred ordinary stock, and it was most improbable that the holders of that stock were going to give up the 8% which they got, just for the benefit of the deferred stockholders.

He was not going to say anything about the economic disaster which seemed to be falling upon the whole of the world, because he hoped to strike a note of encouragement. If he had done that he would be satisfied, and he hoped that the stockholders on their part would be equally satisfied with what he had said. (Applause.)

The report and accounts were adopted, and the other business of the meeting was duly transacted.

COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BIGGS, GEORGE, AND SON, 5, Claypond Lane, Brentford, electricians. £31 8s. 10d. May 5.

CROSS AND CO., 32, Church Street, Baldock, wireless dealers. £18 14s. April 29.

ELECTRADIO CO., LTD., 25, Westbourne Grove, Paddington, wireless dealers. £13 9s. 8d. May 5.

JACKSON, Thomas, and JACKSON, M. L., 101, Oakleigh Park Drive, Leigh-on-Sea, electrical engineers. £34 5s. 10d. May 5.

NORBITON ELECTRIC CO., 190, London Road, Kingston. £15 1s. 5d. April 17.

PYE, Mr. F., 57, Handsworth Road, Blackpool, wireless factor. £18 13s. 5d. May 2.

Deed of Arrangement.

MORRIS, Edgar Reynolds, Knifesmith Gate, Chesterfield, and Matlock, electrical contractor. Dated June 5, filed June 10. Trustee, H. J. Watson, 57, Saltergate, Chesterfield. Liabilities unsecured, £1 638; assets, less secured claims, £597.

Receiverships.

ANEMOSTAT, LTD.—A. A. Lowe, C.A., of 12, Coleman Street, E.C., was appointed Receiver and Manager on May 30, 1930, under powers contained in 1st and 2nd debentures dated August 30 and December 18, 1929.

PICCADILLY SIGNS, LTD.—J. H. Macaulay, of 82, Cranley Gardens, Muswell Hill, N.10, was appointed Receiver and Manager on June 2, 1930, under powers contained in first debenture dated May 31, 1928.

RISSIK FRASER AND CO., LTD.—C. O. Skey, of 10, St. Swithin's Lane, E.C.4, was appointed receiver and manager on June 2, 1930, under powers contained in mortgage and charge dated December 8, 1928, in place of H. A. Brown, who died on May 30, 1930.

TRUPHONIC RADIO, LTD.—E. D. Besden, F.C.A., of 73, Basinghall Street, E.C., was appointed Receiver on May 31, 1930, under powers contained in debenture dated October 30, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

LAMBERT LAWS, LTD., electrical suppliers, 15, Gloucester Place, Brighton, and 109A, Chapel Road, Worthing. The statutory meeting of the creditors in this voluntary winding-up was held on June 10th at the offices of Mr. A. E. Orbell, accountant and auditor, 6 and 7, Old Steine, Brighton. The statement of affairs showed ranking liabilities of £2 687, of which £2 665 was due to the trade and £22 in respect of rent. After allowing for preferential claims, the net assets were £2 323, or a deficiency of £364. The assets comprised stock at cost £1 756; book debts, £749, estimated to produce £350; fixtures, fittings, office furniture, etc., valued at £28; cash at bank, £52; and cash in hand £150.

Mr. Orbell reported that the company was registered on March 29, 1928, with a capital of £2 000, for the purpose of taking over a business which had previously been carried on by Mr. Ernest Lambert at No. 15, Gloucester Place, Brighton. The company took over the assets of the business which were valued at £2 670, agreed to discharge liabilities of £670, and to allot to the vendor or his nominee fully paid shares to the value of £2 000. The assets transferred to the company consisted of book debts, £584; stock, £1 200; cash at bank, £100; lease, £100; fixed plant, £25; and loose plant and goodwill, £661. The first directors were Mr. and Mrs. Lambert, and subsequently Mr. A. W. Finn joined the board. The business at Worthing was opened on May 25, 1928. That business had been treated as a customer of the Brighton company. Between June, 1928, and March, 1929, the turnover at Worthing was £1 841, whilst in the following twelve months it increased to

(*Continued on page* 812.)

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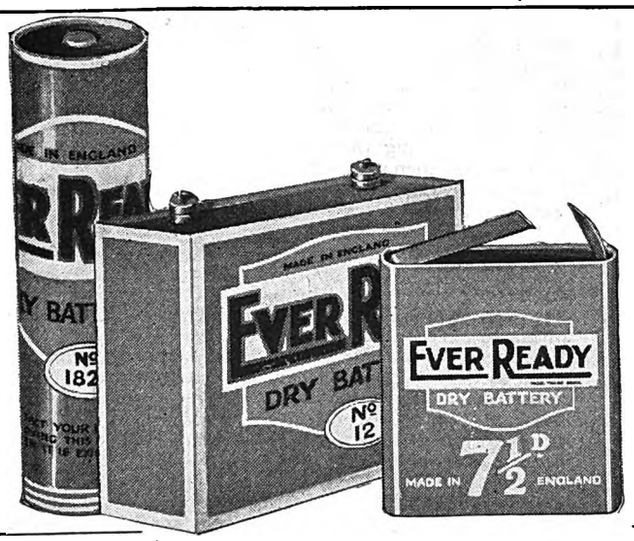

Refill Batteries.	Old Price	New Price
No. 1689, 3-cell P.L. (Green)	9d.	7½d.
„ 1289 „ (Red)	6d.	5d.
„ 1 „ large torch -	1/-	10½d.
„ 1829, 2-cell „ -	8d.	7d.
„ U 2, Unit cell „ -	4½d.	3½d.
„ 1839, 2-cell Baby torch -	7d.	6d.
„ 12, 15, 1215, 3-cell box type - -	1/6	1/3
„ 126, 3-cell (2 termls.) -	1/6	1/3

REFILL DRY BATTERIES

Wireless Batteries.	Old Price.	New Price.
WINNER 60 volt	7/-	6/6
„ 66 „	7/6	7/-
„ 99 „	11/6	10/9
„ 120 „	14/-	13/-

WINNER H.T. BATTERIES

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£2 266. The accounts of the company for the year to March, 1929, showed sales, etc., of £6 682, against purchases of £5 630. There was a gross profit earned of £1 024, but, after allowing for all the expenses, a net loss was incurred of £537. During the year to March, 1930, the sales were £8 392, the purchases being £7 717, and there was a further net loss of £180. Mr. Orbell added that the deficiency was attributed to the loss on trading and the depreciation written off the assets in the statement of affairs. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Orbell and Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., as joint liquidators, and a committee.

LAWSON, R. J. AND R. G., electrical engineers, trading as R. H. LAWSON AND SON, 26, Pilgrim Street, Newcastle-on-Tyne. At the meeting of the creditors of the above, held recently, a statement of affairs was submitted which showed liabilities of £1 683 all due to the trade, with the exception of a claim by the bank for £290. The bank, however, held collateral security in the shape of two life policies valued at £180. The assets consisted of book debts, £197; fixtures and fittings, £20; motors, etc., £20; and surplus from separate estate of R. J. Lawson, £500, making a total of £738. After allowing £12 for preferential claims, the net assets were £726, or a deficiency of £958. It was stated that the debtors were father and son. The father took over the business from his grandfather in 1911. For many years the business was carried on profitably, but recently losses had been sustained. Owing to the closing down of one firm for whom large contracts had been carried out, there had been a substantial falling off in the turnover. During 1926–27 the turnover was £14 500, but in 1929–30 it had fallen to £3,045. A resolution was passed in favour of the matter being dealt with under a deed of assignment and a committee was also appointed consisting of the representatives of three of the principal creditors.

LEO TAYLOR, LTD., radio engineers, Lytham Road, South Shore, Blackpool. The statutory meeting of the creditors of the above was held, on June 12, at the offices of Mr. W. Latham, C.A., 27, Birley Street, Blackpool. Mr. J. L. Taylor occupied the chair and a statement of affairs was submitted which showed ranking liabilities of £1 287 due to unsecured creditors. After allowing £8 for preferential claims the net assets were £409, or a deficiency so far as the creditors were concerned of £878. The assets comprised stock, plant and tools £441, estimated to realise £250, motor car £10 and good book debts £158. The issued capital of the company was £900, and as regarded the shareholders there was a deficiency of £1 778. It was reported that there was a contingent liability in respect of rent for a year and a half at £120 per annum. The company was registered in 1928 with a nominal capital of £1 000 divided into shares of the face value of £1 each. The accounts showed that there had been a loss on the trading and when proceedings were commenced by a creditor it was deemed advisable for voluntary liquidation to take place. The ranking liabilities included a sum of £302 due to the bank, in respect of which third party guarantees were held. A resolution was passed in favour of the voluntary liquidation of the company being continued with Mr. Latham as liquidator, and a committee was also appointed.

London Gazette, etc.

Winding-up Petition.

CHEAP ELECTRIC POWER CORPORATION, LTD. A creditors' petition for winding-up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, on Monday, June 23.

Companies Winding-up Voluntarily.

LAMBERT LAWS, LTD. By reason of its liabilities, June 10. A. E. Orbell, 6 and 7, Old Steine, Brighton, and W. A. J. Osborne, Balfour House, Finsbury Pavement, London, E.C., appointed as liquidators.

ZONE DYNAMO AND MOTOR PATENTS CO., LTD.—By special resolution, June 12, J. J. Reid, of J. W. Best and Co., chartered accountants, 94, Old Broad Street, London, E.C.2, appointed as liquidator.

Bankruptcy Information.

ANDERSON, Cyril Morton, 1556, Stratford Road, Hall Green, Birmingham, trading as ROBIN HOOD ELECTRICAL CO., electrical contractor, and at Back 330, Icknield Port Road, Birmingham, as THE MAROON MOTOR CO. Receiving order, June 12. Debtor's petition.

BLACKMORE, Glanville, 62, Coventry Road, Market Harborough, wireless engineer. Receiving order, June 13. Debtor's petition.

HANSON, Thomas Stanley, 26, Nether Hall Road, Doncaster, Yorks, electrical contractor. First meeting, June 25, 12 noon, Official Receiver's Offices, Figtree Lane, Sheffield. Public examination, July 3, 2 p.m., County Court Hall, Bank Street, Sheffield.

HUNT, Jonathan William, Christmas Street, Bristol, electrical engineer. Receiving order, June 5. Debtor's petition. First meeting, June 25, 12 noon, Official Receiver's Offices, 26, Baldwin Street, Bristol. Public examination, July 4, 11 a.m., The Guildhall, Bristol.

TUCKER, Joseph, 30, Lower Ashley Road, and formerly 876, Filton Avenue, Bristol, trading as THE BRISTOL RADIATOR CO., wireless dealer. First meeting, June 25, 11.30 a.m., Official Receiver's Offices, 26, Baldwin Street, Bristol. Public examination, July 4, 11 a.m., The Guildhall, Bristol.

TURNER, Harry, 20, Battersea Rise, Clapham Common, London, radio and electrical contractor. Receiving order, June 11. Debtor's petition.

Notices of Dividends.

HORSFALL, William Miles, 7, Redcross Street, Liverpool, electrical engineer. Sixth dividend, 4¾d., per £, payable June 24, Offices of the Official Receiver, Government Buildings, Victoria Street, Liverpool.

MADDOX, Victor Frederick, 6, Homend Street, Ledbury, Hereford. electrical and wireless engineer. First and final dividend, 1s. 2½d., per £, payable June 25, Official Receiver's Office, 133, Saint Owen Street, Hereford.

Application for Discharge.

Ross, William, 35, Bridge Street, Haverfordwest, Pembroke, wireless engineer. Hearing, July 16, 11 a.m., The Shirehall-Haverfordwest.

Order Made on Application for Discharge.

MORPHY, Donal William, lately 4 and 5, Dorset Mews North, Upper Gloucester Place, London, N.W.1, manufacturer of wireless apparatus. Discharge suspended for six months, until November 23.

Partnership Dissolved.

GRUNDY (M.) AND CO. (May RAYBOULD and John Henry CARTER). radio manufacturers and dealers in wireless accessories, 54, Clerken, well Road, by mutual consent, as from June 7, 1930. Debts received and paid by M. Raybould, who continues the business.

Bankruptcy Proceedings.

HEMBER, Lionel Edwin, 4, Pepper Street, Lymm, Cheshire, electrical engineer. The public examination of this debtor was held recently at the Court House, Palmyra Square, Warrington, when a statement of affairs was produced showing liabilities of £994 and a deficiency of £693. The debtor stated that he commenced trading in August 1927, his only capital being £35. He attributed his failure to lack of capital and keen competition The hearing was concluded.

WYNSOR ELECTRIC RANGE CO., LTD., 31, Lombard Street, E.C., formerly 1, Broad Street Place, London, E.C. Under a winding up order made against this company on May 5 on a creditor's petition the statutory meetings were held recently at the Board of Trade Offices, Carey Street. A statement of affairs was submitted showing liabilities £2 702, of which £2 652 are expected to rank, and net assets £336. A total deficiency of £3 316 is disclosed with regard to the shareholders. The company was incorporated on May 6 of last year with a capital of £1 000 in £1 shares, and obtained a lease of two rooms at Roxburghe House, Regent Street, W., for seven years from June 1, 1929, at £150 per annum inclusive, occupying them as a sales depot until early this year. The landlord then released the company from all liability on certain conditions. Before the formation of the company the ranges were made by the vendor, Louis Burn, by hand, but as that was not a suitable procedure an arrangement was made with a certain electrical company for their manufacture and under that arrangement the company gave an order for ranges amounting to £21 000 to be delivered during a period of three years. It appeared, however, that much difficulty was experienced with the suppliers owing to alleged faulty workmanship and also delay in delivering the ranges, and although the company repeatedly made representations to them in that matter the position did not improve, and it was stated that this had had an adverse effect on the company's business. The sums payable by the company to the suppliers in respect of goods manufactured and delivered to the company's order was guaranteed by W. D. Stevens, who had acted as a director, and the suppliers had made a claim against him for £230 and were in addition claiming £1 000 in respect of materials bought and goods manufactured under the company's order. Stevens had stated that his reason for presenting the petition against the company was to safeguard himself against further liability under his guarantee and to protect the interests of creditors. He had added that the company could not carry on without further capital, and since that was not forthcoming no good purpose could be served by the continuation of the company's business. The failure of the company was attributed to insufficient capital and to disputes with the suppliers. A resolution was passed for the appointment of Mr. W. H. Stentiford, chartered secretary, as liquidator.

GOVERNMENT PUBLICATIONS.

Ordnance Survey.—Magnetic observations made by Ordnance Survey in England and Wales in 1928, and Preliminary Results (Declination only) of those made in Scotland in 1929: Results of. 1s.

General Post Office.—Engineering Department: Technical Instructions: XXV. Automatic Telephone Exchange Systems: Part 6E: Director System. Exchanges installed by Messrs. Ericsson. (System E.) 3d.

Board of Trade.—Signal Letters of British Ships for 1930: Supplement corrected to April 30, 1930, 3d.

Scientific and Industrial Research Department.—National Physical Laboratory: Annual Report for 1929, 11s.

Tramway.—Additional Byelaw, dated May 6, 1930, as regards Electrical Power on the Leeds Corporation Tramways, 1d.

Ministry of Transport.—Electricity Supply Acts, 1882 to 1928: EL.C.25. Form of Accounts prescribed by Electricity Commissioners for an Electric Supply Company (other than an Electric Power Supply Co.). Reprinted, 1930, revised price 6d.

General Post Office.—Engineering Department: Technical Instructions: V. Wheatstone Telegraph System. (Reprinted, including amendments to date. May, 1930), 5s.

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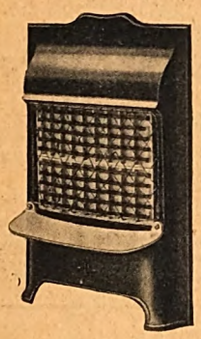

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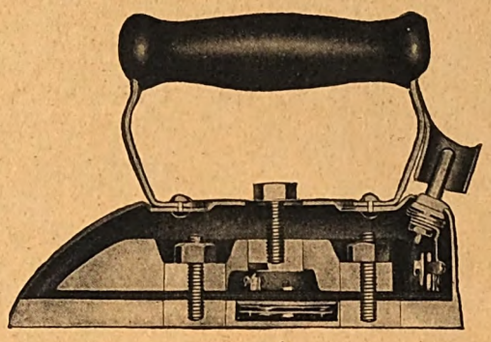

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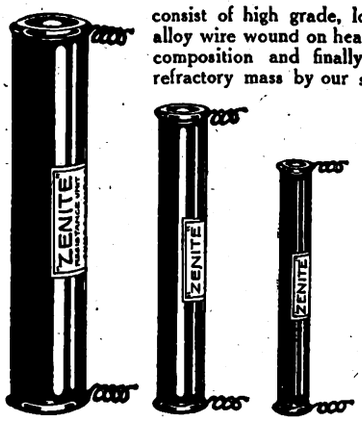

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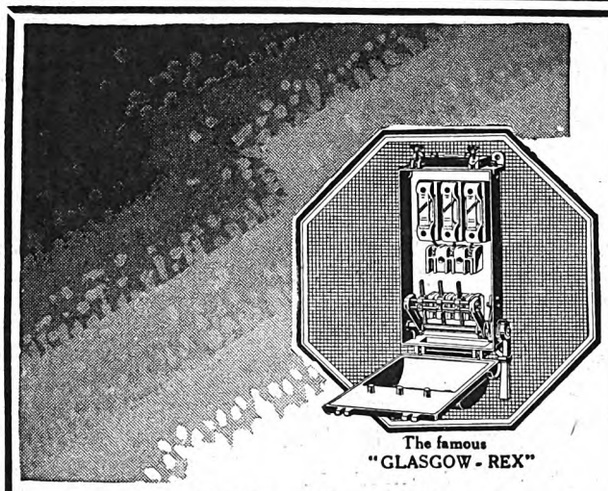

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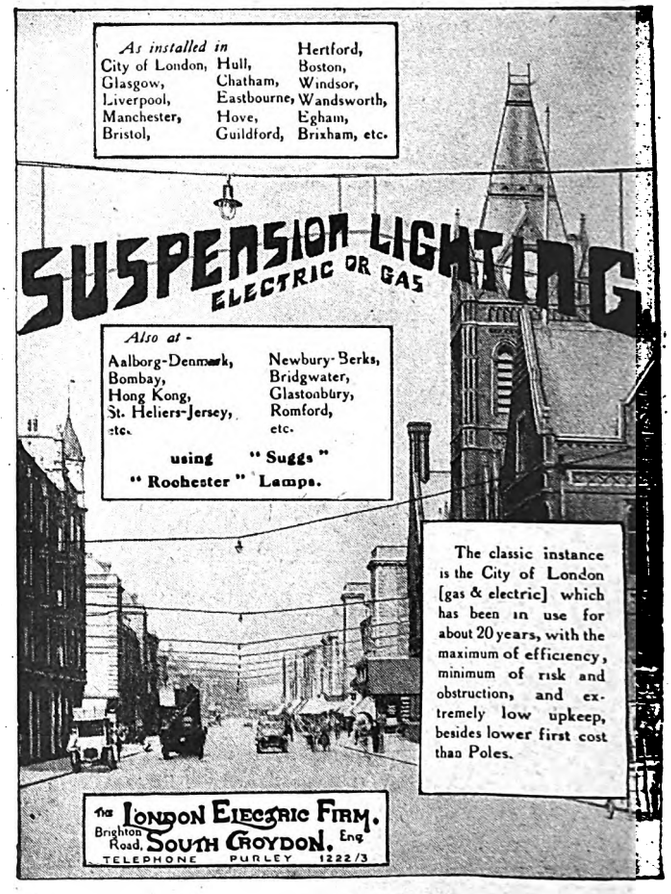

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THE ELECTRICIAN

Established 1861. *The Oldest Weekly Illustrated Journal of*

Electrical Engineering, Industry, Science and Finance.

Bouverie House, 154, Fleet Street, London, E.C.4 *Telegrams: "Benbrotric, Fleet, London."*

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Changing World Conditions.

LORD RIDDELL, in his presidential address to the annual Convention of the Advertising Association at Hastings on Monday, gave some figures which go a long way towards explaining why there is to-day such a serious maladjustment between production and consumption. He pointed out that although in 1927 the world's population was only about 9% greater than in 1913, the production of foodstuffs was 13% greater, and that of raw materials 35% greater. This disparity alone would almost suffice to account for the present glut of commodities and the resulting unremunerative prices. Other factors are operating in the same direction. Increased technical efficiency has largely increased the output of finished products from a given quantity of raw material, and changes in habit are altering demand and diverting spending power into other channels.

The population factor seems likely to become more important as time goes on. In the latter part of the nineteenth century, increasing industrialisation rode to prosperity on a rapidly-growing population, of which it was a leading cause. In this respect the tide has definitely turned. Lord RIDDELL mentioned that the excess of births over deaths had declined in England from 11·6 to 4·3 per thousand, in Germany from 14 to 6·3 and in Belgium from 8·9 to 4·8. Undoubtedly the present tendency is towards a stabilised population such as France has long known. It is quite clear that one effect of the slowing down of the growth of population must be to remove part of the momentum which carried forward the industrialisation of the immediate past. For the cruder forms of production and manufacture, which supply essential needs, the demand must be fairly closely related to the number of consumers. It can, of course, be greatly increased beyond present levels in countries where the population is in a depressed economic state, provided that the purchasing power of such peoples can be augmented. The average quantities of food and clothing, for example, likely to be required by a world in which the growth of population has been so greatly retarded, even under conditions of relative prosperity, will certainly not absorb an annual increase in production on the pre-war basis, and it is as well that this fact should be recognised. Until there is a better adjustment not only between supply and demand, but also between commodity prices and the retail prices of manufactured goods, world trade must continue to suffer from present ills.

Similar considerations govern the production and sale of non-essentials, though here the position is more elastic in some respects. The purchaser has an ever widening range of choice as to the disposal of that portion of his income which is not absorbed either by the expenditure which may be grouped under the familiar heading of "Cost of Living" or by the rapacious demands of local and national taxgatherers. Changes of taste and habit, often brought about by the progress of invention and by social developments, such as the increased economic independence of women, tend to destroy or modify old trades and to give birth to new industries. The electrical industry has the good fortune to be concerned with a vast domain, to which it is impossible to set limits, of human requirements. It can ameliorate living conditions and add immensely to health, comfort, happiness and amusement. But, failing a general increase in spending power, all progress by the new must be to some extent at the expense of the old, and without a steady rise in the number of purchasers to ease the pressure of the attack, the competition must inevitably become intense, adding considerably to the cost of selling and thereby further reducing the total sales. In a world with a static population—at least in the chief civilised countries—conditions cannot be the same as those which have prevailed during the past century, and we must readjust our outlook and our economics to meet the new situation which is already in process of establishing itself.

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Current Topics.

E.C.A. Conference.

YESTERDAY the fifth annual E.C.A. Conference began at Llandudno under the presidency of Mr. H. WILLOUGHBY ELLIS who will, to-day, hand over the office to his successor, Mr. H. C. HAZEL, to whom we offer our congratulations and best wishes. Next week, as on previous occasions, we shall publish a full illustrated report of the Conference.

World Wide Broadcasting.

SOME idea of the possibilities of wireless broadcasting as a new world force must have been conveyed to an immense number of listeners on June 18. Speeches delivered at the World Power Conference festival in Berlin, at the National Electric Light Association Convention in San Francisco, by Mr. EDISON from Orange, N.J., by Lord DERBY from Aldershot and by the Marchese MARCONI from London were radiated by European and American stations and picked up and re-transmitted in other continents so that the majority of owners of receiving sets were able to hear in quick succession speakers separated by many thousands of miles. To-day, when a suitable occasion arises, all the civilised world can become one vast audience.

Electric Farming in Suffolk.

WE gather that in spite of the severe agricultural depression good progress is being made in East Suffolk with the electrification of farming. Mr. H. A. VERNET, the chairman of the British Power and Light Corporation, which controls a group of supply undertakings mainly operating in rural areas, mentioned last week that nine farmers had been secured during the past year in the East Suffolk area as consumers of electricity for all farm and domestic purposes. From another source we hear that a large labour colony in the area, which formerly generated its own light at an annual cost of £300, now has a connected load of 64 H.P. and its bill for current for all purposes supplied by the company operating in this district is only £180.

World Output of Electricity.

A RECENT estimate of the present annual output of electricity in the world as a whole places it at 300 000 000 000 kWh, of which the United States contributes 41%. Germany with 34 000 000 000 kWh is accorded second place, followed by Canada with 18 000 000 000 kWh. Great Britain and France, each producing about 16 000 000 000 kWh, are rivals for fourth place. It is remarkable that Canada with less than 10 000 000 inhabitants should rank so high, but this is partly due to the superabundance of easily developed water power in the Dominion (coupled with a shortage of coal in the places where it is needed), and partly to the large consumption of the pulp and paper industry. Almost 8% of Canada's production of electrical energy is exported to the United States.

Expensive Waste.

SIX hours of the time of the House of Commons was devoted the other night to the discussion of two points, first, the exemption from income tax of the salaries of consuls, and secondly, the wisdom or otherwise of deducting tax from "grants in aid of revenue-producing schemes made to local authorities." Six hours of Parliamentary time! Yet it is often impossible to get five minutes of Parliamentary time to discuss the affairs of the business taxpayer. This sort of thing helps to explain the irritation and contempt of the business man for the politician. When we remember that out of these six hours' discussion will arise hundreds of new appointments for expensive officials with statistical training who will argue among themselves which column in the public accounts is to be used for a given purpose, and that all this totally unnecessary expense will add to the burden of the miserable taxpayer and still further delay both public and private work wherever it is attempted, a little irritation seems to be justified.

Buenos Ayres Exhibition.

THE Department of Overseas Trade has circulated a letter drawing the attention of British manufacturers to the importance of representation at the British Empire Exhibition to be held at Buenos Ayres from March 14 to April 27 next year. In our issue of April 18 last we gave some particulars concerning the electrical section of the exhibition and the plans of the B.E.A.M.A. It is very desirable that the display of British electrical products should be as comprehensive as possible, and that thoroughly suitable printed matter should be prepared. Full information as to the scope of the exhibition and details as to cost of space, stand erection, services, supplies and transport of exhibits can be obtained from the General Manager, British Empire Trade Exhibition, Buenos Ayres, 1931, at 5, Parliament Mansions, Orchard Street, Victoria Street, S.W.1.

Rural Distribution in Ontario.

To cheapen the cost of electricity in rural areas legislation has just been passed by the Ontario Provincial Parliament providing $2 000 000 for loans up to maxima of $1 000 to farmers in order to cover the cost of installations. These loans will carry a low rate of interest and be repayable over 20 years. A second Bill fixes $2·50 monthly as the maximum service charge for rural hydro-electric districts, against a present maximum of $4·10. Between 1923 and 1929 the number of rural consumers on the Ontario Hydro Electric Power Commission's network increased from 4 200 to 37 000. There were more than 5 000 miles of rural transmission lines in existence at the end of last year, and it is expected that an additional 1 500 miles will be built during 1930.

An American Criticism.

FROM the point of view of those who believe that the fundamental principle in fixing rates for light and power for various types of service should be that each should carry its own burden, the Ontario policy savours of cramming electricity down the throats of the farmers at the expense of the general taxpayer of the Province. In other words, if rural services cannot be made self-supporting, the general revenue is drawn upon to make good the deficiency. The equity of penalising trade and industry, as well as the general taxpayer, for the benefit of the small consumer, particularly in rural areas, is certainly questionable, but the policy is not confined to Ontario. In this country it has been applied in another form in the De-Rating Act, which relieves agricultural land of rates. The question is indeed one of national policy rather than of equity. If encouragement of agriculture is considered to be in the general interest, such measures are justifiable, but there are limits beyond which the policy cannot be pursued without injustice to the non-agricultural elements.

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WORLD POWER CONFERENCE.

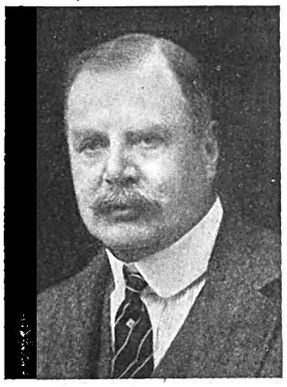
Electrification of Rural Areas—Dr. Gaby's Survey of the Work of the Ontario Hydro-Electric Commission—Development of Domestic Electrification.

By ALFRED EKSTROM, D.Sc., M.I.E.E., and VIDAR EKSTROM, C.E.

THE technical work of the Second Plenary World Power Conference began on Monday, June 16, in the afternoon, at the Kroll Opera House under the presidency of Sir Archibald Page.

Director A. Petri read the general report on: ELECTRICITY IN HOUSEHOLD AND AGRICULTURE.

Mr. Petri mentioned that the most important problem which electricity supply undertakings were faced with at present was the electrification of the household. Electricity in the household meant a saving of labour for the housewife, and from the electricity supply undertakings' point of view a better utilisation of their plant. Further, the scope for electricity in the household was growing with the ever-increasing number of new labour saving devices.



Lord Derby, President of the First World Power Conference, 1924-1930.

Electricity employed in dairies, poultry-farming, and agriculture was, he said, a load which in the near future will be of great importance to electricity supply undertakings. As an example, he mentioned Sweden, where 75% of the arable land was supplied with electricity. He also mentioned the interesting work begun in England in regard to electric ploughing.

Dr. F. A. Gaby's paper on ECONOMIC RESULTS OBTAINED BY THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO IN THE SUPPLY OF ELECTRICITY IN THE HOUSE AND ON THE FARM, was outstandingly interesting. This Commission generates, transmits and supplies energy wholesale to 592 towns and villages in Ontario, serving about 2 400 000 inhabitants. Bulk supply is given to individual municipalities, large industrial consumers and rural power districts, on the principle of service "at cost." Retail distribution is managed by the various municipalities and rural power districts.

This electricity supply system has a certain similarity to that now being developed by the Central Board of England. Even though this supply is based almost entirely upon generation by very cheap hydro-electric power, while that in England is based principally upon energy generated by coal, the lengths of the transmission lines are very considerable—sometimes even up to 450 miles—so that the energy costs for bulk supply to many of the municipalities are comparable with those served by steam-electric plants by the Central Board.

We can, therefore, see no reason why it should not be possible for supply undertakings in England to achieve similar results as those which have been attained by the municipalities in Ontario. Dr. Gaby's report might, therefore, prove instructive to English electrical engineers.

Dr. Gaby, himself, thinks that the phenomenal success which has been achieved over this extensive territory is due to efficient propaganda and to suitable tariffs being given to the domestic consumers, thus inducing them to utilise labour-saving and comfort-giving electric appliances, i.e., electric light, cooking, water-heating and sundry other electric household conveniences.

At the end of 1928 408 000 domestic consumers, consuming 550 million kWh, were supplied in municipalities, and 30 000 rural consumers with a maximum demand of 12 500 kWh.

The tariff consists of:—

(1) A fixed service charge of 1s. 4d. per month per domestic consumer.
(2) A price of 1d. to 1·5d. per kWh for first 55 to 60 kWh per month.
(3) A price of 0·5d. to 0·75d. per kWh for additional kWh.
(4) Minimum charge of about 4s. per month, 10% discount for prompt payment.

In his paper Dr. Gaby showed the steady increase of domestic consumption of electricity and the entirely sound financial profit on the invested capital of the supply undertaking, which has been the result of this policy during the years 1916-1928. During this period there was practically no alteration in the tariffs.

While the domestic consumers connected to all these municipalities had an *average* annual consumption of 300 units per annum in 1916, this average consumption had increased to about 1 400 units in 1928. If we calculate that each consumer consists of four persons, this means that the consumption of energy had increased from 75 units to 350 units per head. From the figures given in regard to saturation of electric appliances among the connected domestic consumers, there still seems to be a very great possibility of further increase in the future.

During this period, the average cost per kWh for the domestic consumers decreased from 2·45d. to 0·82d., a decrease due to the higher average consumption per consumer.

Dr. Gaby gave some interesting figures regarding the domestic load characteristics obtained in different municipalities, as well as regarding the individual consumers.

The load characteristic resulting from consumers using electric cookers in conjunction with lighting and other appliances was 0·83 kW per consumer in the case of favourable diversity, while it was 1·35 kW per consumer in the case of unfavourable diversity. In the latter case the load characteristic from consumers using lighting but no cooking was 0·28 kW.

It should be noted that the electric cookers in general use in Ontario are of high capacity. The average installed capacity for a consumer using cookers, lights and small appliances is about 11 kW per consumer, whereas for consumers using lighting and small appliances, but no cookers, the average installed capacity is 2·2 kW.

Dr. Gaby's paper gave some figures in detail for a municipality which seem to be comparable with English conditions. The town of Sandwich has a population of 9 400 inhabitants with a transmission distance of 245 miles. The revenue from electricity supply is derived predominantly from domestic service. It has 2 700 domestic consumers with an average annual consumption per consumer of 2 160 kWh, paying an average price of 0·88d. per unit, giving a total annual cost for electricity of £8 5s.

The cost of bulk supply from the Commission to the municipality is about ½d. per unit. The first cost for the distribution plant within the town is about £22 per consumer.

After all costs for power in bulk, operation and maintenance of the distribution system, as well as depreciation, are paid, there results a net profit for the municipal electrical undertaking of 12·3% on the total invested capital (including reserved sinking funds).

Mr. D. N. Dunlop, Founder of the World Power Conference, and Chairman of the British Executive Council. Mr. Dunlop was prevented by indisposition from attending the present Conference in Berlin.

While the electricity supply to towns and villages has been carried out in accordance with self-supporting financial business lines, giving a remarkably satisfactory result, the rural supply has been carried out by means of subvention from the Province. The capital necessary for the extension of the agricultural supply was provided half by the supply undertaking of the Commission, and half, as "grant-in-aid," by the Government of the Province. It was thus possible to reduce the tariffs originally given for rural supply, so that they now approximately tally with those valid for urban consumers. The result of this policy is said to have been enormously satisfactory in its assistance to agriculture. It has brought about some interesting results which are worth mentioning here.

A large percentage of the farmers, i.e., 25%, use electric motors and electric pumping equipment. Electric cookers have reached a degree of saturation almost equal to that existing in the urban municipalities of the Province, i.e., 20%. Washing machines are used to a much larger extent on the farms than in the municipalities, i.e., 50%. The general conclusion to be drawn, therefore, respecting the economic results of the Commission's policies in the field of rural elec-

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trical supply is that, having regard to the circumstances in Ontario, these policies have been the means whereby service could be extended on a large scale to rural consumers at relatively low costs without detriment to the financial status of the undertaking, and with great economic benefit to the Province as a whole.

The paper on DEVELOPING THE DOMESTIC USE OF ELECTRICITY IN THE UNITED STATES OF AMERICA, by Marshall E. Sampsell, gave a survey of the vast extent of long distance light and power supply plants. There are now more than 175 000 miles of high tension lines in service in the United States for pressures over 11 000 V. Electric service is given to every community with a population of 5 000 or over; to 97% of the communities having between 1 000 and 5 000 inhabitants; to 50% of those having between 250 and 1 000 inhabitants; and to more than 25% of those having less than 250 inhabitants sixty-eight per cent. of the population in the United States are using electricity in their homes—electric flat irons have a saturation of approximately 90%, vacuum cleaners approximately 40%, electric refrigerators 9%, electric cookers 5% and electric water-heaters 2%. Electric service is given to 500 000 farmers, who utilise it in their homes as well as for farm work. This, however, constitutes only about 7% of all the farms existing in the United States.

The average consumption per individual consumer has increased from 293 kWh per year to 500 kWh per year. The average price for electricity to domestic consumers has decreased from 3·65d. per kWh to 3d. per kWh. Particular attention is devoted to methods for propaganda for a stimulated use of electricity in the home, in order to save the housewife's time and labour.

Mr. C. A. Cameron-Brown, in his paper on THE MOST RECENT APPLICATION OF ELECTRICITY TO AGRICULTURE, referred to a report made by the Electricity Commissioners in which they point out that although the rural areas in Great Britain cover 92·3% of the total area of the country, the average density of their population is only 115 persons per square mile. Rural electrification must, therefore, generally be developed supplementary to adjacent urban supplies. He further stated that, generally speaking, electricity for agricultural purposes in Great Britain has been devoted more to the development of well-known, rather than to the creation of new, applications.

Good results have been obtained by the use of electricity for milking, poultry farming, dairies, etc., but, on the other hand, the use of electricity for electro-culture, curing animals by electric light, electrosilage, electric heating of greenhouses, as well as for the curing of hay and corn, has proved to be too expensive for practical purposes. An exception in this respect is the electric curing of hops. Promising results have been obtained from experiments in this regard, made by the Research Department of the Shropshire, Worcestershire, Staffordshire Electric Power Company.

The author also described some experiments made with an electric tractor, fed by means of a flexible cable, designed by Major A. McDowall, in Scotland, as a result of which it is hoped that the difficulties inherent in the handling of the flexible supply cable will be overcome.

Data connected with THE APPLICATION OF ELECTRICITY TO DOMESTIC USE are supplied by the American Home Economics Association. According to extensive estimates made by this Association, the home-maker spends more of her time in her housework than the industrial labourer does on his work. As the employment of paid labour in the household is decreasing, there is an urgent need for lightening of household duties by the use of electricity. The Association gives data regarding the saving in time achieved by the use of electricity for different purposes. It points out, further, the necessity of improvement and standardisation of the existing types of electrical equipment, as well as of giving reliable information to the home-makers regarding the usefulness of various labour-saving devices and services, as a means of lessening household work.

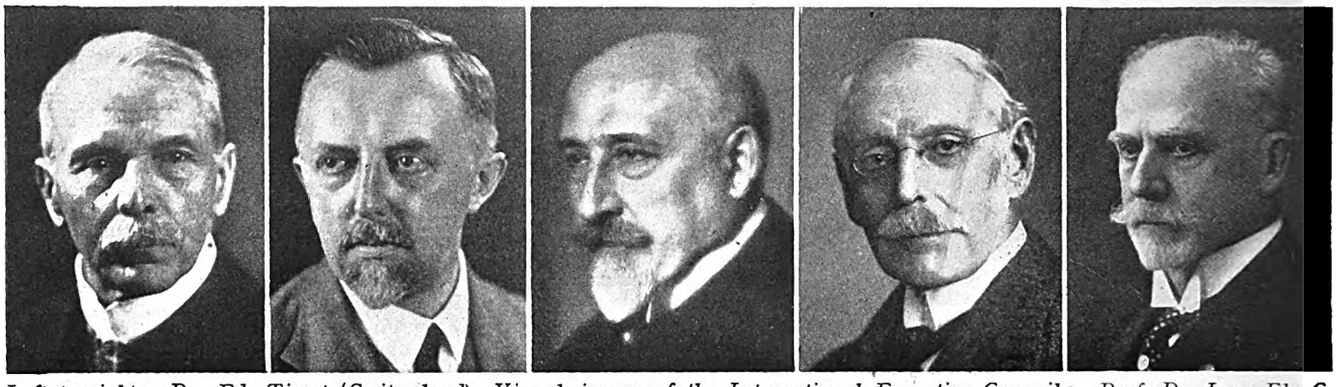
Dr. Moertsch, of the V.D.E. in Berlin, gave some interesting statistics in the discussion: 76·5% of all farms in Germany have electric supply, consuming during 1928 629 000 000 kWh, giving an average consumption per connected farm of 396 units; 5% of the total units sold from all electricity undertakings in Germany during that year were consumed for agricultural purposes. He also gave the following data regarding connected electric appliances on German farms:—

Appliances.	Number of appliances.	Total connected kW.	Average kW per connected appliances.	Number of appliances per 1 000 farms.
Motors	1 046 000	3 770 000	3·6	660
Potato boilers	8 780	9 930	1·1	5·5
Waterheating (thermal storage)	2 960	2 940	1·0	1·9
Household appliances (including cooking)	961 000	417 500	0·4	60·5
Dairies	4 480	5 170	1·2	2·8

Miss Haslett, Director of the Electrical Association for Women, drew attention to the necessity for close co-operation between architects, engineers and housewives.

(*To be continued.*)

PERSONALITIES AT THE SECOND WORLD POWER CONFERENCE.



Left to right: Dr. Ed. Tissot (Switzerland), Vice-chairman of the International Executive Council; Prof. Dr.-Ing. Eh. C. Matschoss (Germany), Secretary of the Conference; Dr. Carl Köttgen (Germany), Chairman of the Conference; Sir Charles Parsons, Vice-president; Prof. Dr. G. H. de Thierry, Vice-chairman of the Conference and Chairman of the German National Executive Council.

POWER TRANSMISSION BY RADIO.

Not a Present Possibility—Greetings to Mr. Edison.

IN the course of the speech by the Marchese Marconi, which was broadcast throughout the world last week, in connection with the World Power Festival, he took occasion to make it clear that some radio tests which he carried out last March, between his yacht laboratory at Genoa, and Sydney, Australia, somewhat erroneously brought before the popular mind the possibility of the transmission by radio of electrical energy through space over great distances. The Marchese Marconi explained that this was at present not possible. Radio, he added, was nevertheless now sending power to and fro across the world in ever increasing amounts.

Sending respectful greetings to Mr. Thomas A. Edison, the Marchese Marconi said that Mr. Edison, through his innumerable inventions had brought light and cheerfulness to countless homes besides showing us the way of utilising enormous amounts of electrical power for the benefit of mankind. He personally should never forget the encouragement and friendship Mr. Edison so generously extended to him in the early days of his work. He was glad now to be able to wish him through space, the continued good health and happiness he so thoroughly deserved.

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SIXTH ADVERTISING CONVENTION.

Sir Ernest Benn on Too Much "Safety First"—Mr. Charles Pinkham's Stimulating Paper—Progress of Electric Signs.

FROM the large and varied programme of papers and addresses delivered at the Sixth Annual Advertising Convention at Hastings this week, we are compelled by limitations of space to restrict ourselves to summarising two or three of special interest to readers of this journal. Prominent among such was the paper on "The Service Expected from a Trade Journal," read by Mr. Charles Pinkham, Publicity Manager of the General Electric Co.—a vigorous and well-considered survey which touched on a number of important points.

In the course of an address at the opening general session on Monday—following the Presidential address by Lord Riddell and short addresses by Lord Luke of Pavenham and Lt.-Col. Sir Stanley Reed—Sir Ernest Benn said that he clung to the belief that in the matter of trade and industry the greatest benefactor was the man who brought the article or the service within reach of the people who wanted it, and that of course was advertising. He doubted whether the delights and benefits which he derived from the use of electricity were more due to the efforts of Faraday than to the life's work of Hugo Hirst.

The Marxian idea that the maker or the worker was the all-important factor in the development of trade and industry was all too slowly losing ground. If wealth was land and labour, as Marx contended, then music was catgut and horsehair and literature was paper and ink. Land, representing raw materials, and labour of hand or brain, were futile and useless until the advertising idea brought them into service.

He proposed to do a bit of pleading for the small man, the modest manufacturer, the retail tradesman and the people who were left out of account when we talked of things in the big way which alone was popular to-day. We must get our people out of the big figure habit and make the little man feel that he counted for something. The mass idea always led to inertia and we were suffering from mass inertia more than from any other national ailment to-day. We must give up the notion that organisation was an unmixed blessing. When one organised in such a way as to restrict, limit, or restrain the efforts of the individual to render better or more service, one had bad organisation. The public mind was obsessed with the false notion that organisation for organisation's sake always meant progress.

From being a nation of shopkeepers we had become a nation of politicians. Politics was the art of looking for trouble, finding it whether it existed or not, diagnosing it incorrectly and then applying the wrong remedy. This was the age of "Safety First." We needed less safety first and a few more healthy bankruptcies—a revival of the old spirit of individual adventure. "Safety First" was a psychological mistake and a libel on the true character of the Englishman. It was part and parcel of the Government Department and the rationalising idea.

There was more in life than a card index and a rotary press. We required less education and more intelligence. If we were to develop trade and industry we must get the parsons and the politicians out of business and re-establish the self-confidence of the individual business man. He did not believe that everything new was bad; he only objected to the modern view that everything old was stupid. We must strive to discover what little good there might be, and it was little enough, in both the old and the new.

Trade Journals.

Speaking first on the subject of circulations, Mr. Pinkham associated himself wholeheartedly with the demand for an Audit Bureau of Circulations. He went on to discuss editorial contents of trade papers and said that the value of a paper to advertisers depended eventually on the appeal of the editorial matter. They were, therefore, justly entitled to expect that the live wires on the staff of the paper should not be confined to the advertising manager and his satellites, but that the editorial side should be equally bright. It was just as essential that a trade journal should be conducted with a view to stimulating a live interest in its readers as it is for any other type of periodical. The editorial outlook should be bold, and independent, and should not be swayed by the advertising. He could not deprecate too strongly the practice which one frequently encountered of the holding out of editorial space as a bait to the prospective advertiser. Editorially, a journal should be observant of every development and movement within the industry with which it was connected, and should endeavour so to present these phases to its readers that they would stop to read about them.

There was one direction in which he thought the editorial pages of trade papers could do a very good work in all industries where there was a retail trade. Sir Ernest Benn had referred to it in his speech at the Imperial Press Conference early this month, when he said: "The retailer must be taught to pull his weight and do his share as an advertiser. That is the next big job in the advertising field. The retailer takes one-third of the gross products of the whole of our industrial output, but he still expects the manufacturer to find his market for him." Everyone on the manufacturing side was only too painfully aware of the truth of Sir Ernest's remarks, and the more those trade journals which reached the retailer educated him up to a proper understanding of his responsibilities in that direction, the better it would be not only for the manufacturer, but also for the retailer, as well as for industry in general.

Mr. Charles Pinkham.

He did not think that sufficient attention was paid by trade journals, as a whole, to the choice of type face and to the layout in their editorial columns. In the general body of editorial matter, he did not think any of them desired, or were better off for having, "puff" publicity. He sent to technical journals endless quantities of write-ups on his company's material and installations. He was not overjoyed when he saw notices concerning any particular item in five or six or more journals all phrased in identically the same words as those which emanated from his Department. He thought they were entitled to expect that there should be sufficient journalists of ability on the staffs of the papers to take the material which was sent to them, and, *if it was of sufficient interest to warrant publication*, to re-write it in a manner possessing some individuality.

He would like to urge that advertisers should receive advance information of forthcoming editorial matter. If this were done, it would be a service of considerable use to the advertiser in enabling him to bring his advertisements into line with the editorial content where he so desired it.

Referring to special issues Mr. Pinkham said that in every industry there were important events in the course of the year that had a large national interest and undoubtedly had very beneficial results upon the industry. Such events were the Motor Show, the Wireless Show, the Dairy Show, the Royal Show, the Furnishing Trades Exhibition, the Fashions Show, etc. Important annual events such as these justified special issues and, generally speaking, the numbers published specially for these occasions reached a high standard and did quite a lot of good. There was another side of the picture. A number of events occurred in the course of the year (sometimes invented and fostered by the journals) which did not assume national importance. Such issues as these should never be raised to the dignity of being called "special." If the contents were assumed to be of particular interest to readers their proper place was in the ordinary issues. In the best interest of trade publications he did not consider the incidence of frequent special issues healthy. He expected, and liked to see, editorial stunts, if only to show that the journal was alive and up-to-date, but he did not expect to be asked to adjust his appropriation to support an obvious *advertising stunt*. The best service many trade journals could render with regard to special issues was to scrap 75 per cent. of them.

On the advertising side great service could be rendered by the adoption of a standard size of page. The saving in art work and in blocks, etc., was obvious. He did not think there

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was any question that the expenditure saved in such a direction would be used in further advertising of some sort. Although the standard size page would be a very considerable advance, this in itself was not sufficient. As well as a standard size page, they wanted a standard quality paper and a standard printing service, so that they could rely on getting a standard result of the highest class. Often many of them had to turn down suggested layouts because they knew that they could not rely on the advertisements being reproduced in a satisfactory manner.

The range of type stocked by trade journals—though much better than it was a few years ago—was still woefully lacking in variety and quality. When they supplied a paper with a complete stereo, were they not entitled to some financial preference in consideration of the composition and setting they saved the journal ?

Should trade journals give service by the actual preparation of advertisements ? He could see no great harm in this in itself, although it did cut across the agents' work ; but, if such service was rendered, it should be charged for at an economic rate and not held out as a bribe to advertisers.

There was a practice which seemed to be creeping into the advertisement policy of trade journals, that of limiting advertisers in the use of black, either in respect of type and lettering or the amount of black used in the display. With regard to the daily Press, he was convinced that the practice was in principle sound and in everyone's interests, though it was often interpreted in a high-handed and peremptory manner. Trade journals had not anything like the printing limitations of a daily newspaper. He could appreciate their concern lest their advertisement pages might become a mass of ugly black, like a number of their present Continental contemporaries, but he thought that the time was a long way distant when this menace would become a reality in this country. If the need did arise, he expected the publishers to approach the offending advertiser to explain their difficulties, and he was certain that they would be met in a spirit of helpful co-operation. He did not think that any " house rules " justified a publisher in scoring or otherwise tampering with an advertiser's blocks without permission.

The question of colour pages must be in the mind of every publisher of a trade paper. He was not over enthusiastic on the use of colour in trade journals, especially while the standard sized page was so much a thing of the future. Where one had to change " copy " very frequently as most of them did in this class of advertising, the cost of blocks made the overall cost of the advertisement extremely high when the limited circulation was considered, and could only be economically justified (except on very special occasions) if the number of pages in the issue was limited so that the use of colour achieved real prominence. He definitely did not like the coloured supplement, particularly when it assumed considerable dimensions, with every advertiser seeming to vie with his competitor in obtaining weird and wonderful colour effects that must dazzle and confuse the reader. He preferred to see the colour pages placed judiciously and fairly among the ordinary black and white pages. If they were to have them, they should be so distributed as to give them a chance of justifying themselves by standing out conspicuously among a run of black pages and not be so placed that they did their best to murder one another.

Electric Signs.

At the Signmakers' Session, on Monday afternoon, Mr. J. M. Woolnough read a paper on the " Progress of the Electric Sign." He said that the first purely electric sign, designed as such, was made and erected by Major Hammer in 1882 at the International Exhibition at the Crystal Palace. This was an electric bulb outlined sign displaying the word " Edison," and although crude in design and constructed for indoor use, it was the forerunner of the electric signs of to-day. In subsequent years the development of electric signs was extremely slow. To-day no large commercial concern, having a commodity to sell or service to render to the public, could consider itself up to date if it did not appropriate a considerable portion of its advertising expenditure to some form of illuminated publicity.

Mr. Woolnough said that he considered illuminated signs to be the cheapest form of advertisement extant. For the cost of a single front page insertion in a daily newspaper, a large, permanent electric sign can be completely installed, and, if placed in a prominent position, it would be seen by thousands of passers-by daily. The Ministry of Transport had actually recently issued a circular, illustrating various types of electrically illuminated road directional signs, which it recommended should be erected by local authorities.

Owing to the increased demand during the last decade for illuminated publicity, a new type of sign specialist had gradually evolved. It was now possible to carry out an advertisement or decorative design in illuminated form at quite a moderate cost. Facsimiles of trains, ships, advertisements in pictorial form with text, either still or animated, had now become a feature of London and provincial city night life. Just to mention a few—the Royal Mail Steam Packet liner " Asturias " ploughing its way through the sea on the company's West End office in Trafalgar Square, the adjacent Canadian National Railways sign depicting a " cow-catcher " American express travelling at 100 miles per hour (incidentally this is fixed 130 feet from the ground, a difficult height for an animated electric sign), the L.M.S. sign opposite the Hippodrome, showing one of their trains in motion, a wonderful electric picture advertising Deauville in Piccadilly Circus, and the intricate animated sign showing a bottle of " Bubbly " being poured into a glass, on Grand Buildings, all of which are correctly outlined in electric lamps.

Daylight Effects.

There were indications that experimenters would eventually be able to evolve illuminated signs with animated effects which would be clearly visible against strong sunlight—a real 24-hour sign.

The ordinary electric box sign or enclosed sign in many cases had become an object of artistic merit and their efficiency was beyond question. To-day few things were impossible to the sign expert. Although there had been no great change in workshop practice, there had been an enormous advance in the adaptation of scientific and artistic ideas in electric sign design and construction during the past 10 to 15 years.

The Neon, or luminous tube sign manufacturers, had introduced several new colour effects, and this step had removed one of the principal objections to this type of sign—monotony of colour. These wonderful signs were rapidly coming into their own and we should see some unusually striking examples of this type in London and elsewhere before long. Another novelty connected with Neon signs was the introduction of interchangeable illuminated letters.

In the event of the erection of a new building as a headquarters or depot of a business, it was very important to impress upon the architects the desirability of designing the front in such a manner as to accommodate a large electric sign, so that it appeared to form an integral part of the building. The L.C.C. and other regulations regarding the size of signs which protrude over the building line were very strict ; therefore, if recesses of suitable size could be incorporated in a building, to take such a sign as might be contemplated, this very great difficulty would be removed. The scheme should be submitted to a qualified sign electrician to determine the size of the lettering, etc., and the number of lamps to be employed to give the most efficient illumination at night.

The value of floodlighting the façade of a building, or any existing unilluminated lettering or signs that may be fixed thereon, if scientifically carried out, could hardly be over estimated and it was becoming very popular.

When an advertiser decided upon the erection of a sign, he should also consider the question of maintenance. This should form a part of the contract with the sign maker.

STREET LIGHTING.

" Illumination Research," Technical paper No. 9, issued by the Department of Scientific and Industrial Research (Stationery Office, 6d. net) deals with Reflection from Road Surfaces. Curves are given of reflection factor for sand carpet, tarmac, rock asphalt and wood paving, as well as a polar curve of light distribution and horizontal illumination and brightness curves. Some conclusions are drawn as to the relative effectiveness of various placing arrangements for street lamps.

In No. 281 of the Researches of the Electrotechnical Laboratory, Tokyo, Mr. Mochinori Gotô deals with " Undamped Electric Oscillation of an Alternator Connected to a Transmission Line." A series of experiments was carried out by the author, collaborating with Mr. Urushibota, and the theoretical part of the study made by Mr. Gotô is described in this paper. A practical method of calculating the range of the field current to produce the undamped oscillation is derived.

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THE PARIS FAIR.

Electrical Exhibits—Enclosed Circuit Breaker for Sudden and Retarded Overload Protection—Watertight Lampholder—Sockets and Plugs for Outdoor Use—A Small Water Steriliser.

By THEODORE RICH.

THE Paris Fair, which is held at the end of May each year, is one of the big Fairs of Europe; it is not so large as Leipzig as it has not so many sections, but those trades which are covered are well organised.

The organisers believe that if a fair is open to the public the advertisement effect as a stimulator of trade is valuable. The main business takes place on days other than Saturdays and Sundays.

The 1930 Fair had 7,500 exhibitors and in 1929 there were 2 000 000 admissions to the grounds. A material proportion of the public are admitted at half price when furnished with vouchers from makers or agents of various firms; the undertaking is carried out by a nominal limited company in which the City of Paris, Chamber of Commerce and such-like bodies have a material share. Last year the receipts more than covered the outlay.

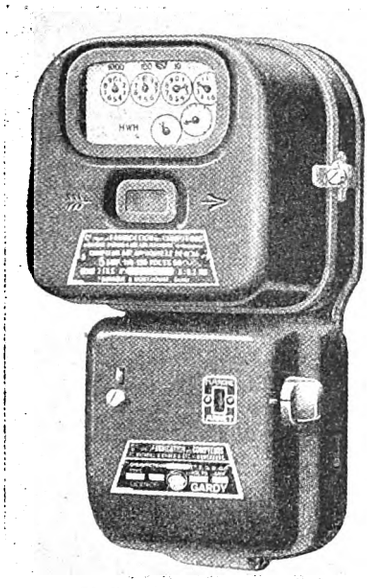

Fig. 1.—Limiter and switch to replace service main fuse.

It is not a sample fair to the same extent as Leipzig, London and Birmingham. With a few exceptions makers have not attempted to cover their stalls with innumerable patterns and types which, like the advertisements on a theatre curtain, tend to weary the eye and cancel out; there is more concentration on a few specialities. One notes the effect of some of the so-called rationalisation, as the impression of a very wide variety of articles on a very large stand is nothing like as good as that made by firms close by that concentrate on certain lines only.

The wholesaler-middleman is not worshipped in France to the same extent as he is in England, and therefore makers names are more often placed on articles than with us.

There was such a demand for space that for the electrical section a new complete building of 12 500 square metres (130 000 sq. ft.) floor space, about 580 ft. by 213, was put up in the spring; there were in this department 360 exhibitors of which about 40% were related to wireless.

New buildings of about the same floor space were also put up to accommodate office fittings, hygiene and musical instruments with wireless reception and gramophones. These new structures are made with light steel framework and corrugated asbestos sheets. Where space is available there is no doubt that a trade fair is best on one floor; lighting becomes easier and there is not the same cramping effect as where several floors are used. As a change from the ultra-modern fashion the buildings were " not " ornamented with meaningless ugliness, but looked like what they were intended to be.

The bulk of the plant on view was light in character; some good machine tools were shown in the mechanical section, also some vertical and horizontal Diesel engines, some of British make.

Owing perhaps to the fact that so much of the l.t. current is at 110/190 V there has not been the same movement towards the use of bakelite for holders and fittings generally. The use of very small fool-proof circuit breakers instead of fuses for section boxes and so on, a tendency which apparently began in Germany, seems to be making headway.

Messrs. Gardy, of Paris, have brought out a neat enclosed circuit-breaker for one or two poles for use on the same mounting as the service meter, to replace a service main fuse, which combines the function of sudden overload protection and retarded overload protection for use when a limited overload is continued too long (Fig. 1). It therefore acts as a limiter with facilities for use as an ordinary switch. One of the problems of farm and rural supply is to prevent the simultaneous use of too much what might be termed low load factor apparatus as that would involve larger transformers and excessive low load losses. The current limiting feature at once draws the attention of the user to the existence of an overload which he can remedy at once; the risk of the client having to call up the supply authority to replace a fuse is eliminated; the linking relay is thermic. It is impossible to keep the circuit closed if the relay is kept hot by overload or short-circuit; in the latter case the thermic element is cut out. The whole thing can be sealed up. It is made for currents from 1 amp. upwards; a 3 ampere breaker can be adjusted to open on a permanent overload from 2·6 to 3·6 amperes.

There are not nearly so many so-called systems of wiring in use as with us. Screwed barrel is also not used to the same extent as at home. Neither in France nor Germany are the house main and distribution fuses and switches up to British standards although the Siemens screw and Gardy plug fuse systems seem to be popular.

A safety watertight lampholder of porcelain for outdoor use made by the Adt company of Ensheim, Germany, has interesting features (Fig. 2). The conductors are not used for suspension, a separate ring being provided. The leads are threaded through two inlet tubes and are fastened to a porcelain contact base the lower part of which acts as an insulating shield, and a slotway for the pins of the bayonet lamp cap. A porcelain ring with a rubber washer is screwed up to hold the loose base in position; this same ring can also support a shade if required. It is claimed that it can be handled in safety.

The demand for tapping points suitable for agricultural works for three-phase current at 300–400 V has led to the development of sockets and plugs which are watertight and earthed. A series has been got out with spring closed flaps, the pins are protected by an aluminium collar, when pressed home a lip on the open flap forms a lock, so that the plug will not pull out until unlocked with the fingers. Fig. 3 shows a type with circular plug. Fig. 4 has an earthing contact; it is designed for three-phase motors so that a reversal of the plug reverses the direction of motion of the motor. A socket made of aluminium for connection to a multiple cable which has a plug at the far end is used for the extension of a flexible fuse. The plugs and sockets illustrated are known as the " Prisinter."

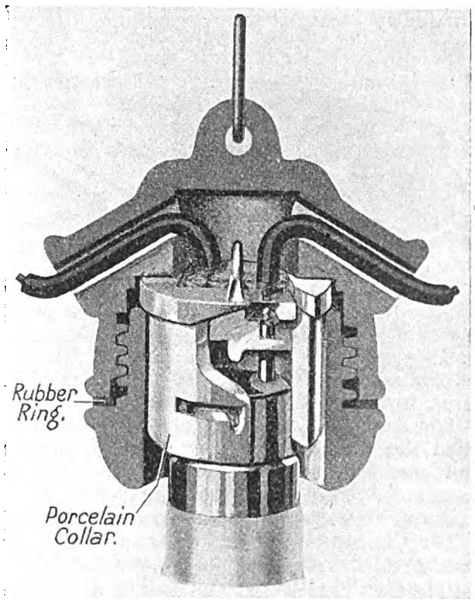

Fig. 2.—Safety watertight lampholder for outdoor use.

Numbers of bowl fires, small coil wound radiators, small hot plates and diminutive ovens were to be seen, but what might be termed more serious heating was not so much in evidence as might be expected. The Compagnie Parisienne de Chauffage showed storage pedestal heaters for night heat charging. This undertaking makes contracts for heating by the year for schools and institutions where low night rates are in force. Improvements in

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electrically operated runways in France, Germany and England seem to be operating in parallel lines to the extent that instead of having a series of cords for raising, lowering and traversing to the right or left a multiple cable is used with a control gear hanging from the hoist above at hand height is operated with the thumb, a French hoist using a series of push buttons for the purpose.

A combined hand and floor vacuum cleaner of American origin, very light in weight and low in price, aroused some

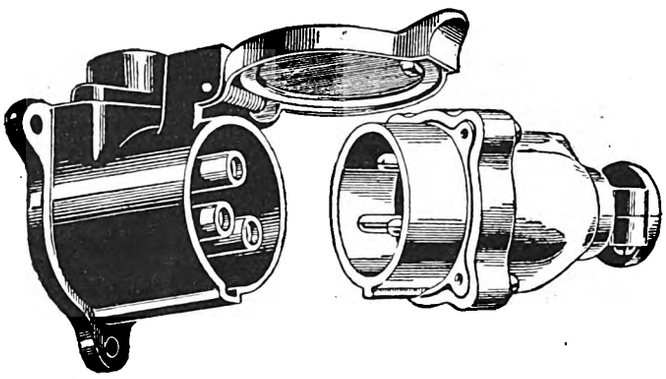

Fig. 3.—Watertight tapping point with circular plug.

curiosity. An electric iron heated on a stand with protected contacts and used without a flexible cord, so that dangers from fire if left on a table are eliminated, has some material attractions. Quite a number of flat disc and cylinder floor polishers were on view.

A feature of the fair was the number of miscrocopic motors on view for industrial and domestic purposes. Some were fitted with self-contained reduction gears, one of 1/100 H.P. had a worm reduction gear to 40 revs. It requires good design and manufacture to make a universal motor 1/25th of a horse power to weigh only 2¾ lb. Improvements in laminated magnet steel, in bearings, and in aluminium casting in recent years have made the construction of such machines possible. The making of electric motors on a commercial scale to replace the hand wound spring gear of phonographs, with the facility of an automatic stop, seems to have now been reached.

There seems to be a tendency to modify some of the very cold looking or ultra-bizarre cubist lamp glassware to something softer and more homely; freaks in art matters rarely stand the test of time. Automatic telephones for workshop and office work seem to be going ahead.

Lamp prices are dearer than they were some years back, apparently owing to the operations of a ring, but they are lower than in England, a 25 W pearl lamp costing about

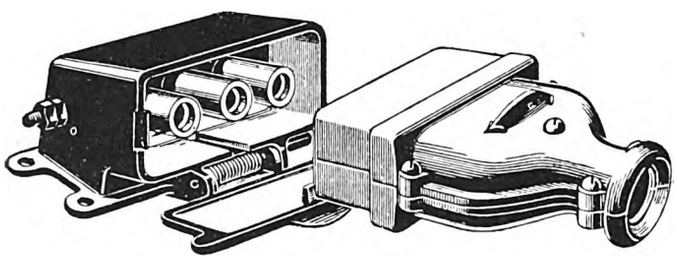

Fig. 4.—Outdoor tapping point with earthing contact.

1s. 3d., a 40 W clear gas-filled 1s. 4d. Normal wireless valves range from about 6s. 8d. to 13s.

The spread of electricity over the countryside has multiplied the demands for very small pumps for house service, and also for various forms of electrically-driven deep well pumps. A trouble has been that well water may be badly contaminated; this can be overcome by sterilising it with ozone.

The Cie. des Eaux et de l'Ozone of Paris, which has for nearly thirty years arranged sterilisation for public water supply on the Otto system, makes a small domestic ozoniser (Fig. 5), which can go on to any lamp circuit. It requires a little rectifier if operated on d.c., and can be arranged so that no water can flow unless the current is on.

The small domestic apparatus is mounted on a wood or marble board, 3 in. by 13 in., on the wall above a sink; it will supply 33 gallons of sterilised water per hour with a consumption of about 1 W per gallon.

The ozone is made between electrodes subject to a high tension discharge, and the ozonised air is drawn into the top by the running water with the aid of an ejector cone. This type of domestic steriliser might be very useful in many parts of the Dominions. It is difficult to make a chlorinating apparatus nearly as foolproof as an ozoniser. The ozone has little taste, and this passes off almost at once. It is made in a modified form for schools, hotels, hospitals, barracks and ships and for works canteens; it is used for the water supply of Paris. It is strange that the system has not been adopted anywhere in this country.

A special building was devoted to oxy-acetylene and electric welding and oxy-acetylene cutting of metals; a clever machine was one electrically driven to cut thick plates with a blow-pipe in accordance with a master pattern.

An electric chain welding machine made a remarkably good job of chains with links about ⅔ in. thick. The competition between the two classes of welding tends to keep both of them up to the mark.

A small building was given up to bakehouse plant; bakers' bread ovens, using heavy oil, competed for customers with those operated by electricity; the former, however, used electric motors for driving blowers for atomising the oil. The movement to abolish night baking, at first thought one might think would upset the furnishing of electricity at very low rates at night for such purpose; this is being got over by the use of heat-storage ovens with the added benefit that there is practically no danger of bread being over baked and further the heating elements being embedded in some granular material inside a casing cannot be injured by bakers' tools. Recent improvements in heat insulation have made it possible to bake bread quite a number of hours after current has been cut off, one maker, the Société Parisienne d'Etudes Spéciales, with a two-tier oven on a steamer, baked nearly 9 cwt. of bread 12 hours after cutting off the power. Another firm in the same line of business is Messrs. Lablyet, of Paris. This company embeds the heating elements in a sort of sand; it is not merely desirable to find a material with a good heat-storage capacity, but also one which will give up the heat readily when required.

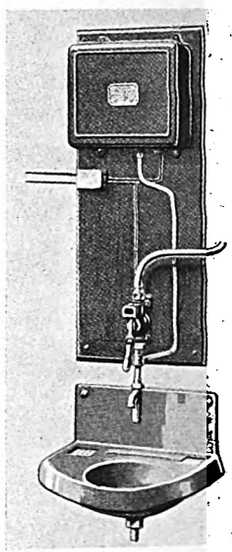

Fig. 5.—Small domestic water steriliser.

It is of interest that storage ovens have found scope on large passenger steamers, which have a peak on their power generating plant much like that of a residential neighbourhood on land. The extra fuel which must be burnt to make up for the low thermal efficiency of the plant is made up by the great advantages which can be had in the placing and fitting up of the ship's galley where most convenient relative to the saloon, the cleanliness and, also it is claimed, the saving in uptake trunk space for steam pipes or smoke pipes, with room for the repair of the former, etc. This increases the cabin accommodation to an extent which will tend to balance the extra fuel bill.

France is going ahead in the use of concrete for ornamental lamp posts and power posts, armoured concrete tanks and asbestos cement pipes made in long lengths; some quite neat looking wood frame buildings are covered with asbestos cement ornamental sheets. Armoured concrete for buildings and for power posts will never make the progress that it has in a number of countries abroad until the pronounced hostility and timidity of the authorities at home is materially abated.

An interesting appliance is a combustion of a mercury vapour lamp with a revolving shutter to give an intermittent light of ultra-violet rays, to attract noxious flying insects such as mosquitoes, tsetse flies, Phyloxera beetles, and so on, and then by means of an electric fan to draw them into a trap in which is acidulated water.

In a swampy district last year over half a million mosquitoes were trapped in three hours; a machine of large capacity is designed to minimise the effect of such pests over an area of about 100 acres. Special arrangements have to be made to keep off the rabbits and hares which are also attracted to the light. A special appliance is made for creeping insects. The plant is made by the Société d'Exploitation des Brevets

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Georges Gourdon of Paris. The same inventor is experimenting on the use of ultra-violet rays to attract sea fish into a pursenet by suspending a lamp below a steam trawler, thus avoiding the power used for trawling and the heavy wear and tear on the tackle.

At the Fair generally one was much struck by the way in which electricity was being used to back up a rival, for example a petrol gas generating plant was to be seen wound up periodically by a little electric motor.

The Fair has one advantage over some of our shows, in that apart from the food section, there was practically none of the touting and screeching going on from the efforts of salesmen or sales ladies to attract custom; that sort of thing is not encouraged, neither are there so many rows of individuals in opera-bouffe costumes, although some of the electrically operated advertising moving figures, connected with the booths of sellers of wines and other exhilarating beverages, were very clever.

Quite a number of ingenious items were on view, and, as remarked by a British merchant, far more people would visit the Fair from this side if it was better advertised by the home railway companies and others, and if business people knew the nature of much of the material on view.

A certain number of the stands were marked wholesale only, but at a great many of them retail orders could be booked. It was quite remarkable to see the large numbers of people of the working class on a Saturday afternoon and Sunday obviously out to learn something of interest in their trade. Perhaps that is one of the reasons why, as compared with our million and three-quarters unemployed, there are only a few thousands out of work in the whole of France; great efforts are being made to get over the difficulties due to the shortage of labour by the adoption of mechanical and electrical appliances. There is very little hostility to what some cold-footed gentry at home are afraid to call labour-saving appliances. The socialism which exists is very largely skin deep, with a large element of common sense in the background. The war taught many districts in France that there was much latent manufacturing talent available; there are a number of good trade schools and the standard of education required before one can become an elementary school teacher is one that would make some self-assertive and noisy fraternities elsewhere feel very uncomfortable.

There is also the point that has a material influence on electricity supply, and also on manufacturing, and that is that a very material percentage of those holding high executive positions are individuals who have passed through the highest class of scientific and technical schools; men from the Ecole Polytechnique can be found all over the place. There are not nearly so many decoy duck directors on the boards of concerns of standing as with us, and recent criminal proceedings have accentuated the feeling that those who are asked to join undertakings for the sake of their positions and followings have not merely to draw their emoluments and do what they are told, but also have a responsibility towards the public at large. This tendency makes for public confidence and therefore stimulates honest trade and trade methods.

At the Paris Fair there were a certain number of British exhibitors, mainly in the mechanical section, but there is scope for greater efforts. The Federation of British Industries has done what it could to help British exhibitors, and no doubt will do so again next year.

HOW TO PUSH RETAIL SALES.

Powerful Appeal of Electrical Appliances—Linking up Local with National Advertising—Adequate Stocks must be Kept.

By R. J. WILLIS.

IT is sometimes said that the electrical contractor is envied by his confrères in other trades because of the ease with which convincing sales arguments for his goods spring to the mind. This is quite possibly true (indeed, it is the firm conviction of the writer that its truth is self-evident), but what concerns us at present is to consider what use can be made of the inherent sales possibilities of electrical appliances in general.

Let us just consider for a moment what is our own attitude when buying, say, a motor-car. Now we do not buy a car because it has a glossy finish, or a streamline body, or a Gabriel horn, or because combustion takes place in the engine so many thousand times per minute, or even because the salesman is well dressed and anyhow has a nice, kind face. We buy that car because it will take us about from place to place with more comfort and convenience than we could possibly expect to enjoy without it. In other words—we buy transport. This method of reasoning applies with equal force if for car we substitute boots, clothes, furniture, house, or even public house, according to the needs and taste of the individual.

Applying the same argument to the sale of electrical appliances immediately shows us what a really powerful and convincing appeal such appliances have. With vacuum cleaners, for instance, the obvious course, and the one which seems to commend itself to the majority of retailers, is to sell the *machine* and to dilate upon the perfections of its motor ("runs for years without oiling, madam"), the sturdiness of its dust bag and the sweet and refreshing odour which it may or may not leave behind in its passage throughout the house. Now how much better, and how immeasurably more convincing, to deal instead with the real advantages of electric cleaning—its speed, efficiency, simplicity, economy, the saving in decorations and furnishings due to thorough cleaning, and finally, the most clinching argument of all, the unnecessary labour it saves and the amount of leisure it gains for the housewife.

As with vacuum cleaners, so with electric fires. Where is the necessity for telling Mrs. Smith, of "The Laurels," that So-and-So's fire has a patent fire bar giving 100% radiation efficiency and embodies quick make and break switches, which break the circuit so rapidly that even the fire itself does not know the current has been cut off until it hears the click and obediently dies away? Why not tell Mrs. Smith instead that when she has electric fires installed there will be no further need for the unholy trinity of wood, coal, and yesterday's newspaper, heaped in an unsightly pile preparatory to "laying the fire"? that she can have heat just when it is wanted, whether it is 7 a.m. for breakfast or 1 a.m. on returning from a dance? that with electric fires the room does not take several hours to heat—it is warm almost immediately? Nor would it be out of place to mention that the reason for spring cleaning is to clean the house from the effects of the winter's coal fires, so that during the summer, when there is no need for fires, the house will remain clean. The inference that electric fires would abolish spring cleaning should immediately enlist the active and enthusiastic support of Mr. Smith on their behalf.

The sales arguments which can be advanced in favour of electric cleaning, electric heating, or any other of the electrical ways of doing things are irresistible and can be used with the most telling effect. It is not as if the electrical contractor is left to himself in educating the public in his area. Most of the manufacturers take advertising space in the national dailies, and it only needs a regular advertisement in the local paper, linked up with the various national advertising schemes, to let the public know where the goods can be obtained.

It follows, of course, that the contractor must actually have the goods in stock. So many contractors seem to think that they can rely on the excellent service maintained by the wholesalers and keep only the bare minimum of stock themselves. No matter how quickly the contractor can promise to have the goods in, it is 99 chances to 1 that he will lose the customer when he cannot immediately clinch the sale. This question is one which deeply affects the whole trade. If the retailer refrains from buying, why should not the public do the same when there is no immediate necessity for the article in question?

If, on the other hand, the retailer has a good stock of such seasonable lines as vacuum cleaners, small portable heaters, electric light fittings, electric floor polishers, toasters and electric washers—and if he displays and advertises them by every means in his power, he must get the eventual benefit from the consistent efforts of the national advertisers.

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ELECTRICAL MARKET OF SOUTHERN AFRICA.

Value of the Gold Mining Industry—Contemplated Power Supply Extensions—Domestic Appliances—Telephones and Wireless Equipment—Standardisation—Points for British Manufacturers.

(FROM OUR JOHANNESBURG CORRESPONDENT.)

AT the present time the commerce of the Union of South Africa is experiencing a setback, caused largely by the unprecedented fall in the price of her agricultural staples of wool and maize. Since the end of the after-war slump in 1923, South Africa has progressed uninterruptedly in its agricultural, mining and industrial activities. The Union has adopted a policy of protective tariffs to foster her industrial development, and under it steady progress has been made, although it is considered in some commercial circles that the policy, which provides a revenue from customs duties of £9 000 000 per annum, has tended to maintain the costs of living and production at a level which reacts unfavourably on the primary industries of agriculture and mining.

The present setback in the country's progress is generally considered to be only of a temporary nature and of minor extent, due largely to the stabilisation of conditions effected by the gold mining industry of the Witwatersrand, which produces and markets over £40 000 000 worth of the precious metal per annum. Although the Rand gold mining industry is a wasting asset, it continues to expand, despite innumerable prophecies that it has passed the zenith of its production. At the present time three new mines are in process of development, i.e., the Geduld East Leases, the Witpoort Areas and the Daggafontein Mines. All of them show excellent prospects of developing into prosperous and long-life ventures, and they will provide a large market for electrical mining equipment during the next two or three years. As an example of the value of the mining industry to electrical manufacturers, it may be mentioned that the Geduld East Leases mine will be completely electrified and will provide a maximum demand of approximately 12 000 kW for its power requirements. As another example of the extent of electrification in the gold mining industry, four years ago a comparison of mining power consumption with some British undertakings showed that the largest single mine on the Rand had an annual power consumption equal to the entire output of the Birmingham Corporation electricity supply undertaking.

The bulk of the electrical and compressed air power requirements of the Rand mining industry are supplied by the Victoria Falls and Transvaal Power Co., Ltd., which has a maximum load of approximately 250 000 kW, of which 50 000 kW are required for the company's compressed air reticulation system. In addition to the company mentioned, three mines, i.e., Randfontein Estates, East Rand Proprietary Mines, and the New Kleinfontein Mine, derive their power from their own power stations. The Victoria Falls Co. has on order extensions of its system (70 000 kW) of electrical generating machinery in addition to increased step-down transformer capacity, and a new electrically-driven air compressing station is under consideration on the West Rand section of the company's system. The figures given are quoted to show the value of the Witwatersrand mining business in electrical machinery, more especially in view of the fact that apart from repair shops no electrical material is manufactured in South Africa.

New Steel Works Load

Most of the immediate municipal requirements have been met in the way of power supply for the time being, but it is probable that the Pretoria (Transvaal) undertaking, both on the generation and distribution sides, will require extension in the near future to meet the new load provided by the State steel works, which are shortly to be established in the vicinity of Pretoria at a cost of approximately £3 000 000; tenders for the establishment of the steel works are now under consideration in London.

Work is actively in progress for the provision of the power requirements of the copper fields in Northern Rhodesia, and this area during the next few years should provide a valuable market for electrical machinery.

One of the features of the development of the Union during the past five years has been an unprecedented boom in the building trade, and at the present time there is little sign of its abatement. It has been particularly noticeable on the Rand, and the city of Johannesburg has been revolutionised in appearance during the past few years. Practically all the old landmarks of the early mining days have given place to many-storied office buildings, and the suburbs of the city have shown similar activity in the erection of residential property, more especially flats. There is a ready market for lifts and heating apparatus in the office buildings, and it may be noted that central heating by steam or hot water has not been developed to the same extent that it has overseas, especially in America. When it is considered that in some of the new townships which form the suburbs on the outskirts of Johannesburg, a clause is inserted in building leases stipulating the minimum value of the property to be erected, and such minimum is frequently £2 000, it will be realised that there is a valuable outlet for such domestic appliances as refrigerators, vacuum cleaners, cooking apparatus, irons, kettles, radiators and the best class of lighting fittings.

South African E.D.A.

In this connection, it may be noted that plans for the establishment of an Electrical Development Association for South Africa, based largely on the British Development organisation, are reaching maturity, and its activities should be of very great value in fostering electrical development and making the manifold applications of electricity more widely appreciated.

The wireless market is practically stagnant at the present time, due to some extent to the difficulties experienced in providing a broadcast service for a white population of one and three-quarter million people scattered over an area of 471 000 sq. miles. There is a possibility of the service being taken over by the Government, but at the present time the wireless market is under a cloud.

The State telephone system has made steady progress since the Great War, and an expenditure of £750 000, spread over the next five years, has been authorised for the extension of the system and the provision of automatic exchanges and equipment for the Witwatersrand area.

Although municipal supplies vary from a.c. to d.c., and no attempt has been made in the case of a.c. supplies to adopt a national standard frequency or supply voltage, the mining supplies of the Witwatersrand, with the exception of those of the East Rand Proprietary mine and the New Kleinfontein mine, are standardised at 50 cycles, three-phase, and voltages of 2 100 and 525 for power, with 220 volts for lighting and domestic supplies. The standardisation of frequency and voltages for mining purposes has proved an inestimable boon to the mining industry due to the interchangeability of plant and equipment between mines, and it has also assisted the merchanting of electrical wares because it has reduced the variety of stocks to be carried.

Competition in electrical material in the Union of South Africa is severe, and a number of Continental and American manufacturing firms have established well-organised and excellently-equipped branches in the Union, officered by trained and able engineers. It cannot be too strongly emphasised that British houses seeking outlets in the Union, particularly in the heavier branches of electrical engineering for mining work, require adequate representation by qualified engineers, capable of assisting clients with technical and practical advice and information. Many of the larger British firms are splendidly represented, both in Johannesburg and the other large towns of the Union, but too much care cannot be exercised in appointing business agents in the sub-continent. To illustrate the need for care, it may be quoted that the writer was recently approached by the local agent for a well-known Continental insulator manufacturer. In the course of a conversation, which disclosed that the agent had no knowledge, other than that derived from a catalogue, of the product he was trying to sell, it transpired that his actual business was the sale of domestic crockery, such as dinner services. Knowing that insulators were also made of porcelain, he had obtained the local agency for the insulator factory, and intended selling them as a side line to his crockeryware business!

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A REAL ELECTRIC KITCHEN.

Cheaper Tariffs Needed—The Kitchen as a Restaurant Showroom—Advantages of Complete Alteration of Layout.

By BEN QUARMBY.

MY idea of an electric kitchen in a modern café or restaurant is one in which no other medium than electricity is used for any purpose, everything possible being done by the aid of electricity.

I have not yet seen, nor do I think that there is in existence n this country anything approaching to this ideal. Yet there must be a remarkable future for the development of the restaurant kitchen on these lines.

Electrical development is slow on account of the fact that the tariff for electricity is so high as to prevent its adoption in a kitchen for all purposes. The result is that almost every restaurant of note, although having electric illumination and power plugs for the vacuum cleaner, draws the line at any further appliances. Perhaps this is due in a certain measure to our supply authorities not pushing complete electrification, but, apparently, satisfying themselves with the lighting load. This, to my mind, is a great mistake, complete electrification of restaurant kitchens being mainly a matter of the offering of inducements, as everyone is acquainted with the superior cleanliness of electricity for all purposes over any other fuel.

If we could find a supply company courageous enough to offer a ½d. unit rate through one meter, exclusive of any other charge, for all purposes, we should secure a gratifying response from restaurant proprietors, who are only too anxious to improve working conditions in their kitchens.

The manager of a well-known café with whom I was recently exchanging confidences was bewailing the fact that comparatively few people had availed themselves of an open invitation to inspect his kitchen, which had been extended to customers over several years by means of a well-worded invitation on the menu. He was rightly proud of his kitchen, and stressed the point of cleanliness and comfort. I pointed out that his kitchen was altogether too hot and stuffy and unbearable to me ; it was, in point of fact, a good kitchen as kitchens go, but far below my ideal of an up-to-date kitchen.

I stressed my ideal of all-electric equipment, only to be met by the bugbear of cost, or the common understanding of cost, and could only come to the conclusion that much yet remains to be done to educate potential users of electric appliances in regard to the advantages offered by their use for all purposes.

The basis of this article was a remark of this particular manager that his kitchen was an important part of his business, consequently he was anxious for as many of his patrons as possible to see it. I am, therefore, making the revolutionary proposal of completely reversing the present layout of a modern kitchen.

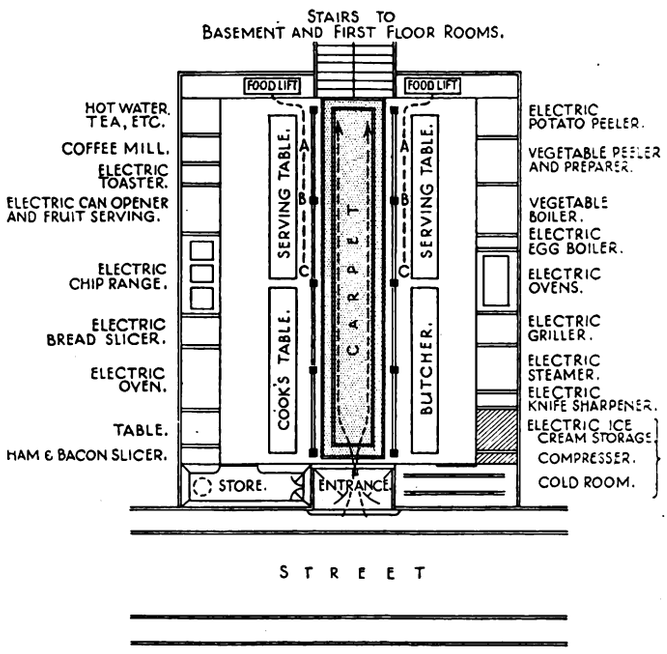
The present policy seems to be to hide the kitchen, but if it is desired that the public should see the kitchen and the food they are to eat in process of preparation and cooking, the obvious thing to do, if they will not avail themselves of an invitation to inspect the kitchen is to make the entrance to the café through the kitchen itself, so that all customers must of necessity pass through the kitchen on their way to the café proper.

The objection will be raised that the ground floor is the most valuable part of the premises, and must, therefore, be used as a dining-room. Yet if the kitchen is the most important part of the business, to be logical it should be placed in the most valuable part of the premises. It is on the kitchen and on what is produced by the kitchen that the reputation of any café or restaurant depends ; no amount of civility or good management could outlive a series of complaints about the cooking and quality of the food.

My method in the case of a two-storey building, consisting of ground floor and basement, would be to put the kitchen on the ground floor and the dining-rooms in the basement, making it necessary for all customers to walk through the kitchen to get to the dining-room proper.

This is a complete reversal of present policy, and would apply similarly if the premises were on the ground floor and first floor. In that case the dining-room would be on the first floor and the kitchen on the ground floor. Below is a sketch of the proposed layout.

It will be noticed the entrance from the street is directly into the kitchen, and that a carpet is provided on which the customers walk through. The walk is guarded by pillars and either brass rails or ornamental ropes on each side of the carpet for the entire length of the building. By careful organisation, it should easily be possible to avoid the necessity for employees to cross the carpet, as it will be seen that food lifts are provided on each side, giving service either up or down as may be required. The waitresses, A, B, C, would have access to the serving tables on each side between the rails, and the tables without interfering in any way with the kitchen staff.



I do not claim, of course, that the layout is completely satisfactory in every respect, my intention merely being to give the electrical trade an idea in order that it may be able to interest possible customers in the idea of adapting or converting existing premises.

From my experience of work in modern kitchens, I know that the staff would then be working in ideal surroundings, and the public, who are naturally curious as to what is happening in the kitchen, and would be better satisfied to see their food prepared under such conditions, would respond to and be thankful for such an innovation.

In the course of my work I have been in hundreds of café kitchens, in connection with the fixing and repairing of electrical refrigerators, and can say that there are very few comfortable, let alone ideal, kitchens; the majority are full of gas fumes, hot, stuffy and unbearable, allowing a minimum of comfort to the workers employed therein, and far short of providing a healthy atmosphere in which to work.

In summer the heat rising from a kitchen in the basement to the dining-room on the ground floor adds considerably to the stuffiness and temperature, while the reversal of their positions would add to the comfort of the dining-room.

Complete electrification would also decrease the heat in the kitchens, the heat being used in the electric appliances and not allowed to heat the kitchen by wastage, as at present. The kitchen would then be a cool and pleasant place in which to work ; the customers could walk through it without being met with a hot, sickly odour, as at present when entering a kitchen.

A kitchen set out on such lines could rival in magnificence, as far as decoration is concerned, the usual lavishness displayed in the decoration of dining-rooms, without the danger of decorations being spoiled by excessive heat or steam.

In my ideal kitchen, as many appliances as possible should be electric, and this fact alone, from the point of view of the electrical trade, would be of considerable importance, opening

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up new avenues in design and manufacture of appliances, and in the improvement in design and manufacture of apparatus with a view to better performance and results on a lower tariff.

The all-electric chip range would have to be developed for better service; there would not be the slightest difficulty in this direction, on the basis of a lower tariff. The improvement would make this a better selling product in the open market, benefiting the electrical trade and assisting in the abolition of chimney smoke and the pollution of the atmosphere to the immediate advantage of the community generally. Most people use well-known appliances because of custom which dies very slowly, so that the sooner all-electric appliances are used for an increased number of purposes the sooner will the resistance of custom against their use be broken down.

I have shown on my drawing the cold room and the ice-cream storage cabinet as being worked by the same compressor; this is possible with an installation of a certain character. I should also like to stress the superiority of British apparatus, as I have found that no foreign appliances of the kind can equal those now being made in this country.

There is still a wide field among restaurants and cafés in this country for electrical refrigeration; also for electric potato peelers and knife sharpeners. I therefore recommend the trade generally to get into touch with British firms manufacturing such apparatus with a view to acquainting themselves of the possibilities in this direction, and to get a little of the cream along with the hard work, as there is a tendency to concentrate sales of such apparatus through the medium of specialty salesmen. These are not interested in increasing the load from any other than a commission-snatching point of view, and invariably make mistakes in their explanations of the electrical side of the matter to our detriment.

Let us concentrate, as traders and citizens, on a crusade for the all-electric café.

UNEMPLOYMENT AND WORK—IX.

Housing the Key.

By SIR ERNEST J. P. BENN.

IF any one thing can be singled out as the essential basis of civilised life it is surely a house to live in. Everything follows on that. Most of our trades can be regarded as subsidiaries to the house building business; if that is active others follow on, if no houses are built others have nothing to do. All trades are, of course, to some extent dependent on other trades; the Post Office could not exist without a paper-making industry; spoons and forks would find no sale in a market where plates and cups were absent; but a house is in a category by itself and promotes and encourages and, indeed, demands the work of almost every other trade. You cannot even have your photograph taken until you have a house with sufficient room to keep it in, while the sale of pianos almost depends upon a collection of family photographs, suitably framed and requiring a worthy pedestal on which to stand.

The satisfactory arrangement of the employment question involves much more than merely finding jobs for those who are at the moment out of work. There is the much bigger problem of all the employed who are wrongly or inadequately or unsuitably employed. Every one of these people, by failing to fill his or her natural place in the complicated scheme of things, is causing some little bit of trouble and hindering progress. It is impossible to know how many of us are working at uncongenial tasks and thus wasting such natural abilities as we possess because we happen to live in a particular place and we see no prospect of getting out of it. All the experts agree as to the importance of mobility to good and satisfactory employment. If things were right, a man or a woman with labour power to sell should be able to take it where it is most wanted, but how many workers to-day have any choice whatever in the matter?

There are many trades where a variety of experience is essential to proficiency. The newspaper reporter is a good illustration. These men do in fact move about, they simply have to, but the moving is a troublesome, indeed, a heartrending, business. If it were not absolutely imperative it would not be done. The method is also uniform. The man, the breadwinner, moves on and leaves his family behind. He goes into lodgings and spends much time which he can ill afford searching for permission to rent some sort of premises to which he can bring his wife and children, and then a few years later he goes over it all again. There are many thousands of people in many trades in this absurd position. If a man wants to stand as a Parliamentary candidate, he has the choice of 615 constituencies in which to work, but if he desires to serve his fellow-creatures in some humbler capacity he must do it in the district where his mother happens to have half a bedroom she can spare for his use.

When a boy leaves his school full of enthusiasm and ambition and sets out to be a baker, or a steeplejack, or a golf pro., his problem, difficult enough in any case, is not complicated by uncertainty whether there are clothes for him to wear, and there is no good reason why the whole of his desires should be limited and thwarted by the absence of living accommodation in the places where he might be able to work out his ideas. There is a certain amount of irony in the present situation, when we find a bricklayer out of work because there is no house for him in the very district where bricklaying is most in demand. If we can imagine a condition of affairs in which everybody was free to go anywhere they chose, we can see the end of any trouble about unemployment? And why should it not be so?

We have pampered the housing trade into a position where it is able to avoid many of the obligations which press so heavily upon every other sort of occupation. The makers of clothes, furniture, books, cars, bicycles and, indeed, everything else are obliged to produce their commodities, put them into stock, display them in the market, and wait the convenience and the pleasure of the buyers. But not so with houses. The fortunate persons who have chosen to adopt the making of houses as a livelihood are able to force the rest of us into the attitude of supplicants, waiting upon their pleasure, and this, as I have said, is the central cause of all our economic ills. The reason is not far to seek. Indeed, there are two main reasons, the first natural and unavoidable, the second unnatural and crying out for alteration. The former consists in the fact that housing is a sheltered industry, there is no export or import of houses, and the trade is therefore almost free from the health-giving effects of anything which can be recognised as competition. We have been foolish enough, in the second place, to intensify this natural monopoly by allowing public authorities to drive everybody else out of the housing market. There will be no real improvement in the housing situation until we return to the days of the speculative builder and through the natural wealth-making qualities of profit making and bankruptcy, over-production and under-production, good and bad, retrieve that resilience and variety which in later Victorian days taught us all we know about the possibilities of houses and home making.

Housing is capital, and the lack of capital is a good big part of our trouble. When the coal trade is flourishing, wages are paid to miners, and wages seem on the surface to be of first importance when we are considering unemployment. It remains true, however, that every ton of coal mined is so much capital exhausted, while every house built is so much capital created. Capital in the form of a house is capital with a maximum of reproductive power and from the point of view of society, if not of the landlord, there is no better investment than houses. This is not merely because a house lasts for a long time, but because during every day of its existence it is an active promoter of trade and employment. I am, indeed, inclined to doubt the wisdom of building houses to last a century, and I rather prefer the American view which puts the proper life of a house at twenty years. From the public point of view, a twenty-year house may be as good an investment of capital as one that stands for the ninety-nine years of a lease. A series of twenty-year houses yielding, say, 15 per cent. interest to their owners, would be far better for owners and occupiers and everybody else than the present long-dated 4 per cent. idea of the way the housing and landlord trade should be conducted. But whichever way you look at it and whoever builds houses or, for that matter, whoever owns them, they are the most valuable form of capital that any nation can possess. The best-managed state, therefore, and the one in which employment and prosperity will be plentiful, will be the one which places the fewest obstacles to the provision of houses.

Whether we take the long or the short view, we must come to the conclusion that to allow the housing market to retain its

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present restricted character is sheer folly. Our lack of proper houses offers more work than could ever be done by all our unemployed. The figures are, roughly, these. We have 10 000 000 families and 8 000 000 houses, but of these not more than a quarter give us real satisfaction. If we consider one house per family a proper standard to aim at, there are orders waiting for 2 000 000 new houses and 6 000 000 replacements; if we go further and accept the twenty-year American idea, we find that we have a regular market for half-a-million houses a year. Nothing short of a perfectly free market, subject to all the stimulation of open competition, will even scratch the surface of this mine of national wealth.

There are quite enough natural and necessary difficulties about the building of a house to make it very important to keep the market clear of troubles that can be prevented. The scarcity of land, the risk of fire, the need for drains and water, all tend to limit our ability to satisfy the full demand, and we should therefore take special care to see that no monopolies, whether of materials or labour, or worst of all the monopoly of public ownership, are allowed to damp down enterprise.

We must really retrace our steps in this matter of housing. We were over-building within living memory, and we all know how it was done. Surely we shoud be delighted to see a condition of over-building to-day. No better social service is possible, and yet we hesitate. One final point. All this talk about housing for the working classes must be recognised as retrograde nonsense. We do not build bicycles or make gramophones for the working classes, then why houses? The builders must be free to build for anybody who will pay them. Every room built for any class relieves the pressure on all classes; the only thing that matters is that more rooms should be built and that the persons who live in them should pay for them. Rents would tumble just like bicycle prices if only we had the sense to adopt this policy.

On the question of unemployment, therefore, building helps us in a double way. It offers unlimited prospects of work first on the building itself, and secondly and subsequently on all the other processes and operations which come into play as soon as a house is available.

Housing is the master key to the situation.

BRITISH POWER AND LIGHT CORPORATION.

Annual Dinner and Reunion.

MR. H. A. Vernet, chairman of the British Power and Light Corporation (1929), Ltd., presided at the annual dinner and foregathering of the personnel of the Corporation and its constituent companies at the Savoy Hotel on June 20. Mr. Vernet, proposing the toast of "The Constituent Companies," said that up to the end of last year progress had admittedly been disappointing from a bankers' standpoint. The drought in North Wales, which lasted six months, had cost them £17 000 and there had been a number of small disappointments elsewhere. A great deal of work had been done in the past year in building up the association between the constituent bodies, and real progress was now being made. In North Wales the increase in units sold during the first five months of this year over the corresponding period of last year was 52½ per cent. and for May 80 per cent. The East Suffolk Co. had made splendid progress in spite of the depressed condition of agriculture and had obtained nine farmers as consumers not only for driving implements but for all household purposes.

Mr. H. S. Prowse replied.

Mr. A. V. Twiss, replying to the toast of "The Corporation," proposed by Mr. G. K. Paton, said that the group represented assets in excess of £4 000 000, operated over an area exceeding 5 000 sq. miles and directly supplied 10 000 consumers. Indirectly it supplied a further 20 000. Fifteen years ago electricity was still fighting to establish its supremacy for lighting; that matter had been decided. To-day a similar position existed in regard to cooking.

Brigadier-General R. F. Legge, who proposed "The Visitors," said that as the result of an electric cooker campaign they had sold 185 cookers at a publicity cost of a little over £1 each. In America the expenditure of £3 000 on a campaign of this kind had only resulted in the sale of 600, i.e., £5 per cooker. They would follow up the cookery campaign with cooling, heating and farming campaigns.

Sir Harry Haward, who replied, said that in some districts people who had not an electric cooker were finding it difficult to get cooks. The development of the cooking load largely depended on suitable tariffs. (*See page* 836).

Round the Jobs.

By "CONTRACTOR."

I WAS glad to see the electrical contracting profession—should I call it trade?—so well represented the other night at the I.E.E. Conversazione at the Natural History Museum, South Kensington. The first group of electrical contractors that I set eyes on were consuming claret cup and sandwiches blissfully unaware of a large notice over their, heads reading "Domesticated Animals and Hybrids"! There is to me a consistent charm about these annual conversaziones in which everything conspires to produce just the right atmosphere. Not the least of which is the annual reminder of the bond between the Royal Engineers and civilian engineers. I suggest that this bond is made all the more secure by the admirable qualities of Neville Flux.

* * *

In these days of socialism we hear a great deal of that phrase "Class Consciousness." It is a principle which extreme socialists and communists try to inculcate into their followers. From their point of view it is a very sound principle, in that in order to arrive at any achievement of note it is necessary that those who are striving for the achievement should force themselves into a state of mind receptive to availing themselves of every means to the end in view. It is a pity the idea is not more applied in the direction of making the public "Electricity Conscious." With the majority of the public electricity and all that it can do is quite a subsidiary thing in their minds. The householder who builds himself a house will take the utmost care that that house is built, let us say, on gravel. He will take a great personal interest in the drainage system, in the hot water system, in the type of window which is put in. He will then spend a considerable amount of money upon the decorating of the house, upon the furnishing of the house. But when it comes to electricity, to the quality of the installation, to the convenience of the switching arrangements, and, ultimately, to the choice of fittings, there will be only one thing uppermost in his mind, and that will be the question of *price*. He is not "electricity conscious," he regards electricity as quite the least important thing in his house, whereas, in fact, it is one of the most important. A little while ago I attended a discussion at my club on the subject of some new building work which was in progress in the club premises. The façade was discussed at length, the decorations, the colour scheme, the furniture and upholstering were all the subject of lengthy discussion and the expression of opinion; the heating apparatus, the service arrangements, in fact, every single detail but one was carefully and conscientiously discussed. The one point which received no mention whatsoever was, of course, the subject of the electric lighting. When I mentioned this omission to someone the answer was: "Oh, but there's nothing to discuss about that, is there? It will be just ordinary electric lighting."

* * *

There seems to be insufficient anticipation on the part of some supply undertakings of developments in their own area. As the electrical contractor is usually the go-between in the matter of lay-out between his customer and the supply undertaking, it is he who is apt to get the blame for what appears to be a muddle. Such a case occurred to me the other day. Quite a large building was in process of erection and having secured the electrical contract for the work I ascertained from the supply undertaking in writing that their supply would be 100 V, single-phase. Accordingly provision was made for a large amount of current to be carried. When the installation was nearly complete I was informed by the supply undertaking that the supply would, after all, be 200 V, d.c. This, of course, made no difference to the installation, except that a great deal of copper had been already wasted upon it. When the installation was finally complete in every detail the undertaking again informed me of a further change, this time the supply was to be 230 V, three-phase. This, of course, necessitated balancing and a triplication of switching and fusing arrangements, so that ultimately the customer had to pay for far more copper than was necessary in the installation, and a last-minute alteration of my estimate in view of the complications of balancing the three-phase. Needless to say, I got the blame for what was regarded as a muddled job. Worst of all, there appears to be no redress of any sort in such cases.

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BOOK REVIEWS.

Electric and Magnetic Circuits. By E. N. PINK. (London: Pitman and Sons.) Pp. vii+124. 3s. 6d. net.

The author of this book is an assistant professor in the electrical engineering department of the Heriot Watt College, Edinburgh; the work represents what, in the author's opinion, students of electrical engineering should know about electrical and magnetic circuits if they are to pass examinations in this subject. This work is clear and concise. It is divided into three sections; the direct current circuit, the magnetic circuit and alternating currents. The first section contains the essential factors of e.m.f., power, energy, resistance, flow of electricity, circuits, multiple circuits and motor efficiency. The portion dealing with multiple circuits is valuable from the fact that, although only d.c. current is considered, circuits of three-phase type are discussed; this paves the way for the more intricate three-phase circuits which are later dealt with. Two complicated circuits are given on p. 40; these should, if thoroughly considered, remove all doubt in a student's mind as to how to deal with almost any circuit set at an examination. The second section is comprehensive. Magnetism, the molecular theory of magnetism, flux and permeability, etc., are thoroughly treated. The calculations are helpful. The last section occupies the largest portion of the work. There are several portions in this section, including vector diagrams, condensers and capacity, polyphase working and non-sinusoidal currents. The portion devoted to vectors is to be commended; students will find it very useful as an aid to understanding phase angles, angles of lag, etc. As a primer the book is to be commended, especially to students in technical schools and colleges.

CYRIL SYLVESTER.

Theorie der Elektrizität. By M. ABRAHAM. Band I—Einführung in die Maxwellsche Theorie der Elektrizität. Eighth Edition. Completely revised by R. Becker. (Leipsig and Berlin: B. G. Teubner). Pp. vii+242. 15 marks.

Of all the treatises devoted to the interpretation of Maxwell's theory of electricity the classic work now under review has been regarded as unsurpassed by many physicists for nearly a generation. Originated in 1894 by A. Föppl, it was rewritten by M. Abraham 10 years later. Since then seven editions of this famous work have served to instruct teachers and students in the fundamentals of the theory of electricity. In taking over the task of keeping the work up to date, Prof. Becker has retained in the main the method followed by his predecessor. The opening section deals with vectors and vector fields, necessary as an introduction to what follows. The second section is on the electric field, and comprises chapters on the electrostatic field, dielectrics, energy and forces in the electrostatic field, and the steady current.

The electromagnetic field is the third section and in it magnetic vectors, electro-dynamics of currents under different conditions, and electromagnetic waves are dealt with. The last section is devoted to considerations of energy and force in the Maxwellian theory.

It may be mentioned that the second volume, now in its sixth edition, deals with the electromagnetic theory of radiation.

Enough has been said to show that this is essentially a book for the advanced reader, with a leaning towards mathematical physics. Commendation is superfluous.

S. PARKER SMITH.

Elements of Electricity. By A. ZELENY. (London McGraw-Hill Publishing Co.) Pp xxiii+438. 15s. net.

This book covers a fair amount of technical ground, and the descriptions and plates are much more up-to-date than most textbooks of physics. The author states that it is intended for the preliminary courses in arts and medicine, as well as engineering (and presumably physics). If an arts student can find time to digest so large a volume on electricity, and presumably similar books on other branches of physics in addition to his other "first year" subjects, the average of intelligence in America must far exceed that in Europe. For all that, I think it excellent that all students should, if possible, have a sound knowledge of modern physics, and doctors in particular are often dangerously ignorant of the electrical apparatus which they may be called upon to use to-day. It is also excellent that the future financier and legislator should have some knowledge of the technicalities of the supply industry and electrical engineering generally—though a little knowledge is a dangerous thing.

Although the treatment is fairly elementary, modern electrical theory and its application is very adequately described, and the student should be well prepared to proceed to more advanced or specialised works if he has read the book conscientiously, and if, of course, it has been backed up by laboratory work. A very pleasing feature is the series of photographs of the important discoverers in the field of electricity. The ground covered is indicated by the following list of selected chapter headings:—

Electric Charges and Forces; Magnetic Forces, Magnets and Magnetic Fields; Electrostatic Field; Electric Current; Electric Resistance; Capacity; Conduction of Electricity through Liquids and Gases; Relative Motion between a Conductor and a Magnetic Field; Inductance; Alternating Currents; Eddy Currents; Magnetic Properties of Iron; Magnetic Circuit-Measuring Instruments; Transformer; Generation and Transmission of Electric Power; Velocity, Charge and Mass of Electrons, Protons and Isotopes; X-Rays, Radioactivity; Production and Detection of Electromagnetic Waves; Communication by Electricity; Electricity of the Atmosphere.

W. F. C.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Hydro-electric Stations in South Africa.

[TO THE EDITOR.]

SIR,—Whilst reading our copy of THE ELECTRICIAN, dated May 2, 1930, we were very interested in your leading article on page 541 entitled "Hydro-electric Power in Africa."

In commenting on the small installations existing you mentioned Howick Falls in Natal. The Electricity Supply Commission, the largest generators of electric power in the Union of South Africa, have a power station at Sabie Falls in the Eastern Transvaal. This station contains three units, which, rated at 450 kW, make a total station capacity of 1 350 kW. The Howick Falls station referred to in your article is owned by the South African Rubber Manufacturing Co., and is rated at 400 H.P. This plant is no longer in commission, the S.A. Rubber Manufacturing Co., Ltd., having decided to take bulk supply from the Electricity Commission's Natal Central Undertaking; this power is steam generated at Colenso.

You will thus realise that the Commission's plant at Sabie is the largest in the Union of South Africa. The plant is fully described in the 1925 report of the Electricity Supply Commission, and subsequent progress is recorded in the succeeding reports, each of which has illustrations showing various portions of the plant.

There are two similar stations privately owned by the mines in the Sabie district. The one station is of about 1 000 kW and the other 800 kW; both supply power for mining purposes.—Yours faithfully,

W. VAN DALSEN,
Assistant to Chairman,
Electricity Supply Commission.

Johannesburg.
June 3.

WORLD POWER CONFERENCE EDITION OF THE "E.T.Z."

The "Elektrotechnische Zeitschrift" of June 12 (No. 24, Vol. 51) contains an article by Dr. O. von Miller on the objects and organisation of the Second World Power Conference, which was opened on June 16, the general report of the Conference, and the plans for the meeting of the International Elektrotechnical Commission in Scandinavia from June 27 to July 9. Amongst the interesting special articles in this issue of the "E.T.Z." are those on water power in Germany, by E. Mattern; fuel, by B. Thierbach; the telegraph and telephone systems as consumers of electricity, by E. Feyerabend; German electro-chemistry as a current consumer, by K. Arndt; electricity in German industries, by K. Dohrn; the installation for the transmission of the reports of the World Power Conference in different languages, by W. Jackel; the first international electricity statistics and Norwegian electricity works, by N. Schulz; the utilisation of Swedish water powers, by W. Borgquist, etc.

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NEWS IN BRIEF.

Dundee and Foreign Cables—The Newton Abbot Power Station—Electrical Women at Birmingham—The London and Home Counties Joint Authority.

THE Secretary of the National Federated Electrical Association desires us to state that the rate in operation for the London District is in accordance with the declaration recently issued by the E.T.U. and the N.F.E.A., namely, 1s. 10d. per hour.

The Electricity Commissioners have approved the Metropolitan-Vickers, type NE, single-phase watthour meter, rated sizes 2½, 5, 10 and 20 A, for voltages of 100, 200, 240 and 400, at frequencies of 40, 50, 80 and 100 cycles, 240 V at frequencies of 25 and 39 cycles and 200 to 250 V at frequency of 50 cycles.

The "Faraday House Journal," summer term issue (No. 6, Vol. XIII), contains many personal notes relating to old Faradians, book reviews, results of examinations, lists of students and the officers and staff of the Faraday House Old Students' Association and particulars of the system of training electrical engineers at Faraday House.

Arundel Corporation is considering the advisability of lighting the town hall electrically.

The all-electric totalisator was used for the first time in Scotland at Hamilton Park last week.

Islington (London) Electricity Committee is acquiring premises in Holloway Road for showroom purposes.

A meeting of electrical contractors, interested in the allocation of corporation hire-purchase wiring, is to be held in Glasgow soon.

The annual general meeting of the Institution of Electrical Engineers, South Midland Students' Section, took place on Tuesday, June 24.

The Centre of British Engineering and Transport Institutions has moved to its new and permanent premises, Prince George's Hall Building, Sarmiento, 1 230 (fourth floor), Buenos Aires. Mr. L. Greaven is secretary.

The completion of a large dam on the Gatineau River, Quebec—bringing the amount of water available at all times up to 145 000 000 000 cu. ft.—is announced in the first year's report issued by the International Hydro-Electric System. This system, which operates both in Canada and the United States, has now a total installed capacity of 1 300 000 H.P., of which 852 000 H.P. is obtained from water power.

On Wednesday the Prince of Wales will open the Constantine Technical College near Middlesbrough. He will subsequently visit Messrs. Dorman, Long's Britannia Works and the Billingham Works of Imperial Chemical Industries, Ltd., which has one of the largest industrial electric generating plants in the country. On Thursday the Prince of Wales will visit William Blosford's shipyards at Sunderland.

The new electrical showrooms in King Street, Clitheroe, which are to be opened shortly, contain two chairs of more than usual historical interest in that they were made for the Prince and Princess of Wales and used by them at a luncheon given by Mr. R. Dixon, Mayor of Middlesbrough, when opening the Municipal Buildings there in 1889. Both bear the Prince of Wales's crest. A small silver plate behind each contains an appropriate inscription.

At the end of last year, only 560 426 (8·8 per cent.) of the 6 371 640 farms in the United States were supplied with electricity. Nearly 100 000 farms were connected last year, an increase of 21·6 per cent. California heads the list of States with 53·3 per cent. of farms served; Washington has 51·6 per cent., Utah 45·1 per cent., and Arizona 37 per cent. In the East, Massachusetts leads with 36·9 per cent., and New Jersey has 32·1 per cent. of its farms connected. Tennessee, with 0·6 per cent. is at the bottom of the list, but North Dakota, Arkansas and Mississippi are little higher.

An earth fracture in the bank of the overflow channe below the spillway has occurred at the Arapuni hydro-electric works. The spillway is being partially drained to permit of inspection.

Dundee Electricity Committee last week considered British and foreign offers for cables. The total of the lowest foreign offer was £5 620, while the lowest British all-in offer was £6 525. It was decided to accept three British offers where the price was not much above the foreign offers and to accept the other foreign tenders.

Since the Illinois Central Railroad began electrifying its suburban lines around Chicago in 1926, the rate of increase in its passenger business has more than quadrupled. The average increase for the last two years of steam operation was 818 611 passengers a year. The average increase for the last two years of electric operation was 4 013 111 passengers a year.

Torquay Corporation has accepted a tender, amounting to £14 230, for the construction of new buildings at Newton Abbot generating station.

Bedford Electricity Committee seeks sanction to borrow £2 000 for the purchase of motors for the purposes of hire and hire-purchase schemes.

Applications are invited for junior assistantships at the National Physical Laboratory. Candidates should have good honours degrees in metallurgy, engineering or physics.

About 3 500 telephone lines in the London area were put out of order by the heavy storms on Tuesday and Wednesday of last week. Trunk and toll lines were not affected.

The chairman of Seaham Harbour Electricity Committee has been authorised to visit London firms regarding supply of meters. The Committee is to acquire premises in Blandford Place for electricity showroom and offices.

On June 17 members of the Birmingham and Midland Branch of the Electrical Association for Women spent an afternoon at Birmingham Corporation's power station at Ham's Hall. The members were received by Mrs. H. K. Beale (president) and Mr. F. Forrest, city electrical engineer, and they also had the pleasure of seeing Mr. and Mrs. R. A. Chattock.

It is understood that negotiations have been opened between the L. and N.E. Railway Co. and the Government Development Act Committee for a grant towards the cost of the company's scheme for the electrification of the main line from London to Hatfield, Enfield, Welwyn Garden City and Hertford, and suburban lines from Finsbury Park to the Alexandra Palace, High Barnet and Edgware, a total of 60 route miles.

The Electricity Commissioners will hold an inquiry at Savoy Court, Strand, London, W.C.2, on July 24, into proposed amendments of the Order constituting the London and Home Counties Electricity District and incorporating the London and Home Counties Joint Electricity Authority. Copies of the draft Order embodying such amendments can be obtained from the Secretary, Electricity Commission, at the above address.

The ascendancy which the telephone is assuming over the telegraph, is shown in statistics published by the American Telephone and Telegraph Company. In Canada, each individual holds, on an average, 241 telephone conversations per year, but in two years sends only three telegrams. The Americans, each of whom on an average telephones 230·7 times a year, send only 1·9 telegrams each. The New Zealanders have 209·1 telephone conversations apiece per annum, Danes, 143·5, the Japanese, 56, Germans, 38·1, and the English 30·6.

LOOKING BACKWARD.

FIFTY years ago, in THE ELECTRICIAN *of June 26, 1880, it was reported that a diver working under water at Halifax, Nova Scotia, had been rendered insensible by lightning which struck the air pump.*

The award of the Volta prize of 50 000 frs. to Dr. Alexander Graham Bell for his invention of the telephone was recorded, M. Gramme receiving a second prize of 20 000 frs. for his magneto-electric machine.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of June 30, 1905, mentioned that nearly 300 members of the I.M.E.A. took part in the tenth annual convention of the association at Edinburgh. (It may be recalled that the number of registrations at the 1930 Convention exceeded 1 100.)*

The formal opening was recorded of the Pigeon House Fort generating station at Dublin (which has recently been relegated to the position of a stand-by station by the transfer of the Dublin load to the Shannon undertaking). The Pigeon House station began operating two years before the official opening.

Heavy thunderstorms occurred during the last week of June, 1905.

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PERSONAL.

CAPT. A. S. Keep has been elected a director of Petters, Ltd.

Abertillery U.D.C. has advanced the salary of Mr. D. Thomas, electrical engineer, from £350 to £400.

Mr. Matthew Smith, Kilmarnock, has been elected chairman of Ayrshire Electricity Board. Mr. Smith is a member of Kilmarnock Town Council.

Miss Eva Moss, whose engagement is announced.

Miss Eva Moss, daughter of Mr. Harry Moss, and hon. secretary of the Bradford Branch of the Electrical Association for Women, has become engaged to Mr. Alfred W. Burgoyne, of Bleasley, Notts.

Worcester Town Council has decided that the salary of Mr. C. M. Shaw, electrical engineer, should be the amount (£1 080) prescribed by the scale of the Incorporated Municipal Electrical Association.

It is reported that Mr. Napier Prentice, formerly managing director of the East Anglian Electricity Co., Ltd., is lying seriously ill at the residence of his son, Mr. Courtney Prentice, Kelvedon Grange, Essex.

Mr. Ronald M. Gravatt, of the Wolverhampton Corporation electricity department staff, has been presented by his colleagues with a pewter coffee set on his marriage.

Mr. Percy James Bradford, on the occasion of his marriage at Stafford last week to Miss H. I. Stanley, was presented by the test staff at the works of the Metropolitan-Vickers Electrical Co., Ltd., with two electric fires, and an iron and toaster.

Mr. Edwin Seddon, engineer and manager of the electrical undertaking, Edinburgh, was the speaker at the weekly meeting of Edinburgh City Business Club last week. Mr. Seddon dealt with the Central Scotland Electricity Scheme.

Mr. Harry Citford Godsmark, formerly assistant rolling stock engineer of Nottingham City transport undertaking, has been appointed assistant manager. He was formerly chief technical assistant in the Manchester transport department.

Prof. Einstein, on whom the University of Oxford proposes to confer the degree of Doctor of Science, has advised the Vice-Chancellor that his medical advisers will not permit him to travel to Oxford to receive the honorary degree from Convocation.

The board of British Insulated Cables Ltd.. has appointed Sir Alexander Roger, formerly vice-chairman, as chairman of the company in succession to the late Mr. Dane Sinclair. Mr. John Ferguson, also a director of the company, will become vice-chairman.

Employees of the Warrington Corporation electricity department have presented Mr. F. V. L. Mathias, borough electrical engineer, and his wife, with a grandfather clock on the occasion of their silver wedding. The presentation was made by Mr. H. B. Jackson, deputy engineer.

Obituary.

PROF. WILLIAM HENRY BRISTOL, aged 70 years, at Newhaven, Conn. Prof. Bristol invented numerous recording instruments for pressure temperature and electricity. He played a large part in the development of the "talkie" film.

MR. ELMER AMBROSE SPERRY, on Monday, aged 69 years. At the age of 20 he founded the Sperry Electric Co. of Chicago. He then turned his attention to electric mining machinery and invented the chain undercutting machine and other apparatus. Following experiments with electric motors for tramway-cars, he founded later the Sperry Electric Railway Co., of Cleveland, which in 1894 was bought by the General Electric Co. of New York. He was the inventor of the chlorine detinning process and the electrolytic process for producing white lead from impure by-product lead, and the designer (in 1915) of a new high-intensity arc searchlight. His most important invention was the gyro-compass. Shortly before the Armistice he devised a form of wireless control for aeroplanes which, it was claimed, made it possible to direct an "aerial torpedo" against a target up to a distance of 35 miles. He was founder of the American Institute of Electrical Engineers, and of the American Electrochemical Society. Since 1910 he had been president of the Sperry Gyroscopic Co., Brooklyn.

LEGAL INTELLIGENCE.

Appeal of Oxford Electric Company Dismissed with Costs.

THE question of the amount to be paid by the Oxford Corporation for the acquisition of the Oxford Electric Co. was raised last week in an appeal by the company from a decision of Mr. Justice Bennett in the Chancery Division. The appeal was heard before the Master of the Rolls and Lords Justices Lawrence and Romer in the Court of Appeal.

The Master of the Rolls in giving judgment on Tuesday said the two points raised were, first, what was the measure of the quantum of purchase price to be paid by the plaintiff corporation to the defendant company for the purchase of their undertaking, and, secondly, the question was from what time the rights of the corporation became effective.

Having referred at considerable length to the contentions of both parties on these two questions, his Lordship said that after very careful consideration of the arguments of counsel he came to the conclusion that the contention on behalf of the corporation on the first question was right, and that the purchase price was to be ascertained by capitalising a sum of 5 per cent. upon the capital of the company properly expended on the undertaking. He thought that on that question the decision of Mr. Justice Bennett was right. With regard to the profits, there were he thought, words in the order which gave an indication of the date from which the undertaking was to be deemed to be sold so that the profits passed to the purchasers. One had to ascertain the capital which had been properly expended at the date of the notice (December 3, 1928). That clearly indicated that for certain purposes the date of the notice was the crucial date, and it appeared to him to be a clear indication of the date at which the profits came to be ascertained and measured both for the purpose of price and thereafter as belonging to the purchasers. The undertaking was to be valued and measured at the date of the notice, and thereafter the profits must be payable to the purchasers. He (the Master of the Rolls) thought the judgment of Mr. Justice Bennett was right on both questions, and that the appeal should be dismissed.

The Lords Justices delivered judgments to the same effect, and the appeal was accordingly dismissed with costs.

The "Colpitts" Patent Extended.

Judgment was given by Mr. Justice Luxmoore in the Chancery Division, on Tuesday, in an application by the Standard Telephones and Cables, Ltd., formerly called the Western Electric Co., Ltd., for an extension of the term of a patent granted to the Western Electric Company, assignees of Edwin Henry Colpitts, for an invention of "improvements relating to signalling by high-frequency currents as in wireless telephony."

His Lordship, giving his decision, said the invention was protected by letters patent in the United States, dated May 18, 1914, the date on which application for the letters patent was made in that country. It was a convention patent and therefore under the statutory provisions the date of the patent was the date of application for the patent in the foreign state in which protection had been already obtained. That date was May, 1914. The applicant company did not in fact apply for letters patent in respect of the invention covered by the American patent till March, 1920, and the question arose whether an applicant who had not applied for a patent until after the war could be said to fall within the description "patentee as such," contained in sub-section 6 of section 18 of the Consolidated Act. If the true construction of that was that the loss or damage to be suffered by reason of the war must be suffered by the person who was the owner of the particular patent at the time the loss or damage was suffered, he would have to decide this matter against the applicants. But he thought that would be to put too narrow a construction upon the sub-section. His view was that the term "patentee as such" covered not only those persons who were owners of letters patent actually granted either before or during the war, but all those persons entitled to apply for the grant of letters patent which when granted would be of a date antecedent to the date of the actual application, such date being either before or during the war period. The applicant company were entitled to make application when the war broke out, and the evidence satisfied him that almost directly after the outbreak of war they started to manufacture munitions and were a controlled establishment till November, 1919. He would extend the patent for a period of four and a half years from March 17, 1930, and he made an order accordingly.

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DOMESTIC ELECTRICAL APPLIANCES.

Refrigerators for the Home—A Handy Accumulator-Operated Pocket Lamp—A New Loud Speaker—Another 4 V Filament Valve.

NOW that the summer is at all events in evidence, dealers may be interested in a few details of some of the popular makes of refrigerators. Our representative recently visited the showrooms of FRIGIDAIRE, LTD., at Chapter Street, Vauxhall Bridge Road, S.W.1, where he found a distinct improvement in the external appearance of the well-known "Frigidaire." The difference is largely due to the finish now being porcelain-enamel throughout; at the same time corners have been rounded and other minor improvements have been made. The principal feature of the 1930 Frigidaire is, however, the "Hydrator." This device is claimed to enable vegetables to be kept fresh for a fortnight; even such relatively delicate viands as lettuces and cucumbers, which had, it was stated, been in the cabinet for this length of time, were quite fresh and crisp when examined. The hydrator is very simple in construction, being little more than a porcelain-enamelled container with holes at the sides; it is arranged to slide on hangers, and in its normal position it is completely enclosed, apart from the perforations. It operates on the principle of preserving internal moisture, thus enabling the same refrigerator to provide moist cold as well as dry. Apart from its uses for keeping vegetables fresh, the hydrator is said to be most effective for rejuvenating vegetables that have become wilted.

KELVINATOR, LTD., 258, Gray's Inn Road, London, W.C.1, also announce a new range of refrigerators. These are known as the "Super-Automatic Kelvinators," and one of their most interesting features appears to be that in the larger models an interior lamp is provided, together with a red indicator to avoid any chance of the lamp being left on. Another notable improvement in the 1930 models is the provision of "Ice-O-Thermic" tubes, which we understand enable freezing to be greatly accelerated and also provide for four temperatures in one cabinet—in the neighbourhoods of 40, 30, 20 and 10 degs. respectively. The new Kelvinators are available in combinations of white and French grey, with non-tarnishable metal fittings of modernistic design. In order to minimise thermal conduction there is an absence of screws. There are nine standard models of the new Kelvinator, ranging from the D.8, which has a food storage capacity of 8 cu. ft. and a shelf area of 15 sq. ft., to the D.22, with a storage capacity of 22 cu. ft. and a shelf area of 38 sq. ft. The ice-making possibilities of the latter model are 243 cubes and one 9¼ lb. cake, and it gives 34 lb. of ice at one freezing.

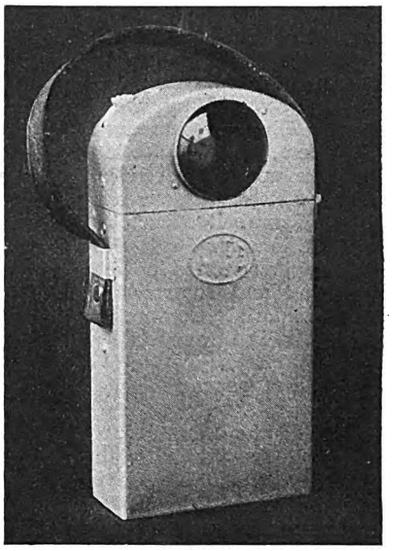
Among the various types of refrigerator produced by MARCO REFRIGERATORS (1929), LTD. (Manor Works, Streatham Vale, London, S.W.16), a recently introduced model is the "35." In this refrigerator the proportion of shelf and hanging space can be changed at will, all shelves and rails being instantly removable. The doors are stable pattern, with heavy nickel-plated brass hinges and fasteners, while the framework, exterior and jointless lining are of wood. The standard exterior finishes are varnished oak graining or white enamel; the interior is finished in white enamel, and the insulation consists of 2 in. of best quality cork slab. The dimensions of this model are as follows:—

	Height.	Width.	Depth.
Exterior	74 in.	46 in.	33½ in.
Large compartment	66 in.	27 in.	26 in.
Small compartment	27 in.	10½ in.	26 in.
Door opening (in clear) ..	59 in.	21 in.	
Shelf area	28 sq. ft.		
Wall rails	26 ft.		
Ceiling rails	4½ ft.		
Clear space between shelves— Lower two, 11 in.; others, 9 in.			

The "Marco" standard sectional cold rooms are made from selected, well-seasoned timber, with one full-length door. The exterior and interior are constructed of ¾ in. T and G board. Fittings are as follows: interior detachable hanging rails on two walls, detachable slatted wooden shelves on one wall, galvanised steel ceiling rails. The floor is lined with galvanised steel lining and fitted with a removable wooden floor grating. The exterior has heavy galvanised steel hinges and fastener, with internal and external handles. The internal capacities of these cold rooms vary from 40 to 1 000 cu. ft.

We are informed that the compressors used in Marco refrigerators are now being manufactured at the Marco works at Streatham. The standard lines of refrigerators are now vitreous-enamelled inside and out; they have catches of a new type and triple hinges.

The "Nife" pocket lamps, type A, marketed by BATTERIES, LTD., Hunt End Works, Redditch, contains a steel plate battery embodying all the principles of the "Nife" accumulator. It is shown in the accompanying illustration, and it is stated that it will "last a lifetime," and that one charge, costing a few pence, will give the same number of hours of continuous light as 10 dry batteries. As no gases are given off during discharge the cell is fitted with solid plugs, thus making it entirely leak-tight.



The "Nife" type "A" pocket lamp.

MARELLI AND CO., LTD., of Fan House, 19-20, Garlick Hill, Queen Victoria Street, London, E.C.4, have sent us particulars of their present range of electric fans. Desk fans are represented by three models of the rigid base type, and by four swivel-and-trunnion models, light pattern. Two of the latter are convertible to bracket fans without the necessity for an extra joint, while with the remaining two a knuckle joint can be introduced. There are also convertible desk and bracket, swivel and trunnion fans of heavy pattern, and convertible oscillating fans. The Marelli exhaust fans are of the open blade type with ring frames; the approximate air displacements against free intake and discharges, in cubic feet per minute, are—10 in., 400; 12 in., 1 000; 16 in., 2 000. A large number of types of ceiling fans are also manufactured.

The GRAMOPHONE CO., LTD., (363, Oxford Street, London, W.1), have introduced a new moving coil loud speaker, No. L.S. 4. This unit has been produced to satisfy the requirements of those owners of "His Master's Voice" standard electrical reproducers who have asked for a separate loud speaker comparable in quality to the original instrument, in order to extend the facilities of their equipment.

The combination of the mechanism of the automatic gramophone with the reproduction of the electrical reproducer has now been effected, and the result—the automatic electrical reproducer "Model 15"—is claimed to be an instrument which is unapproached for completeness and effectiveness as an entertainer for the home or for commercial purposes. It is stated to reveal hidden beauties in the most familiar records, and it may also be used as a super-quality loud speaker for radio reproduction, the change from radio to records being effected by a switch on the centre control panel. It will be welcomed by owners of large houses, hotel and restaurant proprietors, who require greater volume than the original acoustic model afforded. A particular feature of the new instrument is its capacity to operate additional loud speakers (not exceeding three in number) of the L.S. 4 type.

Users of wireless receiving sets that employ a 4 V accumulator or d.c. mains sets employing 4 V valves, will be interested to learn that A. C. COSSOR, LTD., of Highbury Grove, London, N.5, have extended their "new process" to their range of 4 V valves. The new valves are available in seven distinct types, to meet the requirements of all sets. The valves comprise a high efficiency screened grid (410 S.G.), a high frequency valve suitable for the type of set employing stabilised amplification and suitable for the detector stage (410 H.F.), and a valve of high amplification for resistance capacity coupling (410 R.C.). For the low frequency side are a valve for early stage use (410 L.F.), a power valve claimed to give sufficient volume to fill the average room (410 P.), a super-power valve (415 X.P.) and a pentode (415 P.T.).

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EMPIRE COMMUNICATION.

Post Office Policy Under Criticism—Plea for Improvement.

AT the Conference of the Empire Press Union in Edinburgh on June 21, Mr. Norman Smith (Canada) moved that the Conference should approve the principle of the mutual interchange of cable news between component parts of the Empire.

Sir Hugh Denison (Australia) moved a resolution reaffirming the desirability of securing the cheapest possible means of communication in the interests of inter-Imperial relations by the reduction of telegraphic Press rates to the lowest possible limit, by the introduction of a deferred Press rate on all routes, and by the abolition of the terminal charges imposed by governments in respect of messages not handled by them, and requesting the Communications Committee to take up the matter with the authorities concerned. Sir Stanley Reed (India) seconded the resolution.

Sir Campbell Stuart read an address on "Empire Communications for Press Purposes." After describing the relationship, as defined in the agreement of May 29, 1929, between Imperial and International Communications, Limited and the Imperial Communications Advisory Committee (of which he is Deputy Chairman and represents the Canadian Government), Sir Campbell Stuart said that the committee was now engaged on arrangements for joint working in Australia between the Amalgamated Wireless of Australasia and the Communications Company, which would result, among other things, in the assimilation of cable rates to the wireless level. The Advisory Committee, at the request of the South African Government, had examined and made recommendations regarding the questions of policy and rates in the Union, as a result of which the ordinary rates both by cable and wireless would be assimilated and reduced.

Sir Robert Donald addressed the Conference on developments in radio and cable communications. He said they had now reached another critical stage in Empire communications, when a well-defined policy was necessary in regard to new means of rapid world-wide transmission of news, pictures, facsimile newspapers, radio-telephones and Empire broadcasting. A conflict between radio-telephones and radio-telegraphs might arise similar to that which the all-Empire Conference was called upon to consider and solve only two years ago. The outlook for Empire communication in the interest of the Press was as critical to-day as it was 21 years ago. The experimental station at Chelmsford was rented from the Marconi Company, and had been transmitting the British National programme fairly successfully. The question now was the provision of a special station broadcasting with a special programme, or several programmes, throughout the Empire. The scheme was held up because the B.B.C. had not funds available, the Post Office declined to provide funds, and the Dominions Office held aloof.

The policy of putting the Empire second was no doubt due to the fact that the Post Office at Rugby had entered into partnership with a big United States Corporation. The equipment at Rugby was mainly American. Equally effective apparatus could have been made at Chelmsford. All this time there was a system belonging to the Marconi Company, now taken over by the Imperial and International Communications Company, ready for use. The Post Office declined to use the beam stations where, without further capital expenditure, and without delay, wireless telephony could communicate with the Dominions. In a recent circular issued by the Post Office, it was stated that the transatlantic telephone service had been extended to include parts of Australia, South America and Java. It was also pointed out that "these services have now passed far beyond the experimental stage and are regarded as part of the normal long-distance services from this country." If that were so, why not give the Empire the first service? It was the duty of the Post Office to secure the best facilities for communication between this country and the United States, the greatest commercial community in the world: it was vital for the business interests of the two countries, but that was no reason why the Dominions, whose economic interests and social ties were of premier importance to the Empire, should be given second place. It was worth questioning whether the Post Office, organised as at present, was capable of managing efficiently such a changing, delicate, extremely difficult business as radio-telephony.

BRITISH INDUSTRIES FAIR.

London Section to Occupy Whole of Olympia —New Birmingham Arrangements.

THE Department of Overseas Trade announces that the British Industries Fair, 1931, will open in London and Birmingham as usual on the third Monday in February (the 16th) and will close on Friday, February 27. In a letter to manufacturers, the Comptroller-General, Department of Overseas Trade, Sir Edward Crowe, writes:—

"The London section of the Fair, which, as you are no doubt aware, is organised by this Department, will again be held at Olympia, where all the buildings, including the whole of the Empire Hall, will be available for the first time.

"His Majesty's Government have again made a grant of £25 000 for advertising the Fair, and the services of the Trade Commissioners, the Commercial Diplomatic Officers, and the Consular Service will be available for making the Fair known to trade buyers in all parts of the world.

"In view of the success of the last Fair, it is anticipated that all the available space will be taken up at an early date, and consequently no guarantee can be given that space will be available in respect of applications received later than July 31, 1930."

By the addition of two floors of the Empire Hall, Olympia, which were not available last February, the exhibiting area of the buildings is increased by 50 000 square feet to a total of 300 000 square feet. Following a recommendation by the exhibitors' advisory committee, it is announced in the official regulations that the Fair in London will open and close half an hour earlier than in previous years. That is to say, the hours will be 9.30 a.m. to 7.30 p.m., and the public, instead of being admitted from 4 p.m. to 8 p.m., will be admitted only from 4.30 p.m. to 7.30 p.m. and from 1 p.m. to 7.30 p.m. on Saturday, February 21.

In connection with the Birmingham section of the Fair service to exhibitors in the arrangements for their displays has been considerably increased by a new zone system, introduced within the last few weeks, covering the whole of Britain. From now onwards direct representatives of the Birmingham Chamber of Commerce, which is responsible for the organisation of the heavy section of the Fair, will be centrally located in various parts of the country. For this purpose, manufacturing interests in electrical and other "heavy" industries have now been divided into the following areas:—London, No. 1, extending to Bournemouth in the South-West; London, No. 2, extending from Norfolk to the Kent and Sussex Coast; Yorkshire, Lancashire and North Wales; North-East Coast; and Scotland. In these respective areas, representatives of the Birmingham section of the British Industries Fair will in future be at the immediate call of manufacturers who desire guidance on matters tending to the most effective demonstration of their products.

SHOP AND DISPLAY LIGHTING.

Preliminary Details of Special Joint E.D.A. and E.L.M.A. Conferences.

THE E.D.A. and the E.L.M.A. are arranging the details for a shop and display lighting campaign, to be held from September 15 to November 30 and a complete programme of the scheme will be published shortly.

A series of conferences is being organised and these will be held as indicated below.

Area	Date.	Time.	Place.	Members of Campaign Executive Committee in attendance.
South Midland ..	June 23	p.m. 3.15	White Horse Hotel, Congreve Street, Birmingham	Mr. C. W. Sully Mr. V. W. Dale
North West ..	June 30	3.30	Lighting Service Bureau, 4, Fountain Street, Manchester	Mr. C. W. Sully Mr. V. W. Dale
North East ..	July 2		Newcastle	Mr. V. W. Dale Mr. S. Anderson
West of Scotland..	July 2	4.0	Central Station Hotel, Glasgow	Mr. W. J. Jones
East of Scotland..	July 3		North British Hotel, Edinburgh	Mr. W. J. Jones Mr. V. W. Dale
South West ..	July 3		Electricity Offices, 7, Dorchester Street, Bath	Mr. H. Lingard
North Midland ..	July 8	7.30	Board Room, Electricity Works, Leeds	Mr. V. W. Dale Mr. W. J. Jones
London and Home Counties	July 11		E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, W.C.2.	Mr. V. W. Dale Mr. W. J. Jones
South Wales and Mon.	July 23		(Yet to be decided) ..	Mr. V. W. Dale Mr. W. J. Jones

The Conferences are open to anyone engaged in the electrical industry and it is hoped to organise a similar Conference in the E.D.A. Northern Ireland Area at Belfast.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given when available.

DONCASTER CORPORATION.—Overhauling and rewiring electrical installation at Mansion House and Municipal Offices, and electric heating installation. Particulars from Mr. T. W. Hibbert, Electricity Offices, Grey Friars Road; deposit £1 1s.

MESSRS. PREECE, CARDEW AND RIDER.—Supply, if possible by November next, of 15 000 kW, 6 600 V, 50 cycle generating plant, in one or two turbine units, with auxiliaries and boilers, or, alternatively, Diesel engine sets, for a municipal supply undertaking. Preliminary particulars to Messrs. Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1.

STOKE-ON-TRENT CORPORATION.—Overhead wiring and services at 284 houses on Swan Lane site and 112 houses on Sutton estate, Trent Vale. Specification from the City Electrical Engineer; deposit £2.

WEST RIDING COUNTY COUNCIL.—Electric light installation in all departments of Mexborough, Dolcliffe Road Council School. Specifications from Mr. W. H. Jones, Education Offices, Mexborough.

CENTRAL ELECTRICITY BOARD, June 27.—Supply and laying of pilot cables in connection with the Central England Electricity Scheme. Specification (C.E.-S.C.1), etc., from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

MANCHESTER CORPORATION, June 27.—Supply and erection of three-phase 6 600 V switchgear, sheet steel cubicle type, specification No. 279. Supply and delivery of supervisory control gear at Cumberland Street sub-station (Specification No. 280). Specifications, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester; deposit, £1 1s. for each specification, returnable.

CENTRAL ELECTRICITY BOARD, June 30.—Supply and erection of metering equipment required in the area of the Central England Electricity Scheme. Specification (C.E.-G.M.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

DUNDEE TOWN COUNCIL, June 30.—Supply, delivery and erection of e.h.t. switchgear and e.h.t. busbar reactors to the main generating station at Carolina Port. Specifications, etc., from Mr. D. H. Bishop, general manager and engineer, Dudhope Crescent Road, Dundee; deposit £2 2s., returnable.

METROPOLITAN WATER BOARD, June 30.—Supply and fixing of two 120 kW steam-driven electric generators, switchboard, piping, etc., at Deptford pumping station. Specification from the Chief Engineer, 173, Rosebery Avenue, London, E.C.; deposit, £1 1s.

METROPOLITAN WATER BOARD, June 30.—Twelve months' supply of electric lamps. Form of tender (No. 24) from the Chief Engineer (Room 155), 173, Rosebery Avenue, London, E.C.1. Stamped, addressed envelope to be sent.

SALFORD CORPORATION, June 30.—Electric lighting installation for new nurses' home at Hope Hospital. Tenders to Mr. H. H. Tomson, town clerk.

STOKE-ON-TRENT CORPORATION, June 30.—Electric lighting of Burslem general market and shops. Specification from the City Surveyor.

WEST RIDING EDUCATION COMMITTEE, June 30.—Electric lighting at Kippax Council School. Specifications, etc., from Mr. H. W. Powell, Education Offices, Garforth.

CARDIFF CORPORATION, July 1.—Supply of h.t. switchboard (Contract No. IV); h.t. switchboard (No. V); transformers (No. VI); and battery and charging plant (No. XV), for the Llandough Hospital, now in course of erection. Specifications from Messrs. Plevin and Jenkins, 4, Working Street, Cardiff; deposit £2 2s. for each. Only manufacturers on the King's National Roll are invited to tender.

BIRMINGHAM CORPORATION, July 1.—Electric lighting and power installation at Uffculme Mental Hospital, King's Heath; deposit £5.

EPSOM URBAN DISTRICT COUNCIL, July 1.—Sale and removal of two Lancashire boilers, by Edwin Danks, at the generating station, Church Street. Further particulars from Mr. H. W. Watts, resident electrical engineer, the Electricity Works, Church Street, Epsom.

KINGHORN CORPORATION, July 1.—Electric wiring, etc., in 40 houses to be erected on Baliol Field site. Specification from Mr. J. Gentles, surveyor, Central Chambers, Kirkcaldy.

FARNWORTH URBAN DISTRICT COUNCIL, July 2.—Supply of l.t. disconnecting boxes, frames and covers and distribution pillars. Specification from Mr. A. J. Hutchinson, engineer and manager, Electricity Department, Albert Road, Farnworth, Lancs.

KILKEEL RURAL DISTRICT COUNCIL, July 2.—Supply of 30-38 B.H.P. crude oil engine generator, booster, switchgear, etc. Specifications (5s.) from the clerk, Mr. J. J. Bell.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, July 3.—Electric lighting installation at a block of tenement dwellings. Specification, etc., from Mr. David J. Keep, town clerk, Town Hall, Cambridge Road, E.2; deposit, £2 2s. Technical inquiries may be made of Mr. H. W. Couzens, 9, Old Queen Street, London, S.W.1.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL. July 4.—Supply and erection of (*a*) 3 000 kVA transformer, and (*b*) e.h.t. switchgear and interconnecting cables. Specification, etc., from the Engineer and Manager, 11, Staines Road, Hounslow.

LOUTH CORPORATION, July 4.—Electric lighting and power installation at Town Hall. Specification, etc., from Messrs. Burstall and Monkhouse, 14, Old Queen Street, Westminster, S.W.1; deposit £3.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, July 8.—Supply and erection of 250 kVA oil-cooled transformer. Specification, etc., from Mr. R. W. Willis, engineer and manager, Electricity Department, 37, High Street, Cheadle; deposit, £1 1s.

MANCHESTER CORPORATION, July 8.—Supply of steel girder, tramway rails. Specifications, etc., from the General Manager, Corporation Transport Department, 55, Piccadilly, Manchester.

BEDFORD CORPORATION, July 10.—Supply and erection of coal handling plant and extension of sidings at Bedford electric generating station. Specification and form of tender from the Borough Electrical Engineer, Electricity Offices, Prebend Street, Bedford; deposit £2 2s. Only British manufacturers in the United Kingdom are invited to tender.

PLYMOUTH CORPORATION, July 10.—Supply and erection of two water-tube boilers, with chimney, etc. Specification, etc., from the City Electrical Engineer, Electricity Offices, Armada Street, Plymouth.

CARLISLE CORPORATION, July 11.—Supply, erection, etc., of 11 000 V overhead transmission line, with pole mounted switchgear, in connection with a supply to rural districts. Specification (No. 30/5) from the City Electrical Engineer, Victoria Viaduct, Carlisle.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 14.—(I) 33 000 V transmission switchgear; and (II) 11 000 V distribution switchgear. Specification (No. S/S—1) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 14.—Supply, etc., of (*a*) 400/230 V disconnecting boxes, cable and service components; (*b*) 400/230 V consumers' house services; (*c*) supply and laying of 400/230 V three-phase underground cable; and (*d*) supply and erection and laying of 11 000 V overhead and underground mains. Specification (No. 11 000—440/D/1), form of tender, etc., from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 14.—Supply and erection of two 1 000 kVA, 33 000/11 000 V, three-phase, 50 cycle, outdoor type transformers, four 25 kVA, 11 000/440/250 V ditto, and one 10 kVA, 11 000/440/250 V ditto, all with off-load tap changing switches. Specification (No. S.T.1) and form of tender from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

KENT COUNTY COUNCIL, July 17.—Sinking of well, supply of electrically-driven borehole pump and motor, water main, power cable, etc. Specification from Mr. E. A. Borg, 40, Grosvenor Place, Margate; deposit £2 2s.

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GRANTOWN-ON-SPEY CORPORATION, July 19.—Electric lighting work of three blocks each comprising four three-roomed houses, under State-assisted housing scheme. Specifications can be seen at office of Mr. H. J. Fraser, architect and surveyor.

NORTON (STOKE-ON-TRENT) PARISH CHURCH, July 26.—Electric light installation. Estimates to the Rev. J. G. Hamlet, Norton Rectory.

CENTRAL ELECTRICITY BOARD, July 28.—Construction of foundation works for special towers carrying 132 kV transmission lines over the river Thames near Dagenham and Cross Ness. Specification (No. S.E.E.—P.F.6) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

EGYPTIAN PORTS AND LIGHTHOUSES ADMINISTRATION, ALEXANDRIA, June 28.—Four portable electric drills, one portable electric planer, one two-ton electric battery truck, etc. (Reference A.X. 9 676.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, June 30. — Supply and maintenance of an electric generating unit, with motors, transmission lines, etc., at Tor Quarantine, on the Gulf of Suez. (Reference B.X. 6 466.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 1.—Supply of 110 kV suspension insulators for Waitaki power scheme—section 63. (Reference B.X. 6 443.)

POWER SECURITIES CORPORATION, LTD., July 1.—Supply of (*a*) 4—3 000 kVA transformers (specification E.28, price 15s.); (*b*) indoor 11 kV switchgear (E.23, price 22s. 6d.), for Pykara, Madras, hydro-electric scheme. Specifications (on payment of above fees and 3s. 6d. for general conditions of contract), from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4.

CAPE TOWN MUNICIPALITY, July 2.—Supply of paper insulated, lead covered, impregnated, lead sheathed and armoured cable. (Reference B.X. 6 426.)

PYKHARA HYDRO-ELECTRIC SCHEME, July 5.—Indoor switchgear—Coimbatore. Specification (No. E. 29) (22s. 6d.) and conditions of contract (3s. 6d.), from Messrs. Balfour, Beatty and Co., 66, Queen Street, London, E.C.4. Fees are not returnable.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 15—Supply of v.i.r. lead covered cable (schedule No. C. 619). (Reference B.X. 6 498.)

CAPE TOWN MUNICIPALITY, July 23.—Supply of single phase and three-phase motors and startors (specification No. 499/1930). (Reference B.X. 6 497.)

STATE ELECTRICITY WORKS, MONTEVIDEO, July 31.—Supply of 84 three-phase oil-cooled transformers. (Reference A.X. 9 768.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 11.—Thirteen 4-ton electrically-driven portal jib cranes; tender No. 1 653. (Reference A.X. 9 683.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 11.—Supply of one 80-ton fixed electric crane, level luffing type, for Congella Wharf, Durban Harbour (tender No. 1 691). (Reference A.X. 9 727).

INDIA STORE DEPARTMENT, August 14.—Sub-station plant, for Uhl River hydro-electric project, including (1) power transformers; (2) synchronous condensers; (3) switchgear; (4) oil filtration and storage plant; and (5) cranes. Forms of tender from the Director-General, Belvedere Road, London, S.E.1.; £4, not returnable.

Tenders Accepted.

ST. BARTHOLOMEW'S CHURCH, BELFAST.—Birch and Workman, electric light installation.

FARNWORTH URBAN DISTRICT COUNCIL.—Edison Swan Cables, Ltd., supply of l.t. cables.

PORTSMOUTH CORPORATION.—Forest City Electric Co., supply of automatic signals, £140.

ROSCOMMON COUNTY BOARD OF HEALTH.—T. Keogh, electric light installation at County Home, £783.

DALKEITH CORPORATION.—Laing and Kerr, electric light installation in connection with erection of houses.

BARNSTAPLE CORPORATION.—F. Bickford, double wiring in connection with lighting of Albert Hall, £8 12s.

KENDAL CORPORATION.—P. and W. Maclellan, Ltd., supply of lathe motor; Warburton and Co., electric lift.

GENERAL POST OFFICE.—Telephone exchange equipment, Sanderstead (Croydon), General Electric Co., Ltd.

CHARLBURY (OXFORDSHIRE) PARISH CHURCH COUNCIL.—Wessex Electricity Co., electric light installation, £75.

SOUTHWELL RURAL DISTRICT COUNCIL.—Blackstone and Co., Ltd., electrically-driven unscreened sewage pumps.

DALKEITH PAVILION PICTURE HOUSE.—A. P. M'Queen, electrical work in connection with alteration of building.

JOINT ISOLATION HOSPITAL, OTTERSHAW, NEAR CHERTSEY.—E. Pollard and Co., Ltd., electric light installation, £235.

GRIMSBY CORPORATION.—Forest City Electric Co., erection of automatic traffic control signs, £458. (Recommended.)

SHEFFIELD CORPORATION.—T. B. and W. Cockayne, Ltd., electric lighting at Wincobank baths, £179 10s. (Recommended.)

CANADIAN PACIFIC STEAMSHIPS, LTD.—Edison Swan Electric Co., Ltd., supply of electric lamps and accessories for one year.

PENISTONE EDUCATION COMMITTEE.—G. Hinchcliffe and Co., electric light installation at Silkstone Common School, £62 7s. 6d.

NEWTOWNARDS GUARDIANS.—J. Dowling and Sons, Ltd., electrical plant and wiring in connection with reconstruction of hospital.

EASTBOURNE PARISH COUNCIL.—Midhurst and District Electricity Co., public lighting by 13 lamps, £83 14s. 6d. per annum.

Domestic Wiring.

PERTH CORPORATION.—McCowan and Guild, electric light installations in 150 houses at Darnhall Drive and Florence Place, Perth.

BRIDGE OF ALLAN CORPORATION.—W. Marshall and Son, electric lighting and bells, in connection with reconstruction of mineral wells.

AYRSHIRE EDUCATION AUTHORITY.—D. Macrae, electrical work in connection with erection of new school and schoolhouse at Cronberry.

AYRSHIRE COUNTY EDUCATION COMMITTEE.—Graham and Morton, electric light installation in extensions to Craigs School, Stirling.

SOUTHWARK (LONDON) BOROUGH COUNCIL.—Record Electrical Co., Ltd., replacement of battery switches, £136 10s. (Recommended.)

STEPNEY (LONDON) BOROUGH COUNCIL.—J. J. Lane, 26 in. electrically-driven self-balancing hydro-extractor, £105. (Recommended.)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD.—W. E. Fischer, Ltd., dismantling generating plant at Pigeon House (Dublin) power station.

SALFORD CORPORATION.—Bertram Thomas, electric lighting installation, in new extension of Union Infirmary buildings at Hope Hospital, Salford.

SALFORD CORPORATION.—Ferguson, Pailin, Ltd., supply of metal clad switchboard, at Frederick Road sub-station, £542. (Recommended.)

OAKES WORKING MEN'S CLUB, HUDDERSFIELD.—H. C. Stringer, electricians and plumbers' work in connection with additions to premises.

HIS MAJESTY'S OFFICE OF WORKS, ETC.—South Kensington (London), generating station, installation of cables, switchgear, etc., G. E. Taylor and Co.

GLOUCESTER CORPORATION.—Derby Cables, Ltd., supply of 8 000 yards of cable, £2 585; Edison Swan Cables, Ltd., supply of 1 000 yards of cable, £472.

WINDSOR EDUCATION COMMITTEE.—Wellman Bros., electric light installation in connection with structural alterations at Victoria Street Council School, £45.

TAUNTON CORPORATION.—Babcock and Wilcox, Ltd., 25 000 lb. boiler, with auxiliary plant, £7 028; Mather and Platt, Ltd., motor-driven boiler feed pump, and accessories, £267 1s.

GLASGOW CORPORATION.—Supply of transformers, Metropolitan Vickers Electrical Co., Ltd., and Bruce Peebles and Co., Ltd., 18 400 kVA; Brush Electrical Engineering Co., Ltd., four 200 kVA.

ILFORD CORPORATION.—Crompton Parkinson, Ltd., supply of 1 000 r.p.m. convertor, £1 200, and control gear, £1 280; also supply of kiosk, with switchgear and transformer, £444 10s. (All recommended).

LEICESTER CORPORATION.—Gent, Hurley and Orringe, electric light installation at Belgrave pumping station,

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£432 6s. 9d., and electric lighting installation in two cottages at Mental Hospital estate, £44 13s. 2d.

FIFE EDUCATION AUTHORITY.—J. Scott and Co., electrical work in connection with additions to Waid Academy, Anstruther; Moncrieff Bros., electrical work in new Elementary School, Sinclairtown, Kirkcaldy.

WEYMOUTH CORPORATION.—Johnson and Phillips, Ltd., supply and erection of 200 kVA transformer at foot of Overcombe terminal pole and supply and erection of transformer kiosk at Preston, £618 10s. (Recommended.)

LOUGHBOROUGH CORPORATION.—Electron Co., electric wiring of new power station and four firemen's cottages, £110. Also tendered: W. J. Furse and Co., £192; Gent, Hurley and Orringe, £166; E. L. Fisher, £131; Kemp Bros., £109.

SLOUGH URBAN DISTRICT COUNCIL.—Harland Engineering Co., Ltd., two electrically operated pumping sets, with motors, cabling equipment, control switch, distribution box, etc., and air exhauster with motor starter, for waterworks, £873 10s.

BELFAST CORPORATION.—Service Motor Works, Ltd., 10 tramcar bodies, £1 500 each, including £100 per body for contingent work; Brush Electrical Engineering Co., Ltd., 40 tramcar bodies, £1 699 10s. each, including £100 per body for contingent work.

BATTERSEA (LONDON) BOROUGH COUNCIL.—Babcock and Wilcox, Ltd., steam pipes, £4 243; Aiton and Co., Ltd., water pipes, £2 304, in connection with new 30 000 kW turbo-alternator and boilers; General Electric Co., Ltd., supply of switchgear, £410. (All recommended.)

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., switchgear for generating station, £2 248, and switchgear for Scrubs Lane sub-station, £429. (Recommended). Also tendered: Ferguson, Pailin, Ltd., £2 019 and £429; A. Reyrolle and Co., Ltd., £2 069 and £445.

LONDON COUNTY COUNCIL.—W. Wadsworth and Sons, Ltd., erection of an electric goods and bed lift at Tooting Home, Church Lane, Tooting, £618. Also tendered: Express Lift Co., Ltd., £747; Marryat and Scott, Ltd., £814; Waygood Otis, Ltd., £920; Medway's Safety Lift Co., Ltd., £1 100.

BRADFORD CORPORATION.—Bruce, Peebles and Co., Ltd., supply of two 710 kW mercury arc rectifiers, with switchgear; Devonport Engineering Co., Ltd., erection of new interior stacks for cooling towers; Ransome and Rapier, Ltd., supply of petrol electric mobile crane for Valley Road power station. (All recommended.)

GLASGOW CORPORATION.—David Henderson, electrical installation in connection with Carnwadric housing scheme, £3 135 15s.; John H. Spence and Son, provision of electric potato peeler at Ruchill Hospital, £45; R. J. Sinclair (Glasgow), Ltd., electric light installation at Anderson Welfare Centre, £100 13s. 2d. (All recommended).

MIDDLESBROUGH CORPORATION.—Annual supplies: Macintosh Cable Co., Ltd., 7·16 twin cable; British Insulated Cables Ltd., 0·1 by 0·1 by 0·06 l.t., t.c. cable; Ferranti, Ltd., 10, 20, 50 and 100 A meters; Chamberlain and Hookham, Ltd., ditto; Metropolitan-Vickers Electrical Co., Ltd., ditto.

LONDON COUNTY COUNCIL.—A. Hawkins and Sons, wiring and fittings for electric lighting, power, bells, and telephones, at Tooting Home, Church Lane, Tooting, £1 495. Also tendered: A. Dean and Co., Ltd., £1 568; J. Briggs, Ltd., £1 570; Electrical Installations, Ltd., £1 798; L. G. Tate and Co., Ltd., £2 075; Smethurst and Co. (London), Ltd., £2 200; H. J. Cash and Co., Ltd., £2 688.

MANCHESTER CORPORATION.—Berry's Electric (1928), Ltd., "Z" electric Lamp and Supplies, Ltd., Downes and Davies, Ltd., Drake and Gorham Wholesale, Ltd., S. Gratrix, Junior and Bro., Ltd., Baxendale and Co., Ltd., Falk, Stadelmann and Co., Ltd., Sloan Electrical Co., Ltd., F. G. Ride and Co., Underwood (Manchester), Ltd., J. C. White and Co., Ltd., W. E. Beardsall and Co., Ltd., Wholesale Fittings Co., Ltd., R. O'Brien and Co., and Hirst, Ibbetson and Taylor, Ltd.. supply of electric lamps.

GENERAL POST OFFICE.—Telephone exchange equipment: Rhos (Colwyn Bay area), Siemens Bros. and Co., Ltd., London Auto-Manual Operating School and Rochdale Multi-Exchange Area, Standard Telephones and Cables, Ltd. Cable-manufacture, supply, drawing in, etc.—Chester-Mold, W. T. Glover and Co., Ltd.; Stockport-Whaley Bridge, Johnson and Phillips, Ltd. Electric lifts—Salford Telephone Exchange and York Railway Station sorting office and subway, W. Wadsworth and Sons, Ltd. Short-wave telephony transmitter—Rugby radio station, Standard Telephones and Cables, Ltd. Electric lighting—Whitehall Telephone Exchange, Electrical Installations, Ltd.

TRAMWAYS, L.R. AND TRANSPORT ASSOCIATION.

Annual Conference at Hastings.

THE 20th annual conference and 33rd annual general meeting of the Tramways, Light Railways and Transport Association was held in Hastings from June 11 to 13, under the chairmanship of Mr. E. D. Edwardes (chairman of the Executive Council and general manager of the South Lancashire Transport and Power Co.) The town of Hastings was specially selected for the conference this year in order to give the members an opportunity of inspecting what must be referred to as an outstanding example of the conversion of a tramway system to a trolley bus system with excellent results. Hastings was one of the four towns (of which Torquay, Lincoln and Wolverhampton were the others) where the surface contact system of electric traction was installed many years ago but did not prove successful.

During the year the Association has changed its name from the old Tramways and Light Railways Association to its present more extended title.

The Road Traffic Bill.

The Chairman, speaking of the Road Traffic Bill, expressed some regret that, although many amendments put forward on behalf of the Association had been accepted by the Standing Committee of Parliament which was now considering this Bill, the Minister of Transport had at the last moment inserted Clause 90 which, to some extent, cut away the ground from transport undertakings in the matter of traction. This matter, however, he said was to be further discussed when the Bill came before the House of Lords. Other matters in which the Association was taking part related to electrolysis, the new Ministry of Transport regulations as to earthing guard wires and the interruption caused to broadcasting in tramway areas. In regard to the latter, members were specially asked to send to the Secretary any complaints they received, in order that they might be dealt with as a whole in discussions which are taking place with the Postmaster-General.

The report and accounts were adopted, the latter showing a small credit balance, as against a debit balance in 1928.

New Officers.

The following were elected to fill vacancies on the council:—R. S. Asher (general manager, York Corporation Tramways and Motors); W. McGibbon (general manager, Mexborough and Swinton Tramways Co.); C. R. Tattam (Messrs. Balfour, Beatty and Co., Ltd.); J. A. Forde (general manager, Isle of Thanet Electric Supply Co.); W. E. Ireland (L.C.C. Tramways).

Two papers were presented at the conference. The first, by Mr. W. Vincent Edwards (engineer and general manager of the Hastings Tramway Co.), gave a very complete story of the conversion from trolley tramways to trolley buses. Mr. Edwards stressed the point that it was not sufficient merely to take the old tramway overhead equipment and expect to apply that to trolley buses without modification.

This paper gave rise to a very long discussion. Complaints were made as to the demand of local authorities, when a tramway company asked permission to abandon a tramway line and substitute trolley buses, that the road should be reconstructed on the most modern lines, whereas under the Tramways Act of 1870 the condition was that the road should be put back into the condition it was at the time the tramway was constructed. Charges for current to tramway companies by local authorities were stated to be too high in many cases.

Those attending were particularly interested in a new form of trolley wheel which Mr. Edwards has adopted. This contains ball-bearings and only one small working part, which can be renewed at the cost of only a few pence, and has proved a great improvement.

The second paper, on "The Tramcar—Present and Future," by Mr. J. L. Burton (manager, Road Transport Department, English Electric Co.) and Mr. H. H. Andrews (sales manager of the Traction Department) went into much detail concerning directions in which tramcars could be modernised, and pleaded for greater attention to this matter.

The Chairman commented on the fact that even cities like Manchester were to-day buying cars very similar in design to those of twenty years ago. If the manufacturers of tramcars had made a standard car and demonstrated it as the bus manufacturers did, greater progress would have been made.

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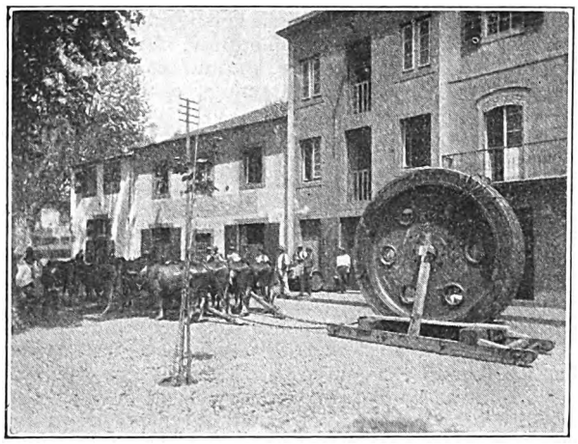
ELECTRICITY SUPPLY.

The Commissioners' Returns for May—Wallasey and the National Register—Progress at Tientsin—Overhead Lines and the Isle of Thanet—Ashton-under-Lyne Lighting.

HACKNEY (London) Electricity department is to extend the network and feeder cables at a cost of £2 800.

Blackpool electricity department is to extend the mains to the Marton district, at an outlay of over £3 000.

An application for a loan of £1 000 for assisted wiring purposes has been made by Spalding U.D.C.



IN connection with the extension of the Madeira Electric Light Co.'s generating plant at Funchal the Fraser and Chalmers engineering works of the General Electric Co., Ltd., have recently shipped to Madeira a 75 h.p. Diesel engine, the 12-ton flywheel of which is here seen in course of transportation by means which seem singularly primitive for so heavy a load.

Additional coal handling plant costing £7 500 is to be installed at the Peterborough electricity works.

Islington (London) Electricity Committee has received sanction to borrow £30 000 for mains and plant.

Lurgan U.D.C. has decided to enter into negotiations with Belfast Corporation for a bulk supply.

Mains extensions at an estimated cost of £2 095 are to be carried out by Aldershot Corporation electricity department.

East Grinstead U.D.C. has applied to the Commissioners for a Special Order to extend the area of supply to Forest Row.

Power is being sought by Pontypool Electric Light and Power Co. to acquire the electricity undertaking of Abersychan U.D.C.

Winchester Corporation has applied for a loan of £570 11s. for an electric light installation at 37 houses in Cromwell Road, Stanmore.

Shoreham U.D.C. has reserved its right to oppose a proposal by Brighton T.C. to supply electricity to certain parts of the urban district.

Salford Electricity Committee seeks sanction to borrow £1 000 for alterations and additions to the 6 600 V switchgear at the Blackfriars sub-station.

Preston and Blackburn Chambers of Commerce urge the continuance of the Mid-Lancashire Electricity Advisory Board which was formed six years ago.

Brecon T.C. has applied to the Commissioners for sanction to instal a 75 kW set and to enlarge the generating station, and for a loan of £2 375 to meet the cost.

Applications for loans of £5 100 for changing over the Lea Bridge area from d.c. to a.c., and £30 000 for mains and services, have been made by Leyton T.C.

Congleton T.C. has agreed to terms for a supply of electricity by the Joint Electricity Authority, and a loan of £26 000 for carrying out the scheme has been sanctioned.

Walsall T.C. has applied for loans of £15 000 for service cables for three years, and £7 795 for adapting premises in Upper Bridge Street for use as electricity showrooms and offices.

Whitwood (Yorks) U.D.C. is to approach Messrs. Henry Briggs, Son and Co., Ltd., in order to ascertain whether the company is in a position to give a supply of electricity in bulk to the council.

The question of lighting the whole of the town of Ashton-under-Lyne by electricity is to be discussed by the General Purposes Committee. Half the present gas lamps are adjacent to electric cables.

Bromley (Kent) T.C. is to expend £4 187 on mains extensions and £900 on a transformer station and extension of main when required for the telephone exchange to be erected at the corner of Coates Hill Road.

Walthamstow T.C. has received from the Unemployment Grants Committee a grant on approved expenditure not exceeding £112 233 in respect of laying underground mains in all uncabled roads in the district, and the equipment of sub-stations.

The Isle of Thanet R.D.C. has consented to the erection of overhead lines by the Isle of Thanet Electric Supply Co., for a supply of electricity to Birchington. The Birchington Parochial Committee, however, has intimated its disapproval of overhead cables.

Battersea (London) electricity department is to provide electricity services to 112 premises at a cost of £1 012 10s., to extend mains for private services at a cost of £356 and to replace with armoured cable old vulcanised bitumen distributors at a cost of £566.

Swanscombe Lighting Committee has approved the scheme submitted by the surveyor for electric street lighting, but has adjourned consideration of the tender of the Kent Electric Power Co. pending the receipt of a report from the Joint Electricity Authority upon the question.

St. Helens T.C. has applied for a loan of £8 154 for a supply of electricity to Bold, a part of Burtonwood area, and has received sanction to a loan of £48 150 for extensions to the generating station and plant. The Unemployment Grants Committee has approved for grant purposes the scheme for changing over the system from d.c. to a.c.

Blairgowrie and Rattray T.C. have agreed to a scheme of street lighting by the Grampian Electricity Supply Co. subject to the company's submitting plans of any proposed overhead works beyond what have already been sanctioned by the council, who also stipulate that they shall have the option of calling on the company to proceed with a scheme for lighting the entire burgh.

The official returns rendered to the Electricity Commissioners show that 818 million units of electricity were generated by authorised undertakers in Great Britain during May, 1930, compared with 753 million in May, 1929, an increase of 8·6%. During the five months of 1930, up to the end of May, the quantity generated by authorised undertakers was 4 672 million units, compared with 4 404 million for the corresponding period of 1929, an increase of just over 6%.

It has been decided that, under Wallasey Corporation's assisted wiring scheme, only registered electrical contractors shall be employed. Exception was taken at the last council meeting to the work being limited to a comparatively small number of firms in the town as it was feared this might lead to the formation of a ring. On behalf of the Electricity Committee it was pointed out that they were insisting upon the best materials and the highest standard of workmanship. Any qualified contractor could take steps to join the register by going before a local examining committee.

The report on the working of the Tientsin municipal electricity department for 1929 shows income £54 467, gross profit £22 681, after allowing £8 403 for depreciation and net surplus £17 555, after provision of £5 126 for interest. Electricity generated was 9 209 883 kWh, and sold 7 489 845, against 8 023 485 in 1928, decrease 6·6%. Consumption of coal per kWh was 3·315 lb., against 3·24 lb. The demand for heating and cooking amounted to 630 550 kWh, an increase of 15%; private lighting consumption showed a decrease of 11%, and power supplies 9·6%. A large number of different types of electric cookers have been obtained, with a view to the standarisation of a thoroughly reliable make. It is considered that this has now been attained, and that the cooker now in use is as dependable as a coal or gas cooker while being superior in every way from a cooking point of view to either of them. The satisfaction that is obtained from the use of electric cooking is evident from the fact that once this modern method has been adopted, a user will never revert to the older system.

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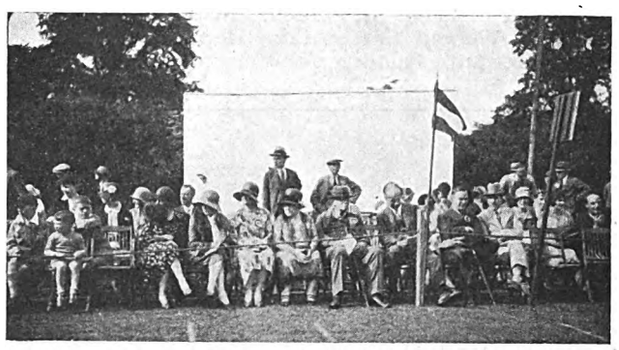
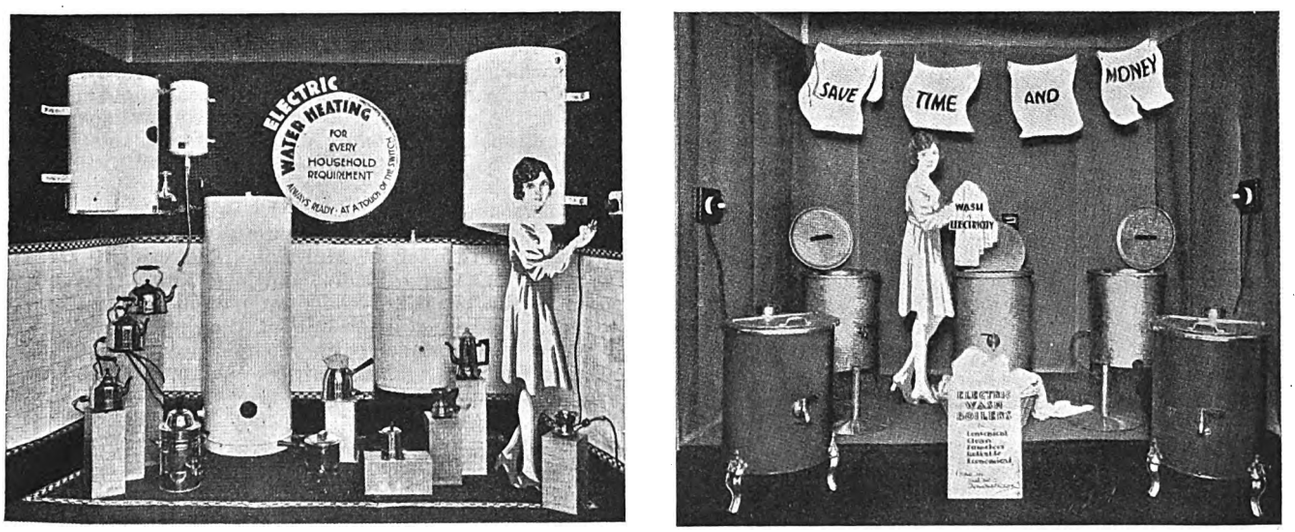
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

[*Photo: John Ralf.*]
Some of the officials photographed at the annual sports of the Enfield Cable Works, Ltd., on Saturday, June 21, at the company's ground at Brimsdown. Mrs. Plutte, wife of the managing director, distributed the prizes. (See page 836.)



On the same day, June 21, Crompton Parkinson, Ltd., held their annual sports meeting on their private ground at Chelmsford. Among the interested spectators was Col. R. E. Crompton, seen seated in the centre of this little group. (See page 836.)

The E.D.A. demonstration house at Cranleigh Gardens, Stoke Bishop, Bristol, which was closed on Saturday, June 21. Arrangements in regard to the house were carried out by the Area Office in accordance with the instructions of the members of the South-West Area Committee, and Messrs. Gough Bros., of Bristol, provided the electrical installation to the E.D.A. wiring specification, which form of wiring stimulated a considerable amount of public inquiry. It is interesting to note that whilst two adjoining houses, wired for electric lighting only, remained unsold throughout the exhibition, the demand for the E.D.A. house was so brisk that the house was sold a few days after the opening.



The window displays of the E.D.A. for July feature water heating and washing by electrical means. The water-heating window, on the left, is elaborated by the inclusion of electric kettles, saucepans, etc. A clear-cut domestic atmosphere is secured for the equipment by making use of a roll of bathroom wallpaper and a black and white border. The circular showcard gives balance and interest to the display and provides a suitable description which, if desired, can be supplemented by tickets describing the uses of the various appliances displayed. The right-hand picture is of the electric washing window. The scheme suggests to the housewife the means for dispensing with out-of-date washing methods, and the showcards are the properties employed to tell the story. The materials required comprise pale blue crêpe paper, imitation garments painted on paper, imitation towel, the electric girl and a showcard, all of which can be supplied by the E.D.A.

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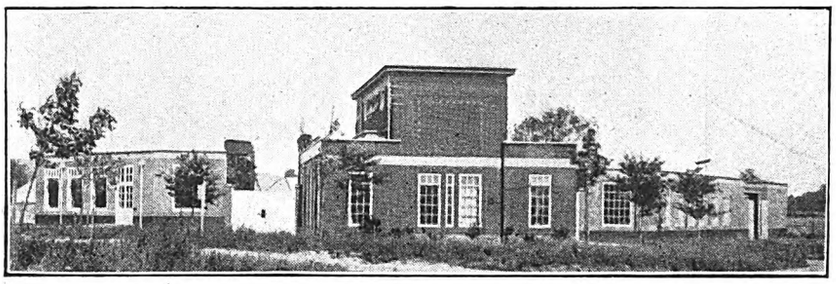
WELWYN GARDEN CITY.

Steady Progress in Development of Domestic and Industrial Loads.

THE Earl of Lytton, president of the Garden Cities and Town Planning Association, last Sunday unveiled a memorial at Welwyn Garden City, Herts, to the late Sir Ebenezer Howard, founder of Welwyn and Letchworth garden cities. From the electrical point of view Welwyn Garden City is of interest in that considerable progress is being made in developing the domestic load. The supply is taken in bulk from the North Metropolitan Electric Power Supply Co. and distributed by the Welwyn Garden City Electricity Supply Co., Ltd., with Mr. A. T. Bullen as engineer and manager. The factory area of the estate includes the studios of the British Instructional Films, Ltd., with an intermittent load of 300/350 kW; Capt. R. H. S. Birkin's racing motor stable, with a load of 180 kW; and the works of Young, Osmond and Young, while a new works is being erected by the Norton Grinding Wheel Co., the estimated load of which will be 500 kW. A transformer station has been placed in the centre of the factory area, switchgear interconnecting supplies from Brimsdown, Willesden, St. Albans, etc.



The showrooms and offices of the Welwyn Garden City Electricity Supply Co.

Last week was made an occasion for a Press view, and among the attractions offered was an exhibition house arranged on modern lines, the electrical heating and water-heating installations being fitted by the Welwyn Garden City Electricity Supply Co., Ltd., the equipment including a "Hera" electric washing machine; a "Jackson de luxe" cooker; and "Unity" tubular heating, by Young, Osmond and Young, Ltd. The electric lighting fittings were supplied by Troughton and Young, Ltd.

ACCOUNTS OF THE WELWYN GARDEN CITY SUPPLY UNDERTAKING.

Item.	Year ending Dec. 31, 1929. Actual.	Year ending Dec. 31, 1930. Estimated.
Units Purchased	3 403 560	4 500 000
Units Sold	3 085 257	4 100 000
Maximum Demand	1 083 kW	1 250 kW
Load Factor (Units purchased)	35·9%	37·5%
Consumers Connected—		
(a) Industrial and Commercial	81	120
(b) Domestic	1 997	2 300
(c) Public Lamps	250	300
Units Sold per Consumer—		
(a) Total	1 486	1 700
(b) Domestic only	640	800
Connected Load (kW)—		
(a) Power	1 678	1 900
(b) Lighting	648	750
(c) Heating and Cooking	3 915	5 250
(d) Public Lamps	16	30
Domestic Apparatus—		
(a) Cookers	512	750
(b) Water Heaters	39	80
(c) Kettles	242	600
(d) Washboilers	32	50
Total Revenue	£24 246	£27 400
Average Price per Unit Sold—		
(a) Industrial	1·37 pence	1·20 pence
(b) Commercial	2·87 ,,	2·50 ,,
(c) Domestic	2·25 ,,	1·90 ,,
(d) Public lighting	7·95 ,,	6·00 ,,
(e) Total	1·94 ,,	1·60 ,,
Total Working Costs	£15 139	£17 500
Average Cost per Unit sold—Bulk supply	0·757 pence	0·720 pence
Distribution	0·077 ,,	0·050 ,,
Public Lamps	0·020 ,,	0·010 ,,
Rents, Rates, Taxes	0·114 ,,	0·090 ,,
Management	0·175 ,,	0·135 ,,
Other Charges	0·035 ,,	0·010 ,,
Total	1·178 pence	1·025 pence

The above table gives some indication of the steady electrical progress which is being made in the Garden City, and it is being found that existing domestic consumers are adding to the load each month.

THE SOCIAL SIDE.

SIEMENS' Sports Club held its eighth annual sports meeting at the Sports Ground, Park Lane, Charlton, last Saturday. There was a large gathering of spectators, the weather was good and some excellent performances were witnessed. Special mention is due to the winner of the long jump, L. D. Butler, who covered 21 ft. 1½ in., and L. G. Parkes, who again won the 100 yards championship, in 10⅘ sec., both these performances being records for the club. Other winners were J. Brown, one mile handicap; F. W. H. Shaw, 1 000 yards championship (time 2 min. 37 sec.); A. R. T. Hadlow, 220 yards handicap (23⅕ sec.); E. Garner, Rugby Section, 440 yards handicap (58 sec.); R. G. Swales, 440 yards handicap (53⅕ sec.); Port of London Authority, 1 mile invitation relay race; Sheathing Department, inter-departmental one mile relay championship. Sir George H. Hume distributed the prizes.

Robert Hornby and Co., Ltd., held their fourth annual summer outing on June 16. This year the excursion took the form of a trip up the Thames from Windsor to Caversham in the steam launch "Queen of the Thames," chartered for the occasion. The party comprised the chairman of the company, Mr. Carson Roberts, the managing director, Mr. Robert Hornby, genial as ever, and the whole of the firm's employee's numbering in all about 75 people. The trip lasted nearly 11 hours, including an hour's stop at Marlow where many went ashore to see the church, and another stop at Sonning, where dinner was taken at the French Horn Hotel. Luncheon and tea were served on board while the launch was under way.

Col. R. E. Crompton, again attended the annual sports meeting of Crompton Parkinson, Ltd., on their private ground at Chelmsford on June 21, before a large crowd of members and friends. The occasion was favoured with fine weather and was particularly successful. In addition to prizes for some 32 events, no fewer than eight challenge cups were competed for with keen rivalry. The event of the day, however, was the inter-section competition for the new Hardie Cup presented by Lieut.-Col. C. Hardie, D.S.O., which was won by the Apprentice Section. See page 835.

Presiding at the distribution of prizes following the sports meeting of the Enfield Cable Works Social and Athletic Club, on June 21, Mr. William Fraser (deputy managing director of the company), chairman of the club, supported by Mrs. Plutte, wife of the managing director of the company, intimated an apology for absence from Mr. F. Plutte, and outlined the interest which had been shown in the welfare of all the members of the Club by Mr. Plutte. Mr. Fraser then proposed a vote of thanks to the various officials in charge of arrangements for the day, specially mentioning Messrs. F. Baker and C. Brown. Mr. D. A. S. Porteous proposed a vote of thanks to Mrs. Plutte and to Mr. Fraser. See page 835.

The personnel and friends of the British Power and Light Corporation (1929), Ltd., were entertained at a garden party on June 21, at Fir Island, Mill Hill. The resident, Mr. G. V. Twiss, the managing director, and Mrs. Twiss, received their guests in the beautifully laid out garden with its spacious grounds. Everyone made use of the opportunity afforded to renew acquaintance with their colleagues, and friends gathered from the various districts operated by the Corporation. Music was provided by Ben Brown's Salon and members of the Margaret Morris Dancing School gave excellent performances and delighted their audience. Mr. H. A. Vernet, the chairman of the Corporation, with Mrs. Vernet, were present during the afternoon.

THE ELECTRICAL ENGINEERS' BALL.

In connection with the Electrical Engineers' Ball held on February 7 last, the General Committee at their meeting on June 19 held at the Institution of Electrical Engineers, voted the sum of £90 to be equally divided between the Institution of Electrical Engineers Benevolent Fund and the Electrical Trades Benevolent Fund. The dance held in February proved as great a success as its predecessors, there being over seven hundred present. Owing to the closing down of the Hotel Cecil, it has been decided to hold the Ball next year at the Grosvenor House Hotel, Park Lane, on February 13. As usual, the date selected is the day following the annual dinner of the Institution of Electrical Engineers.

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FINANCIAL INTELLIGENCE.

Analysis of Appropriation Accounts of Electric Traction and Manufacturing and Equipment Companies, Embodying Results for Last Financial Year or Period.

By "AUDITOR."

ELECTRIC TRACTION COMPANIES.

	Issued Capital	Brought Forward		Profit		Total		Dividends Distributed		Reserves, &c. Allocated		Other Appropriations		Carried Forward		Total		Ann. Divs.	Recent Price	Par Val.	Yield.
	£	£	%	£	%	£	%	£	%	£	%	£	%	£	%	£	%				
British Electric Traction	1 326 263	186 250	8·44	253 081	11·47	439 331	19·91	170 765	7·74	—	—	—	—	251 798	11·41	439 331	19·91	8	128	£100	6·25
,, ,, Deferred Ord. Stock	167 676	—	—	—	—	—	—	*16 768	0·76	—	—	—	—	—	—	—	—	5	—	£100	—
,, 6% Cum. Partg. Pref. Stock	712 744	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7·89	132	£100	5·98
	2 206 683			Loss																	
Carlisle & Dis. Transport	60 000	81	0·13	1 580	2·63	Dr. 1 499	2·50	—	—	—	—	—	—	Dr. 1 499	2·50	Dr. 1 499	2·50	—	—	£1	—
Dundee, Broughty Ferry, & Dis. Trams	28 743	1 168	1·48	220	0·28	1 388	1·76	—	—	—	—	—	—	1 388	1·76	1 388	1·76	—	3d.	£1	—
,, ,, 6% Cum. Pref.	50 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1s.	£1	—
	78 743																				
Lisbon Electric Trams	951 039	16 880	1·23	178 311	12·95	195 191	14·18	92 106	6·69	60 000	4·36	15 000	1·09	28 085	2·04	195 191	14·18	7	23/-	£1	6·09
,, ,, 6% Cum. Pref.	425 553	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	16/6	£1	7·27
	1 376 592																				
Mansfield & Dis. Trams	44 834	3 367	2·70	930	0·74	4 297	3·44	—	—	3 108	2·49	—	—	1 189	0·95	4 297	3·44	—	2/6	£1	—
,, ,, 6% Cum. Pref.	80 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3/9	£1	—
	124 834																				
Shanghai Elec. Construction	600 000	12 028	2·00	170 763	28·46	182 791	30·46	75 000	12·50	84 901	14·15	2 050	0·34	20 840	3·47	182 791	30·46	12½	—	£1	—
Wemyss & Dis. Trams	20 000	56	0·09	loss 2 034	3·39	† 22	0·33	—	—	—	—	—	—	22	0·03	22	0·03	—	—	£1	—
,, ,, 7½% Cum. Pref.	40 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	£1	—
	60 000																				
Yorkshire (Woollen Dis.) Elec. Trams	220 000	17 894	8·13	19 924	9·06	37 818	17·19	13 200	6·00	10 000	4·55	—	—	14 618	6·64	37 818	17·19	6	—	£1	—

* Scrip Bonus. † After transferring £2 000 (3·33%) from reserve account.

The issued capital of the above eight companies, on which dividends, if any, were declared, aggregates £4 726 852, and the following is a summary of the totals, with percentages in relation to total issued capital :—

	£	%		£	%
Total credit balances brought forward	237 724	5·03	Dividends distributed (including Scrip Bonus)	367 839	7·78
Profits, less losses	619 615	13·11	Reserves, etc., allocated	158 009	3·34
Other Income	2 000	0·04	Other appropriations	17 050	0·36
			Total credit balances carried forward, less debits	316 441	6·70
	£859 339	18·18		£859 339	18·18

ELECTRICAL MANUFACTURING AND EQUIPMENT COMPANIES.

	Issued Capital	Brought Forward		Profit		Total		Dividends Distributed		Reserves, &c. Allocated		Other Appropriations		Carried Forward		Total		Ann. Div.	Recent Price	Par Val.	Yield
	£	£	%	£	%	£	%	£	%	£	%	£	%	£	%	£	%				
Aeonic Radio	350 000	—	—	2 370	0·68	2 370	0·68	—	—	—	—	—	—	2 370	0·68	2 370	0·68	—	2d.	2s.	—
Babcock & Wilcox	4 299 656	118 363	2·58	665 530	14·53	783 893	17·11	659 901	14·41	48 000	1·04	—	—	75 992	1·66	783 893	17·11	15	55/6	£1	5·40
,, ,, 6% Cum. Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	22/6	£1	5·33
,, ,, 5% Cum. 2nd Pref.	179 056	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	19/3	£1	5·19
	4 578 712																				
Callender's Cable & Construction	1 116 000	570 246	29·76	320 412	16·72	890 658	46·48	223 400	11·66	238 730	12·46	—	—	428 528	22·36	890 658	46·48	1572/6		£1	4·14
,, ,, 6½% Cum. Pref.	400 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6½	23/9	£1	5·47
,, ,, 7½% "B" Cum Pref.	400 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7½	27/-	£1	5·55
	1 916 000																				
Dominion Gramophone Records (Foreign & Colonial)				Loss		Debit								Debit		Debit					
,, ,, Deferred	16 000	—	—	19 511	20·32	19 511	20·32	—	—	—	—	—	—	19 511	20·32	19 511	20·32	—	—	1s.	—
,, ,, 10% Partg. Pref.	80 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5/-	—
	96 000																				
Electramonic	25 000			Loss		Debit								Debit		Debit					
,, 8% Pref'd Ord.	75 000	—	—	112 389	112·39	112 389	112·39	—	—	—	—	—	—	112 389	112·39	112 389	112·39	—	—	1/-	—
	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10/-	—
Electric Furnace	78 036	1 585	1·00	13 520	8·56	15 105	9·56	11 062	7·00	—	—	—	—	4 043	2·56	15 105	9·56	7	—	£1	—
,, ,, 7% Cum. Pref'd Ord.	80 007	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	—	£1	—
	158 043																				
Radiation	2 262 559	123 925	3·69	295 997	8·84	419 922	12·53	278 453	8·31	—	—	—	—	141 469	4·22	419 922	12·53	12½	37/-	£1	6·76
,, 6% Pref.	1 087 525	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	22/-	£1	5·45
	3 350 084			Loss																	
Richardsons, Westgarth	350 000	3 656	0·52	17 212	2·46	21 444	3·06	21 000	3·00	—	—	—	—	444	0·06	21 444	3·06	—	3/-	£1	—
,, ,, 6% Cum. Pref.	350 000	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	6	—	£1	—
	700 000																				
Rist (A) 1927	20 000	572	1·04	5 458	9·92	6 030	10·96	2 800	5·09	—	—	2 000	3·64	1 230	2·23	6 030	10·96	—	—	1/-	—
,, 8% Pref'd Ord.	35 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	—	10/-	—
	55 000	Debit				Debit								Debit		Debit					
Royce	72 487	34 452	32·07	293	0·27	34 159	31·80	—	—	—	—	—	—	34 159	31·80	34 159	31·80	—	—	£1	—
,, 6% Cum. Pref.	34 955	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	£1	—
	107 442																				
Siemens Bros.	2 450 000	313 361	10·45	247 025	8·23	560 386	18·68	221 875	7·39	—	—	—	—	338 511	11·29	560 386	18·68	7½	22/3	£1	6·74
,, ,, 10% Cum. Pref.	550 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	31/6	£1	6·35
	3 000 000																				
Simms Motor Units	250 000	27 141	7·75	44 651	12·76	71 792	20·51	30 084	8·59	13 500	3·86	250	0·07	27 958	7·99	71 792	20·51	10	20/-	£1	10·00
,, ,, 6% Cum. Pref.	100 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	20/6	£1	5·85
	350 000																				
United Flexible Metallic Tubing	212 000	9 129	4·31	16 515	7·79	25 644	12·10	12 720	6·00	3 000	1·42	—	—	9 924	4·68	25 644	12·10	6	—	£1	—
Waygood-Otis	290 000	15 570	3·54	71 061	16·15	86 631	19·69	38 000	8·63	31 000	7·05	—	—	17 631	4·01	86 631	19·69	10	37/6	£1	5·33
,, ,, 6% Cum. Pref.	150 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	20/-	£1	6·00
	440 000																				

* After transferring £35 000 (5%) from reserves.

The issued capital of the above 14 companies amounts in all to £15 413 281, and the following is a summary of the appropriation accounts, with percentages :—

	£	%		£	%
Total credit balances brought forward, less debit balance	1 149 096	7·45	Dividends distributed	1 499 295	9·73
Profits, less losses	1 533 720	9·95	Reserves, etc., allocated	334 230	2·17
Transferred from reserves	35 000	0·23	Other appropriations	2 250	0·01
			Credit balances carried forward, less debits	882 041	5·72
	£2 717 816	17·63		£2 717 816	17·63

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COMPANY NEWS.

Electrical Share Market Remains Quiet—Callender's Important Overseas Contracts—General Electric Meeting—Directors' Reports and Dividends.

THE recent renewed selling on the New York Stock Exchange has left its effect on the leading transatlantic electrical shares, and the quotations for Hydro-Electric Securities and Radio Corporation of America shares are both distinctly below last week's level. Radios, at the time of writing, stood at just under 37, compared with over 40 a week ago, and Hydro-Electrics at 38 contrast with 41. American Telephone and Telegraph stock remains at 220, a figure which compares with 230 a fortnight ago and 280 in the middle of April. International Telephone and Telegraph shares have declined from $50 a week ago to $45.

Cables and Wireless stocks have been steadier, the 7½% "A" ordinary stock round about 37, the "B" ordinary stock at about 17½ and the 5½% cumulative preference stock at about 88½. Marconi International Marine shares have recovered to 36s. 3d.

The manufacturing department as, indeed, all sections of the market for electrical shares—supply, equipment, communication and transport—has been very quiet during the past week. W. T. Henley's ordinary shares have lost the 1s. 3d. gained last week, and are back at £6 2s. 6d. Brush Electrical ordinary stock is a point down, at 119½.

The capital reorganisation arrangements of the English Electric Co. have been given effect in the Stock Exchange Official List, and there are now quoted 400 284 ordinary shares at 21s., compared with 1 664 000 shares previously at the nominal quotation of 3s. 9d.; and 491 784 six and a half preference shares (non-cumulative until the end of 1933) quoted at 8s. 9d., compared with 983 565 6% preference shares at 7s. 6d. The £1 295 180 6% convertible debenture stock has been marked up from 67½ to 85.

Central Electricity Board 4% stock is a point up at 83. Underground Electric Railways ordinary shares have risen 6d. to 23s. 6d. District Railway ordinary stock at 77 is also a point to the good.

Last Annl. Divd.%	Description.	This Week.	Last Week	1926 to 1929 Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cm. Pf. Stk.	104	104	112½	98½
6½	" " "C" 6½% Cm. Pf. Stk.	106	106	117½	98½
15	B'mouth & Poole El. S. Ord. ..	57/6	57/6	78/–	29/9
6	" " 6% Cm. Pf.	22/–	22/–	24/–	21/–
(*d*)	Brompton & Kensington Ord. ..	26/6	26/6	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	46/10½	46/10½	60/–	32/6
5	" " 5% Cum. Pref.	20/–	20/–	23/3	19/10
4	Central Electricity Board 4% Stk.	83	82	81	77½
4	Central Elec. Sup. 4% Deb. ..	93½	93½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	28/–	28/–	51/–	24/3
4½	" " " 4½% C.P. (£1)	18/–	18/–	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	" " " 6% C.P.	23/–	23/–	24/3	21/6
8	Clyde Valley Electl. Power Ord. .	38/1½	38/1½	44/6	26/6
8	" " " 8% Pref.	28/6	28/6	29/6	26/–
7	Cornwall Power 7% Pref. ..	23/–	23/–	25/6	19/–
11	County Lon. Elec. Sup. Ord. ..	45/7½	45/7½	68/6	25/9
6	" " " 6% C.P.	23/6	23/6	24/–	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/6	24/6	27/–	21/6
(*g*)	Electric Supp. Corp. Ord.	46/10½	46/10½	59/6	29/6
6	" " " 6% Cum. Pref.	22/–	22/–	23/–	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/–	35/–	47/4	26/9
4	Fife Tram. Lt. & P. Ord.	12/6	12/6	23/6	10/–
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/–
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/6	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	90	90	92	80½
—	Hydro Electric Securities ..	38	41	87	20
—	International Holdings	5½	5½	35½	6
(*e*)	Kensington & K'bridge Ord. (£1)	27/6	27/–	27/6	23/9
7	Lancs E.L. & P. Ord.	25/–*	25/–	32/9	22/10
6	" " " 6% C. 1st Pref.	27/–	27/–	28/6	24/9
7	" " " 7% Part. Cum. Pf.	26/6	27/–	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	29/6	29/6	37/6	23/–
5	London Power Co. 5% Deb. Stk. ..	100½	100½	104	95
10	Melbourne Electric Ord. Stk. ..	170	170	182	150
10	Metro. Elec. Sup. Ord.	40/–	40/–	53/–	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7	Mid. Counties E.S. Ord.	27/–	27/–	35/6	18/9
8	Mid. E. Corp. for Power Dist. Ord.	31/10½	31/10½	57/3	29/10
7	N'castle & Dis. Elec. Ltg. Ord. ..	25/–	25/–	31/9	17/6
6	N'castle-upon-Tyne Elec. Sup. Ord.	22/6	22/6	30/3	19/3
10	N. Metro. Elec. Ord.	47/6	47/6	58/3	31/–
6	Notting Hill 6% C.P. (£10) ..	10½	10½	11½	9½
11	River Plate Elec. Ord. Stk. ..	205	205	226	187½
(*c*)	St. James' & P.M. Ord. (£1) ..	28/–	28/–	28/6	23/6
8	Scottish Power Ord.	28/–	28/–	35/9	22/–
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	24/–	20/10½
8	Smithfield Mkts. E.S. Ord. ..	25/–	25/–	26/–	21/9
8½	S. London E.S. Ord.	27/6	27/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/7½	25/7½	27/–	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/–	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	91	92	98½	86½
7	Urban E.S. Ord.	32/6	32/6	46/6	18/–
5	Victoria Falls Power Ord. ..	60/–	60/-	69/–	46/3
1/9⅝	W'minster Elec. Sup. Ord. (£1) ..	27/–	27/–	52/9	24/–
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/7½
7½	Whitehall Elec. Inv. Pref. ..	24/6	24/9	25/4½	18/9
6	" 1st Mt. Deb. ..	102	102	106	97½
8	Yorks Elec. Power Ord.	31/3	31/3	38/9	24/6
6	" " " 6% C.P. ..	23/–	23/–	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. Inv. Trust 1st Deb	80½	80½	85	70½
5	British Colum. Elec. Rly. Pref. Stk.	93½	94½	98½	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	126½	126½	152	116
7·67	" " " 6% Pf. Stk.	132½	132½	133	103½
6	Calcutta Trams Ord.	12/6	12/6	24/–	14/–
5	" " 5% Cum. Pf.	12/6	12/6	15/9	13/–
(*h*)	Cent. Lon. Ry. Ord. Stk. (asstd.)	77	77	74½	54
4½	" " " 4½ Pf.	80½	80½	85½	78
4	" " " 4% Deb. ..	79	79	83	75
5	City & S. London, Cons. Ord. ..	69	69	65½	52
4	" " 4% Perp. Deb. ..	78½	78½	81½	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	74	74	79	42½
4	" " " " 4% Pf. Stk.	70	70	77	68
4	" " " " 4% Deb. ..	79	79	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95	95	97½	74
4	Lon. Un. Trams, 1st Deb. ..	52½	52½	65½	39
4½	Met. Elec. Trams, 4½% Deb. ..	78	78	75½	62
5	" " 5% Deb. ..	82½	82½	72½	65½
4	Met. Rly. Cons. Ord. Stk. ..	64	64½	81	54½
3½	" " 3½% Pf. Stk. ..	63½	63½	76	60½
3½	" " 3½% Deb. ..	71	71	73½	67½
5	Met. Dist. Rly. Ord. Stk. ..	77	76	81½	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	115½	115½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	87½	88½	95½	80
4	S. Met. Elec. Trams, 4% Deb. ..	72½	72½	71	64½
(*i*) 9	Torquay Trams Ord.	27/6	27/6	30/3	20/3
8	Underground Electric Rlys. Ord.	23/6	23/–	28/6	11/–
5	Winnipeg Elec. Refg. Mt. Stk. ..	87	87	92½	77
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb.	55	55	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	23/9	23/9	58/6	26/3
8	" " " 8% C.P.	52/6	52/6	56/9	49/6
4	" " " 4% Mt. Deb.	73½	73½	79½	73
12½	Automatic Teleph. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P.	8/9	8/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/–	75/–	99/4½	56/–
6	" " 6% C.P.	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref.	23/–*	23/–	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	119½	120½	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	63/9
6½	" " 6½% C.P. ..	23/9	23/9	25/9	22/–
7½	" " 7½% B. Pref.	26/10½	26/10½	28/3	25/–
12	Consolidated Signal Ord. ..	35/–	35/–	52/–	6/6
5	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" " 6% Cum. 2nd Pf.	19/–	19/–	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	27/–	7/4½
5	" " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	13/1½	13/1½	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	20/–
4	" " 1st Mt. Deb. ..	69½	69½	75	68
20	Enfield Cable Works Ord. ..	85/–	85/–	112/6	60/–
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	21/–	3/9	15/9	3/–
—	" " 6% C.P.	8/9	7/6	18/9	5/–
5½	" " 1st Mt. Deb. ..	89	89	103½	86
6	" " Conv. Deb. ..	85	67½	107½	63
7	Ericsson Telephone 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	16/6*	16/9	92/3	17/10½
10	" " 7% Partic. Pref. ..	29/–*	29/6	34/2	23/9
6	Ferranti 6% Pref.	19/6	19/6	19/4½	16/9
10	General Elec. Ord.	48/9	48/9	81/3	26/6
6½	" " "A" C.P. ..	23/9*	23/9	26/–	22/–
7½	" " "B" C.P. ..	26/–*	26/–	27/9	22/9
7	" " 1st Mt. Deb. ..	104	104	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	122/6	123/9	136/10½	69/3
12½	International Auto. Telephone Ord	32/6	32/6	50/6	35/–
10	Johnson & Phillips Ord. ..	37/6	37/6	67/11	33/6
7½	Lon. Elec. Wire & Smith's Pref. ..	23/9	23/9	25/6	22/3
12½	Nat. Elec. Construction (10/–) ..	23/1½	23/1½	21/3	13/6
7½	Siemens Bros. & Co. Ord. ..	23/1½*	23/9	36/6	23/6
10	" " Cum. Pref.	31/3	31/3	34/3	28/9
4½	" " Deb. Stk.	92½	92½	95	88½
10	Telegraph Const. Ord. (£12) ..	18½	18½	30½	20
8	Waste Heat & Gas Elec.	21/10½	21/10½	24/6	17/3
	Telegraph.				
9	Amer. Tele. & Teleg. Cap. Stk. .	$220	$220	314½	144½
4½	" " " Conv. Gd. Bds.	102½	102½	105	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	60½	60½	63½	56½
6	" " 6% Prefd. Stk	103½	103½	105½	91
1½	" " Deferred Stk.	24½	24½	27	22
8	Anglo-Portuguese Tele. Ord. ..	21/10½	21/10½	26/–	12/3
	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	37½	37½	90½	73½
—	"B" Ord. Stk.	17½	17½	104	33
—	5½% Cum. Pref. Stk. ..	88½	88½	99	90
3½	Eastern 3½% Pref. Stk. ..	63½	63½	70½	58½
4	" 4% Deb.	76	78	81½	73
4	Eastern Extension 4% Deb. Stk.	76½	76½	80½	73
22	Great Northern Telegraph (£10)	30	30	43½	26
—	International Teleph. & Teleg. ..	$45	$50	161½	48½
15	Marconi Int. Mar.	36/3	33/9	90/–	16/6
4½	New York Telep. 4½% Mt. Bds.	99½	99½	102½	95
12	Oriental Telephone Ord.	55/–	55/–	65/–	41/–
—	Radio Corporation of America ..	36½	40½	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	88½	95/–	81/3
	Western Tel. 4% Deb. Stk. ..	78	78	82	75

(*a*) 19⅞d. per share. (*b*) 1s. 9·2d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·477d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. (*g*) 2s. 2⅞d. per share. (*h*) 88s. 2·136d. (*i*) 9%, plus special bonus of 30% from sale of omnibus company's shares. * Ex dividend.

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Directors' Reports, etc.

YORKSHIRE (WEST RIDING) ELECTRIC TRAMWAYS, LTD.—Intm. div. of 3% on 6% pref. shs. for half-year endg. June 30 is announced.

NOTTING HILL ELECTRIC LIGHTING CO., LTD.—Interim dividend of 5s. p. sh. on 1s. dfd. (same as last year) will be payable on July 1.

ELECTRIC AND GENERAL INVESTMENT CO., LTD.—Net pft. for year ended May 31, 1930, £10 156. Divs. 6% on pref., 10% (same) on ord., and 2s. p. sh. on dfd. shs. To res., £228, agst. £18 588. Fwd. £20 563, agst. £20 024.

MID-CHESHIRE ELECTRICITY SUPPLY CO., LTD.—Net pft. for 1929, after providg. £2 000 for depreciatn., £11 592, agst. £9 254; written off exes. of 1925 issue, £750, agst. £500; to employees' div. bonus acct., £650, agst. £350; pref. divs., £4 737. Div. on ord. shs. 7%, subject to tax, agst. 5%. Fwd. £2 464, agst. £1 833. Electricity sold, 3 190 254 kWh, agst. 2 533 956; total connections 7 836 kW, agst. 6 716.

GREENWOOD AND BATLEY, LTD.—Pft. on trading for year ended March 31, 1930, £39 272; deb. int., £4 000; directors' fees, £2 000; auditors' fees, £315, fees of trustees to deb. hldrs., £105; blce. for year carried to blce. sheet, £32 852, to wh. is added blce. of £11 397 brt. in from previous year, after paymt. of fin. divs. to March 31, 1929. To depreciatn., £6 000, intm. divs. of 3½% on pref. and 2½% on ord. were paid on Dec. 31, 1929, and fin. divs. of 3½% on pref. and 2½% on ord. are recommended. Fwd. £13 801.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Net rev. for the year ended May 31, 1930, after deductn. of exes., £261 751, makg. with blce. of £77 370 brt. fwd., £339 122. Intm. divs. of 5s. p. sh., tax free, on ord. shs., and 3s. p. sh., less tax, on pref. shs. have been paid and fin. divs. of 5s. p. sh., tax free, on ord. shs., and 3s. p. sh., less tax, on pref. shs. will be paid on June 30. Blce. fwd., £17 460. Enlarged powers of investment adopted at last gen. mtg. have enabled those funds which have bn. realised by sale of securities to be re-invested on favourable terms, but owing to changes, divs. credited in rept. are not the full amts. which will accrue in a normal year.

Company Meetings.

BERMUDA TRACTION, LTD.—At a meeting of the debenture stockholders on June 20 resolutions were passed agreeing to the issue of prior lien debentures to an amount not exceeding £100 000, carrying interest at the rate of 7% per annum, and also postponing payment of the interest on the existing stock until January 1 next.

FERRANTI, LTD.—At an extraordinary general meeting on June 18 resolutions were approved for the sub-division of the existing £1 ordinary shares into two shares of 10s. each, increasing the capital to £900 000 by the creation of 300 000 preference shares of £1 each and 600 000 ordinary shares of 10s. each, and capitalising £200 000 of the undivided profits to be distributed as a capital bonus in the form of fully paid ordinary shares to the holders of the existing 200 000 ordinary shares of 10s. each; also adopting new articles of association.

JOHN M. NEWTON AND SONS, LTD.—Mr. John Newton, chairman, stated at the meeting on June 17 that the turnover for 1929 showed an increase of approximately £25 000. The J. M. Newton Vitreo-Colloid (1928), Ltd., had had considerable difficulties to overcome in the construction of the works at Oxted, but the factory was now practically completed, and the manager hoped to start the first machine on manufacturing during the current month. The subsidiaries had not matured as quickly as one would have hoped, but the directors' confidence in the ultimate issue remained as firm as ever.

PREUSSISCHE ELEKTRIZITATS AKTIENGESELLSCHAFT.—A meeting of holders of 6% 25 year sterling bonds was held in London on June 19, to consider resolutns. (1) amendg. clause 19 (c) of the principal trust deed so as to prove that "an event of default" shall not occur if the State of Prussia ceases to own directly or to be registered as the holder of at least 51% of the voting sh. cap. of the company; and (2) waiving the breach of the principal trust deed, which has been committed by the State of Prussia having transferred the sh. cap. of the company owned by it to Vereinigte Elektrizitats and Bergeverks-Aktiengesellschaft (Veeba). As there was not the necessary quorum, the meeting was adjourned until July 4.

CALCUTTA TRAMWAYS CO., LTD.—The ordinary general meeting of this company was held at 1, Queen Victoria Street, London, E.C. Mr. John G. B. Stone (chairman) presided and said the tramway receipts showed a reduction of £5 030. The expenditure showed a decrease of £1 845. As regards the omnibuses, while the receipts showed a decrease of £3 404, there had been a saving in expenditure of £4 137, the result, after charging depreciation, showing a loss of £28 171, compared with £28 904 for the previous year. The final result was that, after providing for first and second debenture interest, second debenture sinking fund, preference share dividend, and ordinary share interim dividend, there remained an available balance of £49 834, which it was proposed to deal with by the contribution of £7 383 to the staff provident fund, the payment of a final dividend of 10d. per share, free of tax, making 1s. 2½d. for the year, free of tax, absorbing £29 166 13s. 4d., and carrying forward the balance of £13 284. The suggestion that tramway systems are obsolete and should be replaced by omnibuses had been assiduously fostered, but it seemed evident that if such substitution was made the poorer classes would have to pay more for their travel, and ratepayers generally would have to bear increased charges for the maintenance of their roads. The chairman of the Berlin Transportation Co., after studying the matter with his co-directors in the principal cities of the United States, stood convinced that the electric car would remain the chief vehicle in the movement of the masses, and that his recommendation on returning to Berlin would be the wider use of electric cars in mass transportation. The company realised that the motor omnibus was necessary to provide feeder and complementary services.

LISBON ELECTRIC TRAMWAYS, LTD.—Lt.-Col. S. H. Pollen, presiding at the meeting on Monday, said it gave the board pleasure to place before the shareholders a record of another successful year. During this period the service had been operated without a break or untoward incident, and the steady progress in the traffics had continued. The number of passengers carried was 118 824 952, with receipts of 72 251 contos, which compared with 112 874 963 passengers and 68 895 contos in the preceding year, and showed an increase of 5 949 989 passengers and 3 356 contos. The sterling value of their receipts had risen by £30 248. The expenditure had also gone up by £18 202, owing to heavier maintenance charges and other necessary provisions. The net profit was £202 551, which compared with £185 689. From the net profit was deducted the interest and redemption of the company's debentures, £24 240, which left a credit balance to profit and loss account of £178 311, to which was added the amount brought forward from last year, £16 880, giving an available balance of £195 191; £50 000 was transferred to general and depreciation reserve; £15 000 to staff benefit fund; £10 000 to exchange reserve; £25 533 to payment of the dividends on the preference shares for the year 1929; and £28 531 to payment of an interim dividend on the ordinary shares on account of the year 1929. A credit balance remained of £66 127. The directors recommended the declaration of a final dividend on the ordinary shares of 4% net, making a total dividend for the year of 7% net. The rate of exchange had remained steady throughout the year at about 108, and its firmness was due to the much improved financial position of Portugal. Work was going on in every direction, and important schemes were afloat for the development of the country, so that the outlook for the future was brighter than for some time past, and gave every prospect of some return to former prosperity, confidence being restored. Their undertaking was bound to benefit from the improvement which was taking place, and there was therefore every reason to expect that its progress would continue. The dividend was maintained at the same rate as last year, and the carry-forward had been increased from £16 000 to £28 000. The report was adopted, and the dividend approved.

GENERAL ELECTRIC CO., LTD.—Sir Hugo Hirst, presiding at the meeting on Wednesday, said it gave him great pleasure once more to open the meeting with a note of satisfaction at the further substantial progress which the company had made. It must be gratifying to shareholders that, in a year full of shocks with which they were all too familiar, the trading account of the company showed a profit of £1 179 000, an increase of over £90 000 compared with the previous year. Electrical manufacturing was not an easy business. The electrical industry was still in a state of evolution. On the generation side they had successfully undertaken the manufacture of turbo-alternators up to 30 000 kW, having a speed of 3 000 r.p.m. The company was the first in this country to obtain an order for machines to run at this speed. They had developed hydro-electric plant and supplied a number of sets to the Palestine Electric Corporation. The development of the grid scheme had called for considerable extensions at their

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switchgear works, and many noteworthy achievements stood to their credit. Until quite recently the maximum size of outdoor oil circuit breakers had a breaking capacity of 1 000 000 kVA at 44 000 V. As a result of their success in the many problems of design, they were now engaged in the manufacture of outdoor breakers for the Central England scheme, having a breaking capacity of 1 500 000 kVA at 132 000 V. During the past year they had completed metal-clad switchgear units of 750 000 kVA breaking capacity, and were building gear up to 1 500 000 kVA. In transformers the new high tension works at Witton were carrying out orders for the grid for 30 000 kVA 130 000 V transformers, and could undertake with complete success the building of transformers up to 75 000 kVA in one unit. Progress has also been rapid in electric traction. Shareholders might know they obtained a contract for the Manchester-Altrincham section of the L.M.S. and L.N.E.R. Railways, which was the first order ever placed in this country for equipment for trains operating at 1 500 V, whereas previously the usual voltage for traction work was 600 V only. Other contracts included equipments for the new tube railway on the Buenos Aires Central Terminal System, and Diesel electric locomotives for India. Their position in the traction field was indicated by a contract for 1 000 motors which the London Electric Railway had placed with the company. Progress in the development of projector lamps had resulted in the production of a number of successful British films for the first time in this country by means of gasfilled lamps. High tension oil-filled cable ranked amongst the most noteworthy developments of the century, and he would refer to the contract their Pirelli-General Cable Works had obtained (they were partners in that company to the extent of 50%) for the 132 000 V oil-filled cable which linked up the North and South sections of the Grid scheme in the London area. During the past year automatic telephone equipments had been installed to the extent of about 50 000 lines in the London and Birmingham areas. A new private automatic branch exchange system, as the Auto Cord, had been developed. A great amount of energy had also been devoted to the development of carrier current systems. Their telephone works had also participated in the development of totalisators, and had done much work on talking picture apparatus. The chairman next referred to the amount of the company's wages and salary list (approaching £4 000 000 annually) and the large sums paid for coal, coke, electricity supply, gas and water, rates and taxes, income tax, unemployment insurance, national health and pension insurance, etc., and their activities in building up an export business, now running into millions. The report and accounts were adopted and a dividend of 10% per annum and a bonus of 4%, both less tax, for the year were approved.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.

Central Electricity Board Contracts—Increased Profit—Research Work—Numerous Overseas Contracts—Factories Full of Orders.

THE thirty-fourth annual general meeting of Callender's Cable and Construction Co., Ltd., was held at River Plate House, London, on June 19.

The secretary, Mr. Howard Foulds, F.C.I.S., having read the notice convening the meeting,

Sir J. Fortescue Flannery, Bart. (the chairman), in moving the adoption of the report and accounts, said that the manufacture and supply of electric cable and appliances had fluctuated during the year 1929, because, especially during the early part of the year, one of the chief sources of demand—what was known as the "grid" system—was suspended for a considerable time. The company had received a very important contract in connection with this system, but great delay, and consequent heavy cost, arose in the Electricity Board arranging the necessary wayleaves upon which the execution of the contracts depended.

The general use of electricity, not only for lighting and power, but for domestic purposes, was expanding practically in every direction, and there were few of the ordinary household operations that could not be carried out by electric-driven apparatus. One of the features of the present day was the greater use of overhead lines, and these overhead mains led to cable orders and to the wiring of factories and houses for which the company was so admirably equipped at Leigh by their Anchor Works. They had secured a very important contract for heavy underground mains which they were now laying in the London area, and much appreciated the confidence which the London Power Authorities had shown in placing this large contract in their hands. The year had been a difficult one, and, like others engaged in world-wide trade, they had had to face severe competition, especially in their export business, and they were still widening their scope and pushing their operations into new fields. They were not always allowed to do so, as, for instance, in Australia, where the Dominion Government had forced the company into a difficult position by the threat of a 35% tariff on electric wires and cables manufactured at home. The permanent cutting off of part—even of only a small part—of their produce and the consequent reduction of employment in this country was a fact of great public importance. They were looking in all directions to maintain and enlarge their markets.

Sir Tom O. Callender (deputy chairman and managing director), in seconding the resolution, said they had devoted much time and energy at their factory and on contracts to economies in their production and in the disposal of their cables, both by improved machinery and methods. The outstanding alteration was in their method of steam raising by the employment of powdered fuel, and he was fortunate in having the help of Sir Ernest Moir, who had had special experience in this new development, as also from their chairman, whose marine and engineering experience had been useful.

It was, however, less by any large outstanding change that economies resulted than by the constant small improvements that their savings could be and were being made. In this, development and progress of manufacture of cables and efficiency of their local management were of the utmost importance, and by Mr. Pipkin in the production side, and by Mr. Watson, their technical head at Erith, he was most efficiently assisted. At Leigh similar watchfulness existed, and they owed much of their wonderful success in rubber cables to the constant attention of the management under Mr. Bowyer and Mr. Smith.

India was their oldest and one of their most important fields of operation, and, in spite of internal disputes and uprisings, of riot and commotion, they were steadily pursuing their way, extending in their old districts and opening up new areas. They were carrying out an important contract for the cable system to supply the South Indian Railway in Madras. They had nearly completed the distribution mains, mostly overhead, of the network for the United Provinces electricity authorities, radiating from their hydro-electric station on the great United Provinces canal system. This supplied several towns, including Roorkhi, a well-known military centre. The Government of India, in co-operation with the Government of the Punjab, had placed with them the contract for the construction of the widespread network throughout the Punjab, spreading from the Shanar power house, situated on the Uhl River.

Their chairman had told them of the interruption to their general trade likely to follow the heavy taxes to be imposed, which were avowedly for the protection and fostering of Australian labour. The cable makers as a body were seeking to meet this difficulty by the erection of a factory in Australia for the purpose of producing certain classes of wire in that country.

He was pleased to say that the China Light and Power Co. operating from Kowloon had placed in their hands their important extension northwards. In South America their men are at work laying cables for the supply of power to the Central Argentine Railway. Their old friends in Chili had given them several excellent orders. Brazil also had come to their help, and considerable cable orders had been placed. The factories were full of orders, and more were coming in every day.

He had thought it would serve an excellent purpose, especially after his recent illness, if he visited South Africa, where, whilst they continued to get orders, the volume of municipal cable business coming to them and Great Britain was inadequate. This visit had done much good to British trade. It had bound them closer to many old friends who had worked with him in the past in this country and who now held important positions in the Union of South Africa. The first-hand information gained, whilst in the Cape, as to Rhodesian copper developments would, he considered, amply repay all the time and money spent on the voyage.

The report and accounts were adopted and the dividend was approved.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CLARKE, Mr. W. E., 149A, Seabank Road, Wallasey, electrical contractor. £14 2s. 9d. May 12.

HOBBS, E., and Co., 61, Wellfield Road, Cardiff, electrical engineers. £21 13s. 11d. May 12.

LINDLEY, Mr. R., 36, Avondale Buildings, Bradford Road, Shipley, electrical contractor. £19 6s. 8d. May 9.

ROBINSON (R. J.) AND Co., Brackenborough Road, Louth, electrical engineers. £10 3s. 7d. May 9.

RUBINS, Mr. M., 55, Duke Street, Sheffield (proprietor of POPULAR WIRELESS STORES), wireless and electrical engineer. £29 12s. 6d. May 5.

STREETER, Sidney Leopold, and Wife, East Street, Petworth, (trading together as M. STREETER), electrical engineers. £11 7s. 6d. May 1.

WARDLEWORTH, L. AND V., Bury Old Road, Heaton Park, Manchester, electrical engineers. £17 6s. 11d. May 23.

Bill of Sale.

MCNAMARA, Tom Bedford, Beaumont Crescent, St. Thomas, Swansea, wireless and electrical engineer. Dated June 6, filed June 10, £87.

Deeds of Arrangement.

DOWLING, Cyril, 12, 14 and 16, New Rents, and PRIMAVESI, Leo Alex., 4, Gilbert Road, Ashford, trading at both addresses, electrical engineers. Dated, June 16; filed June 20. Trustee, R. J. Geering, Bank Chambers, Bank Street, Ashford. Secured creditors, £18; liabilities unsecured, £1 635; assets, less secured claims, £735.

LAWSON, Robert John, and LAWSON, Robert Gibson, trading as R. H. LAWSON AND SON, 26, Pilgrim Street, Newcastle-on-Tyne, electrical and colliery stores merchants. Dated June 12, filed June 19. Trustees, G. H. Middleton, the younger, Royal Exchange Buildings, Hood Street, Newcastle-on-Tyne, and another. Secured creditors, £357; liabilities unsecured £1 326; assets, less secured claims, £737.

Receivership.

HUGHES (ALFRED H.) AND COX, LTD.—K. Peterson, C.A., of Revenue Chambers, 4, Howard Street, Sheffield, was appointed receiver and/or manager on June 11, 1930, under powers contained in debenture dated June 26, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

KING, P. T., 17, Manchester Street, Luton, electrical engineer. A meeting of the creditors in this matter was held recently when the representative of the W. T. Henley's Telegraph Works Co., Ltd. presided. A statement of affairs was submitted which disclosed liabilities of £1 580, all due to unsecured creditors, while the bank were fully secured creditors for £199, holding security valued at £200. The assets comprised book debts £1 071, valued at £990; stock in trade £3 250, estimated to produce £3 000; work in progress £106, plant and machinery put down at £200; and surplus from securities in the hands of fully secured creditors, £11, making total assets of £4 307, from which had to be deducted £205 for preferential claims, leaving net assets of £4 102, or a surplus of assets over liabilities of £2 521. It appeared that the debtor had invented a new electric motor and the patent of those motors had now been taken over by one of the creditors who intended to manufacture them on a large scale, and pay the debtor a royalty of 7½ per cent. on sales, which it was estimated would allow the debtor about £700 per annum. The present position had been brought about by keen competition, shortage of working capital, and overstocking. After considerable discussion it was decided that the debtor should be allowed to continue trading, but in order to protect the assets it was unanimously resolved that a deed of inspectorship should be executed in favour of Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C. as trustee, with a committee of inspection consisting of Mr. E. H. Hawkins, representing creditors; Mr. E. Judd, representing Drake and Gorham, Wholesale, Ltd., and the representative of W. T. Henley's Telegraph Works Co., Ltd.

PEARN, Victor, electrical engineer, trading as E. BROWN AND Co., 387, Bath Road, Bristol. A meeting of the creditors of the above was held at Bristol last week, when it was stated that the liabilities were approximately £250, whilst the assets consisted of book debts estimated to realise about £20, and plant valued at about the same amount. The business was commenced in 1924. No particulars as to the trading were available, but it was stated that the drawings had been small. Recently creditors had been pressing and the debtor attributed his position to trade depression, lack of capital and keen competition. An offer was made of a composition of 5s. in the £, payable in cash and the creditors decided to accept that offer. The following are creditors:—Sloan Electric Co., Ltd., £26; Edison Swan Electric Co., Ltd., £30; Burris, F., and Sons, £36; Russell, John, and Co., Ltd., £25; General Electric Co., Ltd., £21; Philips Lamps, Ltd., £34; and Kremner, L., £18.

TURNOCK, George, electrical engineer, 41, High Street, Aston New Town, Birmingham, and 25, Havelock Road, Handsworth. At the meeting of creditors of the above a statement of affairs was submitted which showed liabilities of £3 347, of which £1 147 was due to the trade and £2 200 to a cash creditor. After allowing £193 for preferential claims, the net assets were £608, or a deficiency of £2 740. The assets consisted of machinery, plant, tools and stock, £288; book debts, £230; estimated to realise £150; cash in hand and at bank, £2; and surplus from fully secured creditors, £361. The fully secured creditor claimed £1 614 in respect of mortgages on certain property, which for the purposes of the statement was valued at £1 975. It was stated that the principal cash creditor advanced money to the debtor some years ago and held no security. There was a second cash creditor for £200, who had obtained judgment for that amount. The debtor had been carrying on business for something like 25 years. The last balance sheet was prepared as at December, 1926, and at that date the liabilities just exceeded the assets. Since that date the turnover had been approximately £20 500, and a loss had been incurred of £1 160. The deficiency was attributed to the loss on trading and the depreciation written off the assets. A deed of assignment had already been executed and a resolution was passed confirming the deed subject to the cash claim for £2 000 being postponed or withdrawn.

London Gazette, etc.

Companies Winding-up Voluntarily.

AEONIC RADIO, LTD. By special resolution, June 16. Oscar Berry, F.C.A., F.S.S., 1, Queen Victoria Street, E.C.4, appointed as liquidator for the purpose of reconstruction.

BASSON ELECTRICAL CO., LTD. Statutory meeting of creditors at the offices of Lawson, Coppock and Hart, 18, Tib Lane, Cross Street, Manchester, on Wednesday, June 25.

LEO TAYLOR, LTD. By reason of its liabilities, June 12. W. Latham, Union Bank Chambers, Lytham, chartered accountant, appointed as liquidator.

YOUNG (C. F.), Ltd. Statutory meeting of creditors at the offices of the Leicestershire Trade Protection Society, 4, New Street, Leicester, on Wednesday, June 25.

Bankruptcy Information.

ANDERSON, Cyril Morton, 1 556, Stratford Road, Hall Green, Birmingham, trading as ROBIN HOOD ELECTRICAL CO., electrical contractor, and at Back 330, Icknield Port Road, Birmingham, as THE MAROON MOTOR CO. First meeting, July 2, 11 a.m., Official Receiver's Office, 191, Corporation Street, Birmingham. Public examination, July 16, 2.30 p.m., Court House, Corporation Street, Birmingham.

BLACKMORE, Glanville, 62, Coventry Road, Market Harborough, wireless engineer. First meeting, June 27, 3 p.m., Official Receiver's Office, 1, Berridge Street, Leicester. Public examination, July 4, 11 a.m., The Castle, Leicester.

KERSHAW, S., AND Co., Broad Lane, West Derby, and 4, Daulby Street, Liverpool, electrical and radio engineers. Receiving order, June 16. Creditor's petition. First meeting, June 27, 11.30 a.m., Official Receiver's Office, Government Buildings, Victoria Street, Liverpool. Public examination, July 15, 10 a.m., Court House, Government Buildings, Victoria Street, Liverpool.

TURNER, Harry, 20, Battersea Rise, Clapham Common, London, radio and electrical contractor. First meeting, June 30, 11.30 a.m., 29, Russell Square, W.C.1. Public examination, July 10, 12 noon, The Court House, Wandsworth.

Notice of Dividend.

READ, Roland Arthur, 9, The Pavement, Middle Lane, Crouch End, London, N.8, electrical engineer. First and final dividend, 9d. per £, payable Bankruptcy Buildings, Carey Street, London, W.C.2.

Bankruptcy Proceedings.

K. N. ELECTRICAL PRODUCTS, LTD., 5, 6 and 7, Singer Street, Tabernacle Street, London, E.C.2. Under a winding-up order made against this company on May 6 on a creditor's petition the statutory meetings were held last week at the Board of Trade offices, Carey Street. The Official Receiver said that the company was registered on July 6, 1929, with a nominal capital of £6 000 divided into shares

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of £1 each and was formed to carry on business as manufacturers of and dealers in electrical appliances and to buy the business carried on by Ignatius and Francis Knowles under the style of Knowles and Son, at 87, Wardour Street, W. The whole of the capital had been issued, namely £3 000 subscribed for cash and £3 000 allotted as fully paid to the vendors. The purchase agreement provided for the sale to the company of the business, including goodwill and the rights of the vendors in two inventions relating to electric soldering irons, plant, machinery, etc., for £3 000 in shares of the company, which was also to take over the then existing liabilities of the business. In addition, the vendors were to be paid a royalty of 2d. in respect of each soldering iron sold by the company. The company carried on business at 87, Wardour Street until March of last year, in which month it removed to Singer Street. The trading also disclosed a loss of £7 807 to March last. Funds were raised by three debentures for £1 000 each and on March 26 last Mr. J. M. Ferguson, C.A. was appointed receiver for the bondholder and he carried on the business until the date of the winding-up order. He then ceased to act. The business of the company was originally restricted to the manufacture and sale of the soldering irons, but since it was found impossible to transact enough trade in those articles alone the manufacture of wireless articles was undertaken. The receiver for the bondholder continued the business in the hope of securing a large order for wireless apparatus, but this was not obtained. According to the statement of affairs filed in the liquidation the liabilities amounted to £8 900 of which £6 271 are expected to rank, and the assets are estimated to realise £2 416, absorbed, however, in preferential payments and debenture claims. With reference to the shareholders a total deficiency of £12 271 is disclosed. The failure of the company is attributed to the bad radio season of 1929–30 and to lack of enough capital to carry on until the business of the company was stabilised.

RECORDAPHONES, LTD., Radio Works, Letchworth, Herts. Under a winding-up order made against this company on May 19, on a creditor's petition, the statutory meetings were held on Wednesday at Bankruptcy Buildings, Carey Street, London. The Official Receiver reported that the company was incorporated on October 18, 1928, with a nominal capital of £200 000, divided into 300 000 8½% participating preferred shares of 10s. each and 1 000 000 deferred shares of 1s. each, and was formed to acquire the exclusive licence under British patents for the manufacture and sale of an electrical invention known as "Recordaphone." The issued capital was £181 000, of which £110 000 was subscribed in cash and £71 000 was allotted as part satisfaction of the purchase consideration. In May, 1929, Mr. A. E. Bowyer-Lowe was appointed managing director for five years at a salary of £2 000 per annum, plus 7½% of the net profits, the total remuneration not to exceed £3 000 per annum.

Under the purchase agreement the company acquired of British Telegraphones, Ltd., for £75 000 in cash and shares, the exclusive licence of the electrical invention for the recording and subsequent reproduction of sound known as "Recordaphone," and the benefit of an agreement with a firm of German manufacturers. A prospectus was issued on October 24, 1928, offering for subscription 300 000 preferred shares of 10s. and 300 000 1s. deferred shares. The Scottish Finance Co., Ltd., agreed to underwrite 200 000 preferred and 200 000 deferred shares for an underwriting commission of 4% and an overriding commission of 1% payable in cash. The Scottish Finance Co. in turn entered into a number of sub-underwriting agreements, to which the company was not a party. The public issue was not a success, applications being received from the public for approximately 60% of the number underwritten. Although the Scottish Finance Co. received payment in full of the agreed underwriting and overriding commission, it had refused to accept any liabilities for the default of the sub-underwriters to fulfil their obligations, alleging that allotment to the sub-underwriters constituted an acceptance of the sub-underwriters' application for shares and operated as a release of the Scottish Finance Co. Proceedings had been instituted by the company against many of the sub-underwriters, but a number of them were now bankrupt, and there was little prospect of anything further being recovered from any of them.

In January, 1929, with a view to having a subsidiary for manufacturing purposes, the company agreed to purchase, for £34 436 cash and shares, the undertaking of the Bowyer-Lowe Co., Ltd., of which Mr. Bowyer-Lowe was the managing director, and which carried on the business of manufacturers of high grade wireless apparatus at Radio Works, Letchworth. Contrary to the expectations expressed by the directors the company did not succeed in obtaining a sufficient demand for Recordaphones to place manufacturing with the Bowyer-Lowe Co., Ltd. In fact the company's endeavours to sell Recordaphones had proved entirely unsuccessful, and it was eventually decided to finance the Bowyer-Lowe Co. with a view to increasing that company's turnover in wireless apparatus to such an extent that Recordaphones, Ltd., would receive a revenue by way of dividend on the Bowyer-Lowe shares —all of which it held—pending a demand for Recordaphones being created and conditions of trade generally improving. The Bowyer-Lowe Co. was also in compulsory liquidation.

No statement of affairs had yet been lodged, but it was expected that the creditors would be paid in full and there would be a small surplus available for distribution among the holders of preferred shares.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

COLTRAGRAPH.—512 125. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. W. H. Colt, Ltd., Bush House, Aldwych, London, W.C.2; manufacturers.—April 15, 1930.

PHILIPS ARGENTA.—B510 116. Class 13. Electric lamps (ordinary). Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Emmasingel 13d, Eindhoven, Noord-Brabant; manufacturers.—February 5, 1930. The applicants undertake that this mark, when registered, and the marks Nos. 423 539 (2 320), B424 535 (2 368) shall be assigned or transmitted only as a whole and not separately. User claimed from February 1, 1925.

LACENT.—510 887. Class 13. Electric light fittings of ordinary metal. Heyes and Co., Ltd., Water-Heyes Electrical Works, Wigan; manufacturers.—March 4, 1930.

SUPER WASP (sign).—508 891. Class 8. Wireless telephonic and telegraphic apparatus and parts thereof. Pilot Radio and Tube Corporation, 323, Berry Street, Brooklyn, New York; manufacturers. December 18, 1929.

DOUBLE EAGLE (sign).—510 448. Class 8. Electrical storage batteries (not for medical purposes). The Goodyear Tyre and Rubber Co., 1144, East Market Street, Akron, Ohio; manufacturers. February 17, 1930.

GOLDEN RAY (sign).—511 617. Class 8. Apparatus for use in wireless telegraphy and telephony. A. Rist (1927), Ltd., Waveney Works, Freemantle Road, Lowestoft; manufacturers. March 28, 1930.

ZALMA.—512 005. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching, but not including optical instruments, and not including any goods of a like kind to optical instruments. Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex; manufacturers. April 11, 1930.

TOREX.—511 905. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including optical and ophthalmic lenses or apparatus for indicating the level of liquids and not including any goods of a like kind to any of these excluded goods. Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex; manufacturers. April 8, 1930.

LYFA.—511 166. Class 13. Metal goods for electrical purposes not included in other classes. Lyfa, Ltd., 39, Lombard Street, London, E.C.3; manufacturers. March 14, 1930.

METAL AND CHEMICAL PRICES.

TUESDAY, June 24

	Price.	Inc.	Dec.
***Copper*—**			
Best Selected .. .. .. per ton	£53 10 0	—	10s. 0d.
Electro Wirebars .. .. .. „	£56 10 0	10s. 0d.	—
H.C. Wire, basis .. .. .. per lb.	8½d.	—	—
Sheet .. .. „	8⅝d.	—	1/16d.
***Phosphor Bronze*—**			
Wire (Telephone), basis .. .. per lb.	11½d.	—	—
***Brass* (60/40)—**			
Rod, basis .. .. .. per lb.	8½d.	—	—
Sheet „ .. .. „	8⅝d.	—	¼d.
Wire „ .. .. „	9½d.	¼d.	—
***Pig Iron*—**			
Cleveland Warrants .. .. per ton	£3 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
***Lead Pig*—**			
English .. .. per ton	£19 5 0	—	—
Foreign or Colonial .. .. „	£18 0 0	5s. 0d.	—
***Tin*—**			
Ingot .. .. per ton	£134 5 0	15s. 0d.	—
Wire, basis .. .. .. per lb.	1s. 1½d.	¼d.	—
Aluminium Ingots .. .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£16 5 0	—	5s. 0d.
Mercury .. .. per bottle	£22 10 0	—	—

***Sulphur*—Flowers, Ton £12 0 0** *Copper Sulphate* .. Ton £25 to £25 10s.
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £31 0 0
Sulphuric Acid (168° Tw.) Ton £6 15 0 *Sodium Chlorate*—per lb., 2½d.
Sodium Bichromate—Per lb., 3½d.

***Rubber*—Para fine, 7¼d.; plantation, 1st latex, 6½d.**

***** The metal prices are supplied by British Insulated Cables, Ltd.**

THE LEAD MARKET.

According to James Forster and Co. the only feature of the market last week was the disappearance of the contango, owing to the placing of a Russian order for early shipment. At one time a backwardation of 3s. 9d. per ton was seen, but later, owing to further declarations of Mexican and American lead, June lead was more freely offered. A little official support was given from time to time. The American price was lowered 10 points on June 17. Closing prices on June 19 were £17 17s. 6d. for all positions or unchanged on the week.

COMING EVENTS.

Friday, June 27.

ELECTRICAL CONTRACTORS' ASSOCIATION.—Town Hall, Llandudno. Annual Conference. Paper by Mr. W. Cross on "Specifications and their Problems," 9.30 *a.m.*; short address by the new President, 12 *noon*; ball and supper, Grand Hotel, 9 *p.m.*

Monday, June 30—Friday, July 4.

INSTITUTION OF MECHANICAL ENGINEERS.—Summer meeting. Secretarial Office, at Bristol University.

Tuesday, July 1.

ELECTRICAL CONTRACTORS' ASSOCIATION (DERBY BRANCH).—Ordinary meeting.

Wednesday, July 2.

ELECTRICAL CONTRACTORS' ASSOCIATION (LONDON BRANCH).—General meeting.
ELECTRICAL CONTRACTORS' ASSOCIATION (BATH SUB-BRANCH).—Ordinary meeting.
ELECTRICAL CONTRACTORS' ASSOCIATION (CARDIFF BRANCH).—Ordinary meeting. 2.0 *p.m.*
ELECTRICAL CONTRACTORS' ASSOCIATION (DUBLIN BRANCH).—Ordinary meeting. 2.30 *p.m.*

Thursday, July 3.

ELECTRICAL CONTRACTORS' ASSOCIATION (NEWCASTLE BRANCH).—Ordinary meeting.
ELECTRICAL CONTRACTORS' ASSOCIATION (BRISTOL BRANCH).—Ordinary meeting. 3.15 *p.m.*

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BENN BROTHERS

LIMITED

1880 — 1930

Jubilee History

THE TRADER AND HIS BANKER

'Keep in touch' is the rule of thumb by which many a sound enterprise has been brought to fruition.

Because it is through personal contact and friendly relationships that a Bank can best aid the prosperity of its clients.

The general services which the Westminster Bank renders its customers are a commonplace: yet how often the Trader's personal relations with his Bank Manager never get further than the arranging of an overdraft.

Is it, perhaps, this Borrower-Lender 'complex' which hinders that mutual and friendly understanding that is of such supreme value to a Trader and his Banker? This should not be. Rather the Trader should feel free whenever he is passing to call in and have a word with his Bank Manager.

Is it the question of sending the firm's traveller abroad and providing for his drawing money, easily, at defined places, and within prescribed limits? Or of discounting bills that are guaranteed by the Export Credits Department; or merely of depositing documents for safe custody? It is just in matters like these that a word with the Manager may be helpful; and it will be found that the visit will be welcomed. Why?

A Bank Manager is not a philanthropist; but he *is* interested in the prosperity of his clients. It is good business for him to be so: for on the prosperity of its customers depends the prosperity of the Bank. And it is because the Bank's welfare is inseparably bound up with the welfare of its customers that to be in personal touch with his Bank Manager is a matter of first importance for any Trader.

So a client must not feel that the glass door marked 'Manager' is a barrier between himself and the man behind it. On the contrary, it is hoped that he may be familiar with either side of it, and feel that the occasional word within is almost a matter of routine.

That is why the Manager at any Branch of the Westminster Bank is most ready to give interviews and to discuss or explain any point that might help a client to a full and straightforward use of the Bank's services.

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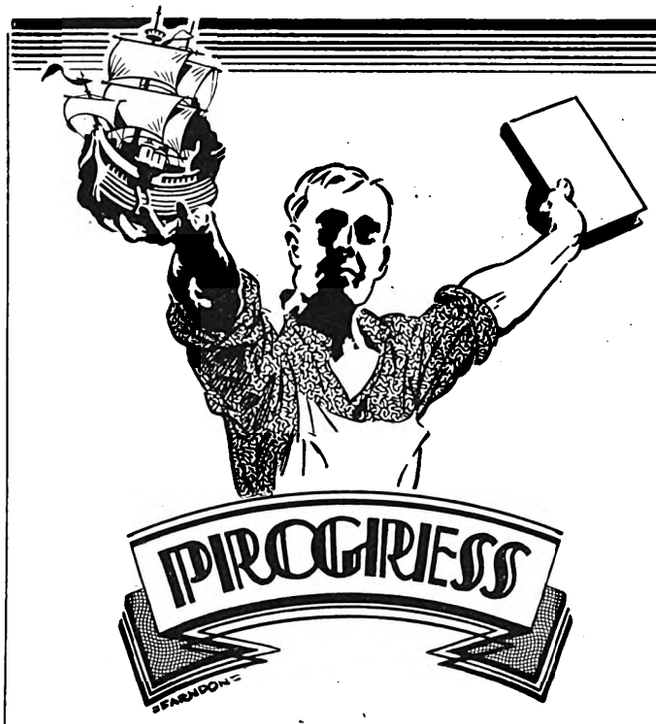

IN company with their business friends in all parts of the world, we join in congratulating the House of Benn Bros., Ltd., on attaining its Jubilee.

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If you would like the co-operation of a good printer, Loxley Brothers, Ltd., have a Service Department of Lithographers, Artists and Copywriters together with a staff of craftsmen with modern machinery and equipment, all working as a unit to help business men in their struggle for success.

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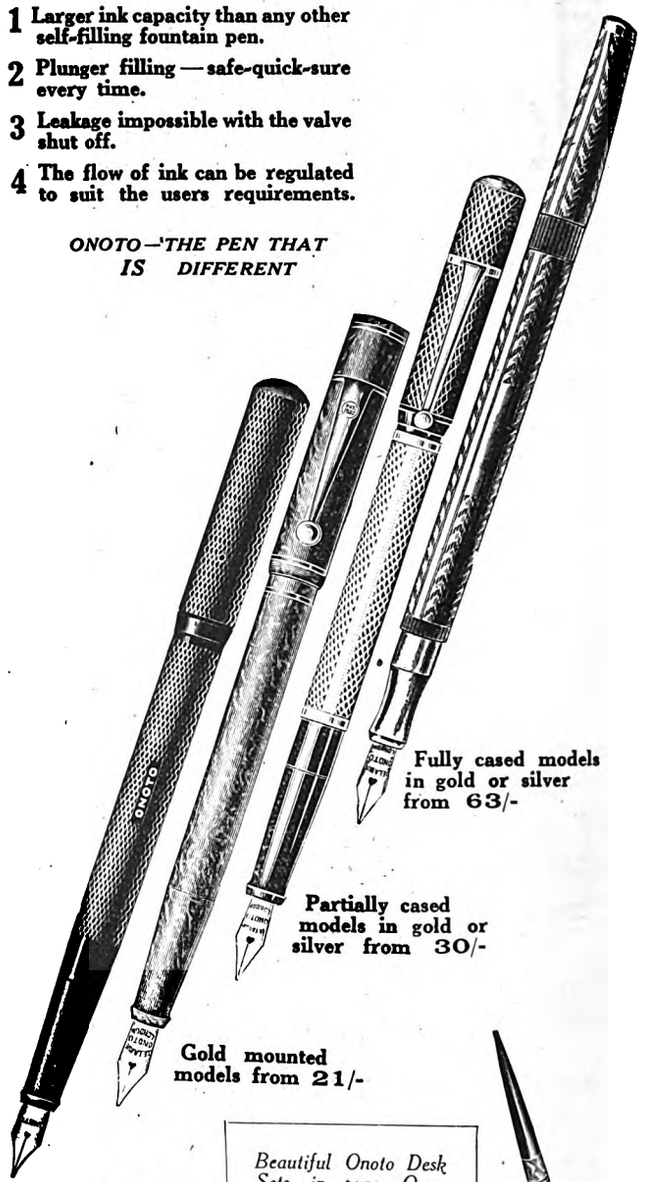

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The BEST CARS for your PLEASURE

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Each SINGER Model represents the BEST that the British motor industry produces. The SINGER "SIX" is a beautiful car with long sweeping lines, and genuine coach-built construction. The engine will maintain a high cruising speed, and give an outstanding top gear performance from 5 to 55 m.p.h. The SUPER-SIX has a seven-bearing crankshaft, one-shot central lubrication to all points of the chassis, four-speed gear-box, and many other exclusive features.

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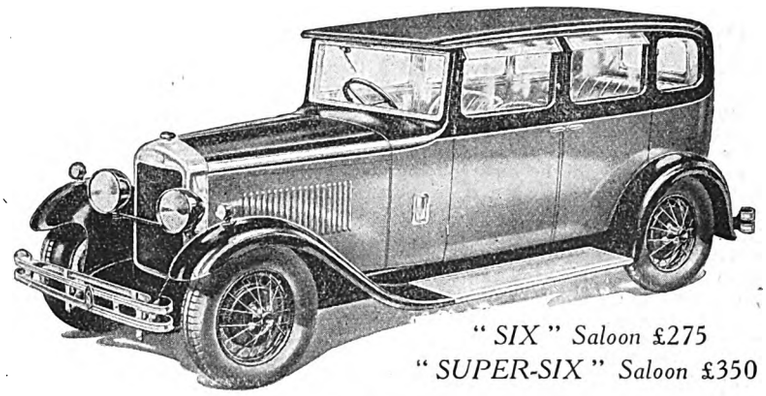
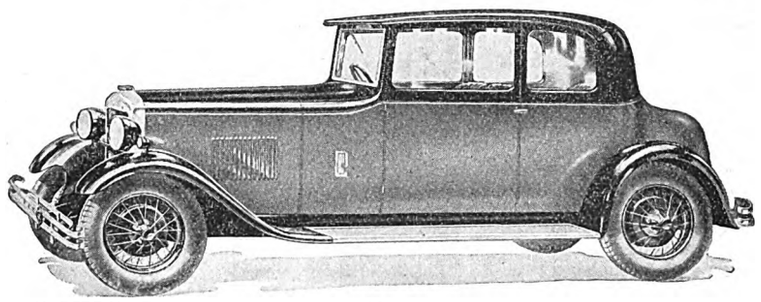
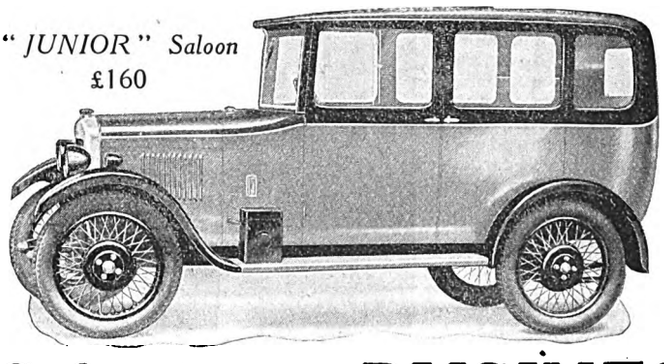


"SIX" Saloon £275
"SUPER-SIX" Saloon £350



"SIX" Coupe £270 "SUPER-SIX" Coupe £350

"JUNIOR" Saloon £160



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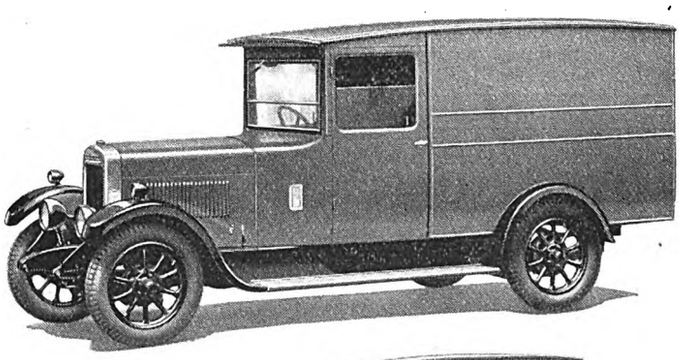
The BEST VANS for your BUSINESS

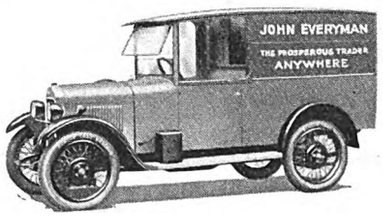
SINGER "SIX" DELIVERY VAN

Gives a real express delivery service with economical running costs. Here are some of its special features:—
All-weather cab, winding windows, carrying 14 cwt., petrol consumption 22/24 m.p.g. Speed, fully loaded, 50 m.p.h., smooth 6-cylinder engine, "Marles" patent steering, six brakes on four wheels. Price £200.



SINGER "JUNIOR" VAN

Costs only 1d. per mile to run. It has internal expanding brakes on all four wheels. Carrying capacity 5 cwt. Petrol consumption 35 to 40 m.p.g Price £135.



Catalogues and full particulars from SINGER & CO. LTD., COVENTRY.

LONDON SHOWROOMS: STRATTON HOUSE, PICCADILLY, W.1

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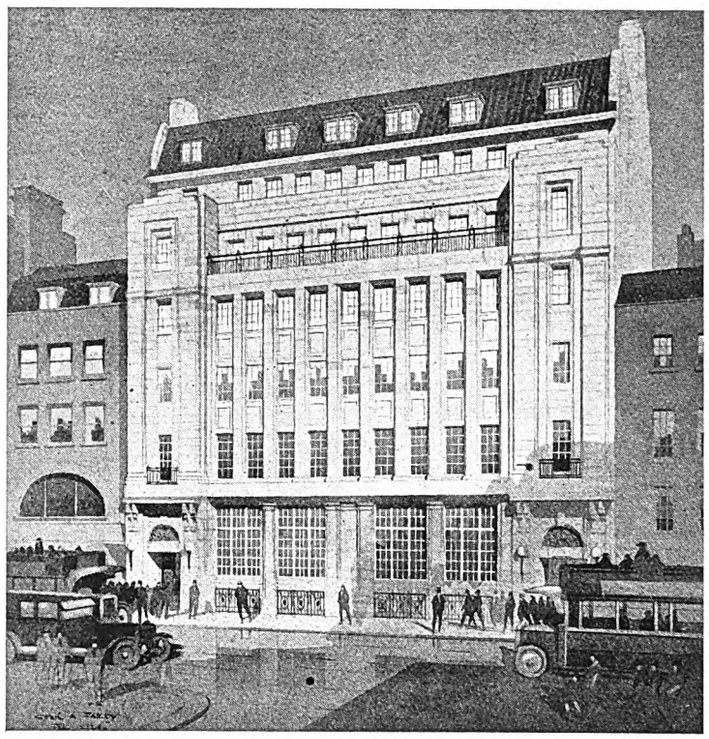
ENGRAVING

on the contrary the fact that this country can claim to be the birthplace of the modern Three Colour Process is entirely due to the farseeing generosity of the ARC ENGRAVING CO. The actual inventor was Harmann Cartheusar, a cosmopolitan craftsman of outstanding genius, and it was due solely to the encouragement and practical assistance of the "ARC" that he was enabled in their Studios and at their expense to conduct his experiments with the new collodion emulsion until Colour Type reached the stage when it became a definite commercial proposition.

Nor was this the first instance of the keen interest taken by the ARC Engraving Company in the technical development of their craft. For as far back as the days of wood engraving when this tedious process failed to keep step with the rapidly increasing demand for good illustration in Books, Periodicals and even the Daily Newspapers, this Company played a pioneer part in the production of "Line" and Half-tone Blocks by the new chemical processes which followed the invention of modern photography. That this traditional enterprise remains to-day as then is evidenced in the important commissions with which this Firm is continually entrusted and reflected in the notable results achieved.



In an article such as this, viewing as it does the development of process engraving from the standpoint of craftsmanship rather than the technical methods it employs, this special reference to the "ARC" Engraving Company is amply justified. For it is generally accepted by prominent users of commercial illustration that an "ARC Block" whether in the simplest "line" or the most intricate "colour work" provides outstanding evidence that above the present day demand for speed and, in many instances, mass production, there remains still adequate scope for that individual treatment and artistic perception without which no genuine craft as such can survive.

It is this very attitude towards their business that has earned and maintains for the "ARC" the premier position in the engraving world which they unquestionably enjoy. Indeed many of the "ARC" Reproductions, especially in Colour are regarded by experts as the finest specimens of modern process engraving in existence. The student and also those who are commercially interested in securing this class of work will need no further evidence on the point than the wonderful coloured plates issued by Messrs. Benn Brothers in their classical series of illustrated Books on Ceramic Pottery. These plates, produced in the "ARC" Studios, deal with the most complicated colour subjects and the superb skill which alone made them possible was deemed worthy of an appreciative Editorial commentary rarely vouchsafed to commercial enterprise however excellent.

With acknowledgments we quote the following significant paragraph from *The Observer*, December 30th, 1923. "So faithfully do these reproductions render the textures, glazes, and exact tones of the different subjects that the actual handling of the pieces could scarcely be more instructive." Such a tribute from such a source is praise indeed. It is equally significant to note that the production of these plates must in no sense be regarded as an isolated example or as representing a supreme effort to meet a supreme occasion. They were produced upon a strictly commercial basis and the fact that their cost was no more and no less than that often paid for work of a less satisfying nature is not only worthy of record but of immense practical importance to all who require such aid in the preparation of their Business Literature.

The "ARC" Colour Studios at Wimbledon (the offices of the Company are at 4 and 6, Farringdon Avenue, E.C.4) are equipped with every appliance required for modern colour reproduction, and these advantages coupled with the selective care exercised in the appointment of their Operatives enables the "ARC Engraving" to extend to the smallest commission the same skilful treatment that is as vital to its perfect execution as it is to the many reproductions of famous masterpieces in oils, water colours or tapestry which are continually passing through the Studios.

But, in laying stress upon the advantages of high grade colour type and the services available at the ARC Studios those who chiefly employ Black and White reproduction will be interested to know that the same degree of excellence and the same unmistakable mark of individuality is equally available in this very important, if less spectacular, branch of engraving and once again stamps the ARC Engravers as past masters of their Art.

Those concerned in "giving out" line and half-tone work know full well that however excellent the engraving may be, speed is also a factor and indeed time more often than not is the essence of the contract. It is inconceivable that the "ARC" Engraving Co. viewing with such responsibility the standard of their craftsmanship would fail to equip themselves with an adequate organisation to deal effectively and promptly with matters of urgency. It can therefore be taken as a foregone conclusion that instructions of this nature for the Press or other purposes are dealt with by a special Staff whose duty it is to see that speed is never an excuse for faulty production and that the Blocks are delivered "ON TIME."

NOTE.—This page which is an example of type and half-tone illustration produced and printed from a combined Line and Half-tone Block is issued by the **ARC ENGRAVING COMPANY, 4 and 6, FARRINGDON AVENUE, LONDON, E.C.4,** ***who will be pleased to receive your enquiries and, upon application, provide you with further specimens of their Colour Work or Black and White engraving.***

SEE INDEX - PRINTING - MODERN ILLUSTRATION - BLOCKS

The ARC ENGRAVING Co., LTD.
4 & 6, Farringdon Avenue, E.C.4

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The House of Waring AND THE STORY OF A GREAT IDEAL 1695 – 1930

It was one of the ideals of the House of Waring to preserve the craft of furniture-making, as it has been handed down. And to provide a great House in London where, in spacious galleries every example shown should be a work of art, even to the humblest item ; and where it was possible to purchase articles of beauty for the home, hitherto only accessible to the wealthy, at prices within the reach of all classes

A little less than a century ago, having absorbed the Gillow firm with its historic factory at Lancaster, the House of Waring set out with the ideal of re-asserting the beauty of old English furniture ; to restore the influence, if not the precise form, of those master-workers in wood of the 18th Century whose designs in furniture and home decoration combined distinctive charm with practical utility that had no equal in the world.

THE manufacturing resources of the House produced furniture at prices which have proved a revelation. The great shop in Oxford Street was founded to demonstrate the alliance of art with economy. It is a beautiful building, on the lines of Hampton Court, by Wren. Consisting of seven floors, covering over 8 acres of space, it was conceived in the spirit of providing a huge establishment where every furnishing need would be provided to meet a large public demand.

Antiques and Reproductions are shown in a splendid series of Period apartments
Over 100 Rooms demonstrate the characteristics of individual English Period styles
Wonderful Eastern rugs, priceless in themselves, are reproduced at a trifling cost
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Exquisite designs in old china are reproduced at prices for every-day use
Glass of historic character and Georgian silver is available at the price of ordinary articles

The Waring Showrooms of to-day are unique ; and are the Mecca of all interested in Art and the Home.

WARING AND GILLOW LTD

WARINGS

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IN CUBIC FEET

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1925-294,756 million
1929-321,616 million
and steadily progressing

There are over 9,000,000 gas consumers, that is to say, practically every family in an area of gas supply is using gas for some purpose.

The B.C.G.A. . . representing the British Gas Industry, is at the service of the public, without charge, for information and advice on any use of gas.

GAS
is a sound investment
A striking testimony

GAS IS KNOWN TO BE USED in approximately 3,000 trades or branches of trades in this country for an average of seven processes in each, and in more than 9,000,000 homes where heat is needed for something like a dozen household purposes.

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Textiles—gassing, singeing, stentering conditioning, shrinking, calendering, ironing, drying silk, lighting.
Leather—lighting, heating, power, drying, melting, softening, sealing and other processes.
Printing—melting stereo metal, drying matrices, drying photographs, preparing plates, lighting, power.
Food—bread, biscuit and pastry baking, canning, bottling and drying fruit, poultry farming (incubating, heating the brooder house, etc.), ripening bananas. Milk sterilising, pasteurising, churn and bottle-washing. Refrigeration.
Catering—cooking, fish frying, heating, water-heating, etc., in hotels, restaurants and boarding houses.
Fish Frying.
Varnishes, Paints and Lacquers—gum running, oil boiling, lacquer and enamel drying.
Theatres and Cinemas—heating, ventilation, generating electricity, lighting, catering.
Shops and Business Establishments—heating, lighting, water-heating, equipment for canteens and sports pavilions, baths.
Laundries—ironing, power, lighting.
Hospitals, Clinics, Dental Surgeries, Medical Societies, Institutions—heating, catering, water-heating, laundering, laboratory and dental workship equipment.
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Street Lighting—high and low-pressure gas lamps.
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For those who wish to place money with assurance of a secure return there is

NO MORE ATTRACTIVE INVESTMENT THAN

GAS STOCK

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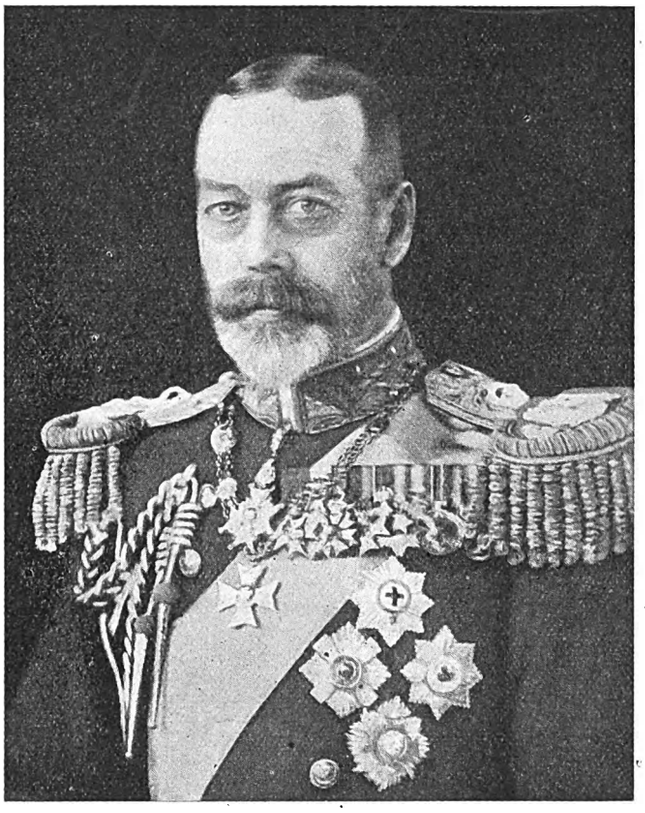
BENN BROTHERS LIMITED 1880-1930 JUBILEE HISTORY.

Fifty Years' Progress in Trade Journalism.

The ELECTRICIAN *and allied publications provide a history of British industry during fifty years of unprecedented development. The rise of gas and electric lighting, of aeronautics and of electrical engineering, are among the events recorded in their pages. The following outline of the firm's activities has been compiled by Mr. J. A. Benn.*

THE British Press is distinguished among all forms of private enterprise by the recognition that it is an essential public service. This special position has long been acknowledged in the Courts of Law, was repeatedly affirmed by the Government during the Great War, and is now graciously attested by the highest authority in the land. The King's message on the occasion of the Jubilee of Benn Brothers, Limited, expressing the hope that every success may attend the efforts of their publishing house for the development of British trade, is a landmark in the history of journalism. It gives the best of all sanctions to the claim of the trade journal to national status. The trade journal has taken far less time to reach maturity than either of the other main branches of journalism, the daily newspaper and the periodical review. Addison's SPECTATOR and Delane's TIMES had passed into the realm of legend before John Williams Benn founded the CABINET MAKER. Trade journalism was then in its infancy, eking out a precarious existence in comparative obscurity. Fifty years later the CABINET MAKER and a dozen other journals concerned with important British industries have taken their rightful place on the finest office site in Fleet Street, the acknowledged hub of the journalism of the world.

The first number of the first Benn journal was published ir July, 1880. Its founder and editor had for some years been designer to a firm of cabinet makers in the City Road, and had contributed a weekly article to a furnishing paper. A disagreement with the Editor on the policy of the articles spurred the contributor to found a journal of his own, and thus the House of Benn came into being. "The growth of an idea" was how the founder described its great expansion in later years.



H.M. KING GEORGE V

whose Jubilee Message to the Chairman of Benn Brothers, Ltd., expresses His Majesty's hope that "every success may attend the efforts of your publishing house for the development of British trade."

The biographer's practice of tracing continuity in a career is often more convenient than accurate, but in the case of John Benn it certainly happened that his earliest employment was selling newspapers. His father, the Revd. Julius Benn, led the hard life of an East End minister and took a newspaper shop to help support a large family. Young John did the round with the morning papers, until at the age of eleven he became office boy to a leather firm in Mincing Lane. His natural ability with the pencil already began to appear, for some portraits sketched on the borders of a sale catalogue were sufficiently life-like to bring him before the auctioneer, who warned the young clerk against poking fun at his seniors. And in 1866, at the Guildhall Industrial Exhibition, John was the youngest exhibitor and received an award for some prints of old coins, ingeniously executed with the aid of a copying press.

A few years later found him invoice clerk to the furnishing house of Lawes Randall and Company, and it was an ambition to outgrow this drudgery that led him to develop his taste for drawing. He soon noticed that designers were better paid and respected, and the candle in his bedroom was accordingly replaced by a paraffin lamp. "Between nine and eleven almost every night"—he wrote in some Memoirs—"I was trying to learn to draw. Twice a week I went to a South Kensington art school in order to get technical training, but I made most headway at home, and after six months got up my first sheet illustrating some of our leading lines in art furniture. I screwed up my courage and showed the sheet to the head of the firm. He looked at me for a moment—it seemed like five minutes to me—and then said: "You'll never draw, my boy; it isn't in you."

That was enough to *make* Benn draw, and before very long he was designing furniture for some of the smaller manufacturers. In 1868, at the age of 18, he was appointed draughtsman by his own employer, at a salary of twenty shillings a week. After further experiences, which included a free-lance journey through the country in the style of "John Williams Benn and Company, of Stepney Green, furniture designers to the trade," he was appointed junior partner in Lawes Randall and Company. As his acquaintance with furniture increased Benn became convinced that the industry had fallen into a rut and that the over-ornamental style of the Victorian productions must be abandoned for the classic beauty of the eighteenth-century designs. Ruskin and William Morris had been preaching similar ideas in regard to craftsmanship, and naturally enough the young partner, who owed his advancement to artistic ability, was already an ardent reformer. The obvious outlet for his ideas was the weekly article in the FURNITURE GAZETTE, but another view was taken by Dr. Dresser, the newly-appointed art editor, who already exercised a wide influence among manufacturers and was directly opposed to the Morris school. Benn was told that his contributions were no longer wanted. Once more the determination was roused that had prompted him to draw, and the outcome was a monthly paper of his own called the CABINET MAKER. The first number was issued at 5, Finsbury Square, from a room divided by a screen into editorial and business departments. It comprised sixteen foolscap pages and the price was sixpence. Of course the venture was regarded as ridiculous by John Benn's former partners—who thought him mad to give up a certain £500 a year, as by this time he had a wife and children to support. But the journal was no amateurish production. What distinguished it from the outset was a profusion of illustrations, the original issue of July, 1880, containing a six-page lithographic supplement. As the first leading article announced, the purpose was to provide "a pictorial record of the furniture of the day." It was to "supplement rather than supplant" the existing journal—actually the latter was soon to go out of business.

As his trade mark Benn designed a happy combination of the plane and the pencil, showing a carpenter at the bench and behind him the artist engaged on a design; underneath were the words from Shakespeare: "And work in their shirt, too;

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as myself." The productions of the pencil were valueless, Benn contended, unless they could be turned to account by the plane. Fifty years later this view has become so generally accepted that it is worth stressing how little favour it found in 1880. The furniture at the Royal Academy of that year, illustrated in the CABINET MAKER, is sufficient evidence of the popular taste, and in the hands of the Victorian manufacturer even the Chippendale style—"the most curious revival of this reproducing age"—was open to the charge of over-ornamentation. Not that all the original furniture was free of meaningless and useless ornament; but it was honest, simple and serviceable, and in essentials it harked back to the simplicity of early Queen Anne. The new journal evidently attracted attention, for not many weeks after the appearance of a rival, the editor who had rejected John Benn's ideas was hastening to assure his readers that "the rage for Queen Anne is over, so far as the educated portion of the community and the great west-end manufacturers" are concerned. And to the little group of workers in Finsbury Square it must have seemed as if he were right. Only those who went behind the editorial screen knew how precarious the position was, and seemed likely to remain. There was little enough demand for the new paper and it met with misfortune from the outset.

The First Issue.

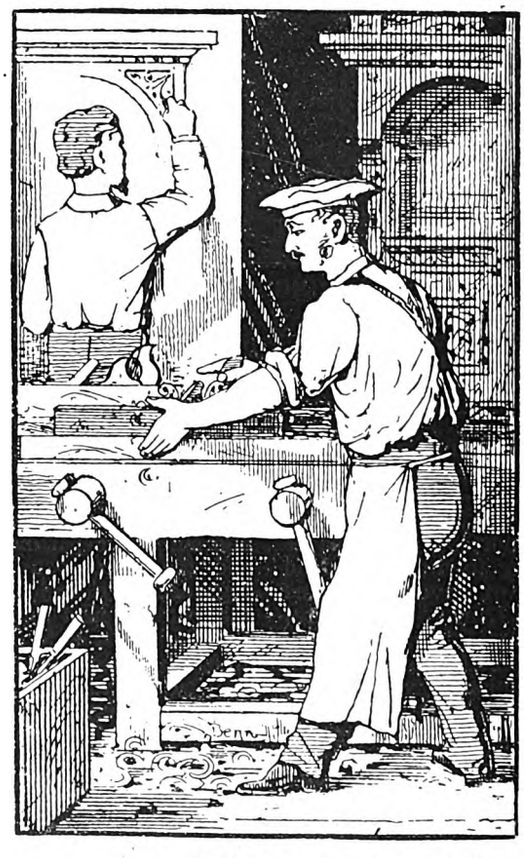
"The packing and posting of the first issue lives in my memory as a most anxious and exciting episode," writes Mr. Henry Benn, the one survivor of the original Benn brothers. "Upon the delivery of the copies from the printers, the whole staff, from the editor to the office boy, rolled up its sleeves and set to work for dear life pasting and wrapping for the post. An open one-horse van was subsequently requisitioned to take this first consignment to the General Post Office, for free distribution to the whole of the furnishing houses in the United Kingdom. On the way to the post office, owing to the doubtful stamina of the paste and the more rapid than efficient operations of the staff, many of the copies parted company with the wrappers and had to be taken back to the office for readjustment. The subsequent period of waiting for the return of subscription forms, as a nucleus of circulation, was an anxious time, and the arrival of the post was eagerly awaited. They came in at first all too slowly to evoke enthusiasm, and it required a stout heart to face those early days of fluctuating fortune and disappointment. All who had the privilege of working with the founder of the firm look back with wonder and admiration for 'the boss,' as he was affectionately though respectfully called; following his energetic lead was no light task, but his example was the inspiration of everyone on the staff. The strenuous experience of his own early years developed a feeling of sympathy and consideration for all who entered his service in after years, and a spirit of cameraderie was thus engendered which I think I may say has dominated the operations of the firm from the very first to the present time."

Paste was not the only cause of embarrassment; a subscription tout who drew commission on bogus orders was another trap which only experience could cure. But although it had to face innumerable difficulties and soon swallowed up the savings of the proprietor, the CABINET MAKER was already gaining ground within a few months of its appearance. The issue of October, 1880, was prefaced by a notice that the proprietors had been "compelled to reprint."

There were doubtless many acquaintances of the journeys which John Benn had made some years before as a furniture designer who welcomed the regular drawings in his new paper. Others came rapidly from the lectures which he now began to deliver in all parts of the country. Again his pencil stood him in good stead, for talks on Dickens, Cruickshank, and the characters of the London streets, were illustrated with blackboard sketches. Apart from the publicity which this new activity afforded, it certainly proved the means of financing the CABINET MAKER at its most difficult period. In 1885 John Benn fulfilled his thousandth engagement on the platform, while continuing to carry on the journal—which meant writing, drawing and canvassing advertisements during business hours, with often a long journey to follow for the evening's lecture. The fees he asked were sometimes ridiculously low, for he suited his demand to the purse of the audience. At a Baptist chapel in the Gray's Inn Road, for example, he charged a guinea, on the 8th December, 1886, and this was one of eleven lectures delivered in nineteen nights. The amazing energy involved is seen in true proportion from the fact that John Benn was now making £2,000 a year from his platform work. "My chalks," he wrote in after years, "formed the bridge which carried me over the turn of the tide in my journal's career." It was with good reason that forty years later Sir John included a pen and pencil in the arms which he designed for his family.

The rapid progress of the CABINET MAKER was recognised in 1881, when the editor was asked to contribute to the Official Catalogue of the first Furniture Trades Exhibition held in September. His review of past developments and future prospects remains a masterly summary of furnishing history and concludes with some lines which time has proved an accurate forecast of the success of the journal not less than of the exhibition. "Fashion in furniture," Benn wrote, "changes almost as rapidly now as fashion in dress, and he is a wise business man who scans the horizon to see what is likely to come along next. Some good houses, large and small, have gone to the wall in consequence of adhering too much to obsolete ideas and one great advantage of this exhibition is the opportunity it affords of judging the tendency of popular taste. . . . For those who strive to elevate the furnishing trades still further in the directions of art and excellence, there is plenty of scope and a prospect of good business."

Besides his brothers, Julius, Henry, and Robert, Benn's original staff included Mr. G. D. Smith, who is to-day one of the most successful exhibition managers in the country and largely responsible for the vast dimensions to which the Furniture Trades Exhibition has now grown. In 1884 the CABINET MAKER was officially entrusted with the artistic printing connected with the fourth exhibition, work for which it was particularly qualified by reason of having been the first trade paper to employ zinco engraving. It is further entitled to a place in Press history as the first journal of its class to take advantage of the Meisenbach process, which it promptly adopted to reproduce photographs of prominent members of the trade.



"And work in their shirt, too; as myself."—Shakespeare. The trade mark of the CABINET MAKER *in* 1880.

The move which Benn Brothers (J. W. Benn & Bros.) now made to larger offices at 42, City Road—the street in which the founder had obtained his first job in furnishing—was made the occasion of a permanent exhibition under the auspices of the journal. Up to this time the business had been housed in the original premises at 5, Finsbury Square, except for a temporary move to an adjoining address. The new accommodation included separate departments for printing, at 55 and 57, City Road, and anticipated to a remarkable extent the services which are provided at the firm's 1930 headquarters in Bouverie House.

The building was surmounted with a sign-board announcing "The Cabinet Makers' Exchange and Sample Rooms." Space was available to manufacturers for the display of new inventions, and there were facilities for writing and a reference library. Admittance was open to subscribers, who were presented for the purpose with members' tickets. A passage in the CABINET MAKER of May, 1885, explains the objects of the Exchange. The two hundred advertisers in the pages of the journal represented almost every branch of the trade. Numerous applications

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J. W. BENN AND BROTHERS

JOHN WILLIAMS BENN.

FINSBURY SQUARE 1880

JULIUS BENN.

All four brothers worked together in the publishing firm founded in 1880. Julius was responsible for the commercial side, Davis and Henry for the art department.

HENRY BENN.

R. DAVIS BENN.

J. W. Benn remained Chairman of the company until his death in 1922. The only survivor of the original team is Henry Benn, who retired from business four years ago.

for the display of samples had previously had to be refused, owing to limited accommodation, but now three well-lighted floors were available to advertisers, at a nominal charge, "for the display of any invention, novelty or material which has to do with furniture or cognate industries. We are not prepared to receive any ordinary furniture which is of common-place kind, because the exhibition will not be allowed to become, nor is it intended to be, a furniture shop or bazaar. . . . To steer clear of any semblance of 'going into business' and to show that our object is merely to establish a useful novelty medium between our buyers and sellers, we distinctly decline to accept any commission or consideration for orders which may be taken through the Exchange." Advertisers were further offered the publishers' assistance in distributing catalogues, booking orders, and in general supplying a complete service to the trade at the centre of the city furniture market. The Exchange was opened on the fifth anniversary, in July, large firms having already taken space, and for some years it was regularly used by manufacturers, especially visitors from the Provinces.

With the seventh volume, in 1886, the dimensions of the journal were enlarged, the original foolscap size being abandoned for the format in which the CABINET MAKER still appears in 1930. In September a serious fire at the printers' premises destroyed the complete stock of blocks and paper, none of them insured. But all this time John Benn was continuing to lecture, so maintaining the finances of his business. In 1893 the title page embodied the words "Five Journals in One." This statement heralded the change which was rapidly coming over the furnishing trade. Firms that had originally confined their production to cabinet making now opened departments for the sale of carpets, decorating materials and so forth, and the era of the giant furnishing "stores" was already in sight. In keeping with this growth and development, John Benn published regular sections on these new subjects, which he named respectively the Upholstery and Decorating Journal, the Carpet and Floor-covering Record, the Timber Yard and Woodworking Machinist, and the Furnishing Hardware Guide. In 1902 the comprehensive heading was adopted by which the journal has been known ever since—the CABINET MAKER AND COMPLETE HOUSE FURNISHER.

Art in Industry.

The improved taste which marks the English homes of to-day in contrast with those of the 'eighties is not due to the influence of small groups of craftsmen; the general level has been raised through the ordinary trade. What John Benn set out to do fifty years ago was to bring artistic ideas to the trade itself, in proving to manufacturers that the most profitable course for them lay in a return to the best English traditions of solid workmanship and good design. Some people may think that in his advocacy of the seventeenth and eighteenth century styles he was too successful, and that the modern trade devotes too much attention to reproductions. It can only be said that in the many articles he contributed to the CABINET MAKER Benn was never an advocate of slavish imitation. He had no patience with the *chinoiseries* of Chippendale and, as already stated, he often complained of the excessive ornament of this later work. What he did stress were the admirable proportions and solid workmanship of the earlier cabinet-makers. "It is well to bear in mind," Benn wrote, "that the mere reproduction of originals is bad; they should merely form the ground work of fresh thought and arrangement."

The significance of these views is recalled by Lord Waring, who was acquainted with Benn as early as 1875 and was among

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his oldest friends at the time of his death in 1922. Only those who can remember the furnishing trade as it was fifty years ago can fully appreciate the great change that has since occurred. Every small manufacturer was in those days his own designer, with the result that the poverty of designs only equalled the quantities of furniture produced. The public thinks of furnishing in terms of the great West End firms, but these are only representative of the vast size of the trade that is pursued in small factories all over the country. It was while Benn was travelling for Lawes Randall that he first met Lord Waring, who attended one of his earliest lectures in Liverpool and saw the "lightning sketches" for which he soon acquired a public reputation. "By emphasising the period styles in the pages of his new journal," Lord Waring states, "the late Sir John Benn performed a service that was of the greatest value in the era of development and expansion into which the furnishing trade was about to enter."

The Second Generation.

From the outset in 1880 the firm had witnessed the co-operation of four brothers. Eleven years later they were joined by a second generation of the family. In order to prepare his sons for business, John Benn sent them to Paris in 1888 to study art. In 1891 the eldest son (the present Chairman, Sir Ernest Benn) entered the business as office boy. At the age of seventeen he was transferred to the studio to learn to draw, but soon abandoned art for the commercial side of the enterprise. Before long the second son, Wedgwood Benn, joined the staff and for some time edited the CABINET MAKER in conjunction with Robert Davis Benn. In 1902 Wedgwood was adopted Liberal candidate for the St. George's division, and finally relinquished business for politics on his election to Parliament in 1906. Meanwhile he had made a business tour in South Africa and he also conducted another journal known as the HOUSE. For more than twenty years since his main interests have been political, and he was appointed Secretary of State for India in Mr. MacDonald's Government after the 1929 election.

42, CITY ROAD, E.C.
The offices of Benn Brothers half a century ago.

Mr. Ernest Benn, after working for six years on the road selling advertisement space for the CABINET MAKER, now took the first step in expanding the business which has since been under his direction for some thirty years. In December, 1899, the HARDWARE TRADE JOURNAL was put up for sale by its proprietors, Messrs. Hazell, Watson & Viney, who offered it to Benn Brothers. "If my father had acted as I imagine most fathers would have done," Ernest Benn confesses, "he would have bought the journal, added it to his own business, and reaped for himself the benefit of any profit that might be made, keeping the son, as so many are kept, in a subordinate position, to wait for dead men's shoes. That is the usual method of procedure. My father was built of different material." While allowing his son to continue to manage the CABINET MAKER, John Benn at once gave the HARDWARE TRADE JOURNAL into his sole control. At that time the new property had a total revenue of under £2,000 a year, barely sufficient to cover production costs and sometimes equalled, in 1930, by the income of a single issue.

Just as Sir Ernest thus acknowledges his debt to his father, so the founder of Benn Brothers, writing towards the end of his life, paid tribute to the son who from 1900 onwards proceeded to develop the business. "The CABINET MAKER," he said, "was the corner-stone but the bricks for the House that Benn built have been collected and well and truly laid by my eldest son." Probably only the Benn family circle and those who were connected with the business in the early part of the present century can realise to the full how well merited the praise was. As one of the "older generation" writes: "Strength of character and a purposeful resoluteness were needed to guide the destinies of the publishing firm to the sound and pre-eminent position that it occupies to-day. The difficulties that beset a young and growing business with only limited capital available continued to arise. They were all faced and overcome by Ernest Benn, who had the satisfaction of seeing the fruits of his energy in balance-sheets which showed steady improvement during the next thirty years. As the business grew, so he emerged more and more clearly as the dominating personality, whose daring tempered with sound judgment not only created fresh activities but developed and expanded those that already existed. . . . In this way the opportunity and the man found each other."

To the founder of the firm the co-operation of his sons was increasingly valuable, for in 1889 John Benn was elected to the first London County Council, and thereafter continued to devote the greater part of his time to public work. It was in connection with the inauguration of the tramway service that a Knighthood was conferred in 1905, followed by the Baronetcy with which Sir John was further honoured in 1914.

At the outset of his career the present Chairman of Benn Brothers had to repair a disastrous failure from which he "learnt more about the publishing business than ever before or since." The HOUSE—the publication in question—was also largely responsible for keeping John Benn on a very modest income. To begin with, some of his staff had left to start a rival paper, called FURNITURE AND DECORATION—now the FURNITURE RECORD—and he had promptly countered with a costly subsidiary to the CABINET MAKER, of more popular appeal, which ran for a few months only. This soon led to Benn's putting into practice a long-cherished idea, to provide a paper dealing with all the practical matters of home equipment. During the next four years in which the HOUSE was published, it anticipated nearly every aspect of such present-day successes as GOOD HOUSEKEEPING. Even the revolutionary departure was made of enlisting the services of women journalists, Miss E. I. Benn and Mrs. Holmes joining the staff to deal with the domestic arts. As events were to show, the magazine was before its time. Perhaps it was a trifle technical in its appeal, but in view of the enormous sale of its modern counterparts, the experiment remains of permanent interest. It was not alone among pioneer publications which Benn Brothers have issued and failed to establish.

The first number of the HOUSE appeared in March, 1897, as a sixpenny monthly "for those who manage and beautify the home." "There are now dozens of journals which have to do with the dressing and adornment of the body," the editor explained; "but, strange to say, there is not one dealing exclusively or specially with the dressing of the house. . . . If we find a welcome on the doorstep we shall take possession, and peer and poke into every corner of the domicile, from the kitchen to the roof, assuming indeed the rôle of friendly critic to the family." There were articles on furniture and china, needlework, pictures, and books, as well as "The Cook's Instructions," embodying specimen menus for the month. Silver, wallpaper and home carpentering were other features—altogether a decidedly ambitious scope for an entirely new departure in publishing. Some of the best drawings in its pages were those by Mr. W. C. Baldock, who from 1895 onwards worked with the firm for over thirty years. His skill had already shown itself in the zinco-engraving process, which involved drawing directly on to the metal plate used for reproduction.

"The Hardware Trade Journal."

As manager of the HOUSE, which after four years had to be pronounced a commercial failure, Ernest Benn came to recognise that catering for the general reader requires a distinct technique. Accordingly he determined that success depended on specialisation and for the next twenty years Benn Brothers confined their activities to the special class of publication with which the firm had started—the trade and technical journal.

While the CABINET MAKER was now paying its way and already foreshadowing its position of 1930, the fortunes of the HARDWARE TRADE JOURNAL began to be laid. The paper had been founded in 1874 as the circular of a big factoring house

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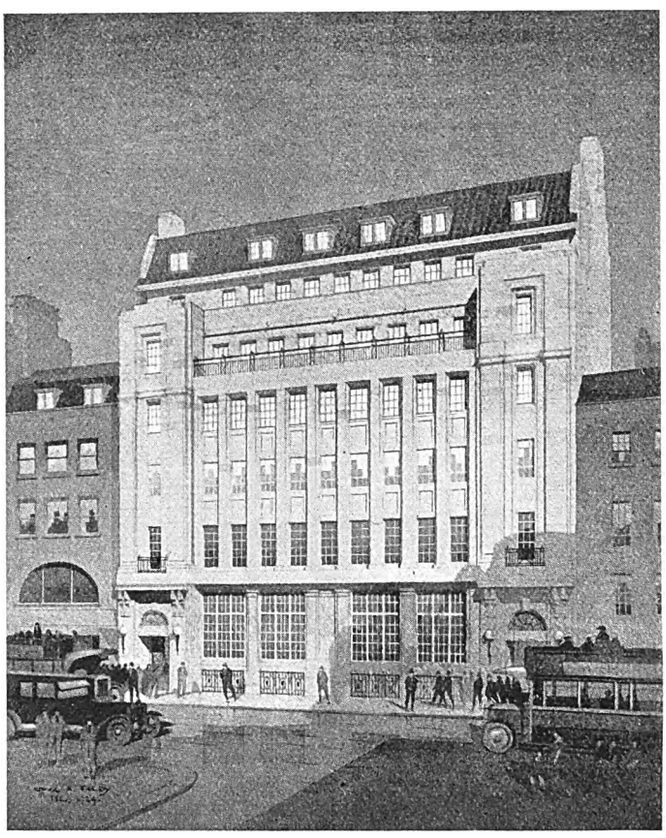
of those days, Martineau and Smith, before passing into the hands of Hazell, Watson & Viney. In December, 1899, Mr. F. J. Francis, for twenty years previously a sub-editor of the IRONMONGER, secured an option to purchase the smaller monthly, and brought the proposition to Benn Brothers.

The next steps forward in the history of the HARDWARE TRADE JOURNAL were the incorporation of IRONMONGERY in 1900 and the change from a monthly to a weekly issue in 1901—a practice that was adopted four years later for the CABINET MAKER also. From the wealth of incidents associated with the story of the second Benn journal, as of their other publications, one fact emerges as supremely important. The ideal of service that brought the journal into being has been responsible for its amazing growth, alike in size and influence. The desire of a single firm of hardware manufacturers to keep its customers regularly informed of its wares was limited, in contrast with the wider conception of disinterestedly serving one of the nation's biggest industries; but service was there just the same.

The single sheet that constituted the first issue in January, 1874, was followed next month by a number containing two illustrations—one of a coach wrench and the other of the "Scarborough" iron trunk. A paragraph published about this time makes curious reading half a century later. This was a description of "The New Game of Garden Tennis," which announced that four rackets, twelve balls, with portable poles, a net of 15 ft. by 4 ft. 6 in., with guard nets, hammer, cords, pins and book of rules, in case complete, could be acquired for the modest sum of £2 7s. 6d. In the year 1878 the journal gave space to the municipal gas exhibitions—"a decided novelty"—and interest was also roused by experiments with electric lighting which were evidently very diverse in results. Cheek by jowl with a paragraph to the effect that this innovation had proved "practically successful" at the reading room of the British Museum was another stating that the electric light at Billingsgate Market was a failure.



BOUVERIE HOUSE, FLEET STREET.
The 1930 offices of Benn Brothers, Ltd., and Associated Companies.

The Paris Exhibition, 1878.

John Benn once confessed that the idea of starting a paper of his own first took definite shape when he visited the Paris International Exhibition in 1878. It happened by a coincidence that another visitor to the same event represented the HARDWARE TRADE JOURNAL, which celebrated the occasion with an illustrated supplement. This special correspondent prefaced his report with a host of personal grievances respecting his treatment at the hands of the French, before he got down to the business in hand—the descriptive story of the Exhibition. The lot of the trade journalist provides experiences as interesting as are to be found in any career. A typical incident occurred to John Benn during one of the visits to foreign art galleries, reports of which soon became a feature of the CABINET MAKER. He had gone to Italy in search of material and was one day sketching some decorative items in the palace of King Bomba at Naples. "While thus innocently engaged," he afterwards wrote, "I found myself seized by an officer and marched off to the Bureau, charged, as far as I could understand, with making a plan of the place for military purposes. My book was taken from me and examined, but when the innocent nature of the contents was discovered it was returned and I was set at liberty. Some caricatures of Italian life, which greatly amused the curator, saved me. A few days afterwards, while sketching in the National Museum of Naples, I saw another soldier, more fierce looking than number one, approaching me, and at once concluded that he was on the same mission. I pocketed my book and proceeded to leave the apartment, but he got in front of me and offered me a piece of blue paper with some writing upon it. It looked so much like a summons that I promptly declined it in the best Italian I could command, but he persisted in offering it, so I took it from him. What was my surprise to see written thereon in a good round hand, in English, the following words: 'How is your aunt? Was she quite well when you last saw her?' etc. For a moment I could not understand why this dusky son of Mars should take such an interest in my estimable aunt. The mystery was soon explained. This soldier was very wisely employing his leisure, of which he had plenty, to learn English. Noticing my English appearance, he had applied to me for the correct pronunciation. I readily assisted him and in return he showed me some parts of that wonderful museum which I should not otherwise have seen."

On his foreign travels the Editor of the CABINET MAKER was usually accompanied by his brother, Mr. Henry Benn, who completed nearly fifty years' service with the firm before his retirement in 1926. For many years the artistic side of the journal was entirely in his control and in the course of his career he has published three books—"Characteristics of Old Furniture," "The Nation's Treasures" and "Style Schemes in Period House Furnishing."

Party politics have always been regarded as outside the sphere of trade journalism, but questions affecting the organisation of industry and the status of those engaged in its ranks were receiving attention as early as 1880. The files of the HARDWARE TRADE JOURNAL reveal that for the next ten years there was developing a keen interest in shop assistants and in the Ironmongers' Association movement, which began in April, 1879, when a few ironmongers met at Salisbury and unanimously decided to form an Association with the object of protecting the interests of the trade. Later, during the Royal Show week, a meeting was held at Anderton's Hotel in Fleet Street, London. Mr. Lindsey (who was then Editor) took a prominent part in ensuring the success of the early meetings, and striking testimony to the help received is found in a resolution passed by the Association, expressing its thanks to the proprietors "for their thoughtfulness in requesting the Editor of the HARDWARE TRADE JOURNAL to attend and report the proceedings, and especially for their generous offer to print and supply to the Association 5,000 copies of such report for distribution among the ironmongery trade throughout the country."

A few years later the HARDWARE TRADE JOURNAL took an active part in the formation of the National Hardware Association, at the time when Mr. Thomas Coates was editor. Later still the journal gave prominent attention to the Ironmongers' Federated Association, the national trade body that to this day continues to grow in influence and in membership.

Price Maintenance.

While discussing the interests of the retailer, a word may be said about a movement known as "price maintenance" in which the HARDWARE TRADE JOURNAL played a leading part about this time. Strange as it may sound to-day, the difficulty in the early part of the century was to get the shopkeeper to make sufficient profit and in some cases any profit at all. In his desire to serve his customers the tendency was to cut the price of an article to a point at which it was worth nobody's while to touch it. In self-defence manufacturers at length initiated "price maintenance," an endeavour to force merchants and retailers to preserve a fixed price in the selling of these articles. For a young and inexperienced publisher Ernest Benn did a very daring thing in this connection. A big firm of drapers in the provinces, with a reputation for price-cutting, bought quantities

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of hardware goods—branded lines that had been well advertised—and offered them to the public at prices less than the actual wholesale figures. On the principle of throwing a sprat to catch a mackerel, these drapers were by this means attracting custom to their drapery wares.

"I sought out a drapery expert," Sir Ernest writes, "and induced him to visit the various establishments of this great drapery firm and make purchases of smaller lines, not so well-known to the public and upon which the margin of profit or loss was not so obvious. My expert came back with a bunch of receipted bills and a bag full of drapery sundries—half a yard of veiling; a yard of delaine; a boy's shirt; a pair of braces; a pair of corsets; and, I think, some shoes. On each of these articles the drapers in question had made a profit which varied from 200 per cent. in the case of the corsets, to something over 700 per cent. in the case of the veiling. I published a series of articles explaining how these people were persuading the public that they were real agents of economy when, as a matter of fact, at the expense of my hardware manufacturers, they were securing exorbitant profits upon most of their own merchandise. It brought me very near to a law suit, but we made the most of it. We published double-column advertisements in the local newspapers, offering to subscribe £200 to the hospitals if our statements should prove unfounded." Another case occurred a year later, when the HARDWARE TRADE JOURNAL convicted one of its biggest advertisers of similar practices. The case cost the paper a good customer and lost advertising revenue it could ill afford, but it was good journalism and undoubtedly good service to the trade as well.

From 1900 onwards the management of the journal was undertaken by Mr. Ernest Benn, who also edited the paper personally for some years. In 1907 Mr. E. E. Starke was appointed manager, having entered the business some ten years before as office boy. When the writer of fiction takes a successful man of business as his hero he always makes him start in this junior position and the majority of readers, smiling indulgently, say that these things happen in books but not in real life. They happen, however, in Benn Brothers, for it was in response to an advertisement in the DAILY TELEGRAPH that Edgar Starke applied for the job at eight shillings a week, which started him on the ladder to his present position. A period of addressing wrappers and filling the office coal-scuttles was followed by work on subscriptions, which in turn led to his appointment as representative of the Benn Brothers' journals in the provinces. Very soon the results of his energy and initiative began to show, and when in 1907 he was given control of the HARDWARE TRADE JOURNAL's advertisement department, the foundations of its present success were laid. When the CHEMICAL AGE was founded in 1919 it was established on the business side by Mr. Starke, and his numerous activities led to his appointment as a director of Benn Brothers in 1923.

Daily Trade Papers.

The foundation of the Institute of Metals in 1908 was marked by a special extra issue of the HARDWARE TRADE JOURNAL, published on the day following the ordinary weekly issue. Hitherto the non-ferrous metal interests of Britain had possessed no central organisation, and this journal was the first trade publication to deal with the activities of the new body. The pages of that first issue contain articles by metallurgists whose names have since become world-famous—among them Walter Rosenhain, B.A. (now Director of Metallurgy at the National Physical Laboratory) and Professor Cecil Desch. A similar enterprise in the subsequent history of the journal was the publication of a daily issue, which before the war was undertaken during the Ironmongers' Federation Conference week, giving a full account of each day's proceedings, with sketches by its own artists. For many years illustrations, in particular of the "lighter side" of the hardware business, have been a prominent feature of the paper. A continuance of this policy was witnessed after the war, when the first page of weekly "news pictures" appeared in 1923 and has since been adopted by most of the leading trade papers. Credit for this last development is due to the enterprise of the present Editor, Mr. Norman French, who had a wide experience in the newspaper field before joining Benn Brothers in 1918. An interesting link with the firm had occurred many years before, when at the age of fifteen he was already sending paragraphs to the CABINET MAKER in such hours as he could spare from work as a junior reporter on the BRADFORD POST.

Perhaps the most striking indication of the position in recent years was the £1,000 prize—believed to be the biggest ever offered by the trade press—which the HARDWARE TRADE JOURNAL paid in 1924. The competition was designed to estimate the volume of the nation's business represented by hardware and was keenly competed for throughout the country. Retail ironmongers were invited to keep a record of their purchases from advertisers and others, from which it became clear that the hardware shops throughout the country were doing an annual business of not less than £80,000,000. In the attainment of this large turnover the hardware press can claim to play no small part, and the total serves to emphasise a point stressed before in this story—how large a share of the national trade budget is accounted for by the often despised "middle man."

Move to Larger Offices.

The twenty-fifth anniversary of the CABINET MAKER on July 1, 1905, was marked by conversion of the monthly into a weekly publication, the price being reduced from sixpence to one penny per copy. Already the journal had grown to substantial proportions, carrying more than fifty pages of advertisements. Some years before, the editorial staff had been joined by Mr. H. P. Shapland, who had a wide practical experience of furniture besides an architectural training. Until his retirement from the business in 1927, he continued to act as editor, introducing many vigorous ideas and generally developing the artistic side of the paper. In his wider capacity as a director of Benn Brothers, Mr. Shapland guided the editorial policy of all the journals, and his experience was also of invaluable aid during the building of the Company's latest premises—Bouverie House, Fleet Street. But that is to anticipate events, for we must here note the move which occurred in 1906, when the expansion of the business made it necessary to seek larger offices.

A site was purchased in Christopher Street, Finsbury, and a six-storey building erected that was to be the home of Benn Brothers for the next ten years. The firm moved in September, 1906. The autumn issue brought out that month created a record at the time as the largest periodical ever issued to the furnishing trade. The circulation was 10,000 copies. Special rooms in the new building were again available for readers, as had been the case at the City Road premises. The "Cabinet Maker Rendezvous" was opened on November 27 by Lord Monkswell. As a colleague of Sir John Benn on the London County Council, he took a keen interest in the trade, and when Chairman of the Council two years before had attended the inaugural dinner of the Furnishing Trades Provident and Benevolent Association. The need for this charity had been apparent for some time to leading members of the trade and its practical realisation was largely due to Mr. Sol Lebus and Mr. Samuel (now Lord) Waring. Only after repeated efforts was the necessary finance procured, the project being assisted through the columns of the CABINET MAKER. The enthusiastic support of the publishers has been continued throughout its first quarter-century. As the latest endeavour, in the spring of 1930, Benn Brothers' dramatic circle gave a performance at the Scala Theatre in aid of the Association's funds.

The close connection of the journal with this aspect of the trade has been maintained until the present time, and no one devoted more energy to its development than Mr. H. B. Crole-Rees, who was appointed manager in 1911. From the moment of joining the staff of Benn Brothers in 1909, when he sold advertisement space for the EXPORT WORLD, H. B. Crole-Rees has been tireless in his enthusiasm for everything connected with the Company, while establishing intimate friendships with members of the furnishing trade and in advertising circles generally. At the Olympia exhibitions since the War, the successful conduct of Benn Brothers' interests has rested mainly with Mr. Crole-Rees, and at the 1929 International Advertising Convention held in Berlin he represented the firm in conjunction with Sir Ernest Benn. It was no surprise to the staff when "C.-R."—as he is affectionally called—was appointed a Director in 1925. The management of the CABINET MAKER is now in the able hands of Mr. N. B. Mellor. The Editor, Captain E. W. Gregory, has had an unusually wide experience of the trade and was for some years in charge of the FURNITURE TRADE ORGANISER. His artistic abilities are not confined to cabinet-making, and high prices are paid for the water-colour drawings which he occasionally exhibits.

After Sir John Benn's election to the L.C.C., the direction of business was left mainly to his brother Julius. Davis and Henry also were actively engaged in editorial work, with Mr. Ernest Benn responsible for the commercial side. Early in May, 1907, the original "team" of Benn Brothers was impaired by the death of Davis Benn, at the early age of thirty-seven. In his brief career he had acquired a reputation in art that extended beyond the sphere of trade journalism. A book which Messrs. Longmans Green commissioned him to write became a

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standard work on "Style in Furniture" and at once established him as an expert in this subject. Davis also acquired considerable ability at the piano and for some years assisted John Benn in his professional lectures.

"The Export World."

Having successfully established two papers and failed with a third, Benn Brothers next founded the EXPORT WORLD, in 1907. The principal paper in the field at that time was the BRITISH TRADE JOURNAL (now amalgamated with the EXPORT WORLD), but there was ample scope for the new monthly, which soon became widely known as the "shop window of British commerce." Encouraged by this experience, the publishers followed it by another important endeavour in the interests of overseas trade. The ideal method of advertising British goods in foreign countries was to do so in the local language, and accordingly the publication was commenced in Buenos Ayres of a monthly journal, printed in Spanish, with the title EL COMERCIANTE ARGENTINO. In this connection Sir John Benn visited the Argentine in 1910, where he was received as a guest of the Republic. A wonderful opportunity was afforded to secure an insight into the fundamentals of South American commerce. Accompanied by Lady Benn, he visited all the principal centres from Buenos Ayres to Valparaiso. Some years later this Spanish journal had to be discontinued owing to the War, but in the short period of its existence it established claims to being the most successful publication of its kind ever produced. The enterprise has its modern counterpart in the Spanish edition of the BRITISH TRADE JOURNAL, with the distinction that this is printed in London and afterwards distributed abroad. A similar idea in regard to the Chinese market was in contemplation when war broke out, and it may possibly be revived among the future endeavours of the publishers. In 1912 the EXPORT WORLD was strengthened by the acquisition of COMMERCIAL INTELLIGENCE. Benn Brothers had already added to their foreign connections by acting as agents for INTERNATIONAL MARINE ENGINEERING. This journal was published in New York, and naturally the War made its discontinuance necessary so far as the London end was concerned.

CAPTAIN OLIVER BENN.
Before the war Manchester representative of Benn Brothers, Ltd.; killed in Gallipoli, June, 1915

Everyone remembers the slogan which made its appearance on the outbreak of war. Once it was seen that the nation was in for a prolonged struggle, "Business as usual" appeared in every shop window, traders realising that renewed efforts must be made if supplies were to be maintained. This duty in the new emergency was promptly recognised by the CABINET MAKER, which in a leading article of August 15, 1914, named among the King's Enemies not only those who hoarded gold and food but "the employer who discharges a man except from the direct necessity, the man who does anything to disturb the normal condition of business, the man who thinks of his profits before his country, the man who needlessly cancels a contract." Though itself already reduced in size, the journal ten days later came out with the headline "Capture German Trade," over an article urging British manufacturers to tackle in particular the carpet trade. Full details were published of the exports of carpets, rugs, etc., from Germany and Austria-Hungary to the neutral markets of the world, coupled with the slogan "Fight the Enemy from your Office Desk." In pursuance of this plan, a German Trade Register was initiated in September, merchants being invited to send the Editor confidential particulars of goods previously bought from the hostile powers, also of sales made abroad and now available for British markets. The information was registered by the journal and used to effect introductions, thus retaining within the country the import and export trade hitherto carried on with Germany.

Normal trade operations became increasingly restricted, but business men as a whole were slow to admit that the War would be of long duration. Once again the initiative rested with the trade journals, which foresaw the need for adapting factories to military requirements. Among the first steps in this direction were the special Aircraft Issues published by the CABINET MAKER. A huge demand for aeroplanes had suddenly been created and could only be satisfied by every available woodworking plant being converted for their manufacture. Raw materials for domestic products were strictly controlled and supplies diverted for the production of propellors, wing-frames and other aeroplane parts. Twice a month, from early in 1915, the journal devoted its pages to the new subject and this information was of great service to the "mobilised" industry.

Long before conscription came into force, the staff of Benn Brothers was already diminishing in numbers. Mr. Oliver Benn, the youngest son of Sir John, who for some years had represented the firm in Lancashire, was among the earliest to enlist, having already obtained a commission in the Territorial Army. Another director, Mr. C. E. Hughes, joined the East Indies and Egypt Seaplane Squadron, of which he has written the history under the title "Above and Beyond Palestine." Very soon many principal posts were vacated and came again under the personal control of Sir John Benn, who resumed active work in the business. While remaining Chairman, he had previously left its direction to Mr. Ernest Benn, who now gave part of his time to work at the Ministry of Munitions.

Many casualties in the ranks of the firm occurred in the next few years. None was more keenly felt by the staff as a whole than the loss of "Mr. Oliver," who was reported missing in Gallipoli in the spring of 1915. For two years the family made exhaustive enquiries but without definite news, and it then became necessary to assume his death, which had occurred at the early age of 28. From boyhood he had good health, but in 1911-12 he was obliged to winter in Switzerland. On the outbreak of war he at once attempted to join the Army, but the doctors declared him unfit and he was thus kept in civil life for a few weeks. But nothing could dissuade him from repeated efforts to join up, and in October, 1914, he was gazetted to the 9th Somerset Light Infantry. Previous military experience in the 7th Manchesters proved useful to him, and he soon secured his third star.

Early in 1915 a draft of officers was required for Gallipoli and, with a dozen others, only one of whom has returned, he set sail from Plymouth on May 10. On May 29 he arrived at the Peninsula, and was given command of the X Company of the 1st Essex Regiment. Within a week he led an attack on trenches in front of Achi Baba, and on the night of June 5-6 was reported missing. The Company lost three captains in a fortnight, and Oliver Benn was one of them. It is therefore not surprising that no authentic details are available of the manner of his death. Survivors of the battle who were traced in hospitals in England and in Egypt gave varying stories, but all agree on one point, that he led his men into action with a fearlessness and cheer worthy of the "regulars" whom he had the honour of commanding.

Advertising the Army.

"Oliver Benn was one of the keenest of men," a colleague wrote. "He gave of his best in whatever he undertook; nothing could daunt or discourage him. It will be hard to find his equal as an advertising man. He was a keen yachtsman, and some years ago in company with his brother Wedgwood, he cruised across the North Sea in a seven-ton smack. As showing his love for the Army, a circumstance should be recorded which is of special interest in view of later developments. Two years before the War he prepared a memorandum on 'Advertising the Army' in which he argued that the Territorial Force could be enlarged and encouraged by this means. The document was submitted to his superiors in the Manchester Regiment and to other authorities, but in those days it was considered unthinkable that the War Office could descend to advertising. Most of his ideas were afterwards adopted in the famous recruiting campaign for 'Kitchener's Army.'"

As the War progressed, Benn Brothers had to face an

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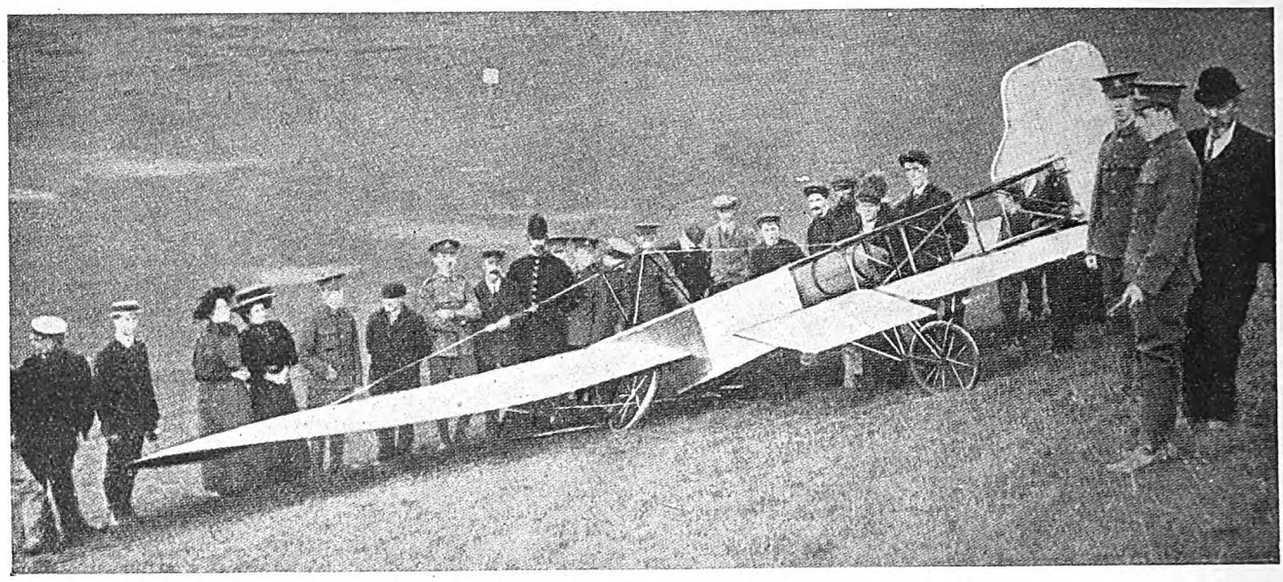

Bleriot's machine as it appeared on landing in the field behind Dover Castle, after the first cross-Channel flight, July 25, 1909. (Photograph reproduced from AERONAUTICS, *August,* 1909.)

increasing shortage of staff in common with other businesses. It was not surprising that the opportunity soon arose to acquire some smaller publications that were experiencing even greater difficulties. The first of these was a pioneer flying paper known as AERONAUTICS, founded in 1907 and first edited by Major B. Baden Powell and Mr. J. H. Ledeboer. The journal had been started two years before the first flight over the Channel and was devoted from the outset to the technical aspects of aviation. Gradually it grew from a monthly of slim proportions to an established weekly and it was among the few publications that received an immediate benefit from the War. No science developed so rapidly as aeronautics and many experts hitherto regarded with mild amusement on account of their eccentric hobby, at once found their value recognised.

The First Hundred Aviators.

The copyright of AERONAUTICS was acquired by Benn Brothers in 1917, and the most important event in its history occurred in July, 1920, when a dinner was organised to the first hundred British aviators and pioneers of British aviation. When the plan to hold the function was announced it met with such an immediate and widespread response that a committee of hosts was formed, which included Lord Desborough, Major-General Seely, Sir Charles (now Lord) Wakefield, Mr. Ernest Benn and the Editor, Major C. C. Turner. The pioneer character of the journal made it well fitted to organise this function, and another qualification existed in the presence on its staff of Major Blake, the first Englishman to fly round the world. The principal guest was the Duke of York, himself an experienced pilot.

The speakers at the banquet included Mr. H. G. Wells, whose claim to pay tribute to the pioneers of flying was that he had advocated the aeroplane and the airship in his writings over a quarter of a century before. An eloquent tribute was paid in this speech to the international value of aviation, Mr. Wells expressing the view that flying had gained all it would ever get out of war and that its future progress rested entirely on the peaceful development of air routes throughout the world. Captain Wedgwood Benn, D.S.O., D.F.C., supported this prophesy. "No doubt," he said, "incredible things were achieved under the urgent incentive of war, but I think we should utterly lack perspective if we regarded the work of the pioneers of aviation merely as a preparation for that or for any war. Flying annihilates space and is the greatest civilising agent that has ever been known."

AERONAUTICS continued to flourish during the period when flying was gradually passing out of the control of the Government into private hands. But with the return to peace, the demand for aeroplanes diminished rapidly, and the journal was among the first enterprises to feel these effects. Had its pages catered for purely popular flying the position might have been otherwise, but the purpose had been from the outset to provide a technical review. In 1921 AERONAUTICS ceased publication as a separate entity and was amalgamated with the EXPORT WORLD.

Another enterprise acquired by Benn Brothers in 1917 was the ELECTRICIAN Printing and Publishing Company, which besides the journal of that name issued the FRUIT GROWER. The printing business was separately disposed of and the two papers added to Benn Brothers' list.

Although dealing with a science which is generally regarded as a new one, the ELECTRICIAN was founded in 1861, and is thus the oldest of the trade and technical papers published by Benn Brothers. An early proprietor was Sir John Pender, and the first issues were edited by Mr. Desmond Fitzgerald. At that time application of electricity was practically confined to telegraphy, the first efficient submarine telegraph cable having been laid between Dover and Calais in 1851. No celebration in the life of a journal connected with electrical science would be complete without mentioning the name of Faraday. In 1861 Faraday was still living, though his great work on electromagnetism had been done some thirty years before, and he was at that time enjoying an honourable retirement. It is a matter of interest and congratulation that he was an early contributor, and special attention may be drawn to an article from his pen on "Electrical Illumination for Lighthouses," which appeared in the issue of August 22, 1862. There are now few lighthouses that are not electrically lighted.

This first series of the ELECTRICIAN ended in May, 1864, and a new series was commenced in May, 1878, when electric lighting provided a more extended field for journalistic enterprise than was available during the former life of the paper. The telephone was also coming into use at this time, and the invention and development of these two important aids to the conduct of affairs coincides with the Jubilee period of Benn Brothers. It was nearly thirty years after the establishment of the journal before that great expansion in the use of electric power for the propulsion of tramcars and the operation of electric railways took place, a growth which has continued on an increasing scale ever since.

An Editor's Foresight.

The earlier editors deserve commendation for their foresight in recognising the prospective value of theoretical papers, which were destined to become of great practical value in after-years. An instance of this was the publication of Mr. Oliver Heaviside's long series of articles on "Electromagnetic Theory," which was not dealt with in any other publication at the time. Actually it was to prove of invaluable application in the era of telephony and electric power transmission about to begin. For all practical purposes, the theory had been scoffed at by the electrical authorities of his time, including no less a person than Sir William Preece, for many years chief telegraphic engineer to the Post Office. The main subject on which the fame of Heaviside rests, and which aroused bitter controversy, was his development of the theory of cable signalling. This theory was begun by Lord Kelvin, whose work had rendered possible the Atlantic Cable of 1865, after the failure of the 1858 cable, but it was incomplete. It remained for Heaviside to recast and remodel the theory in a more general form. Briefly, he

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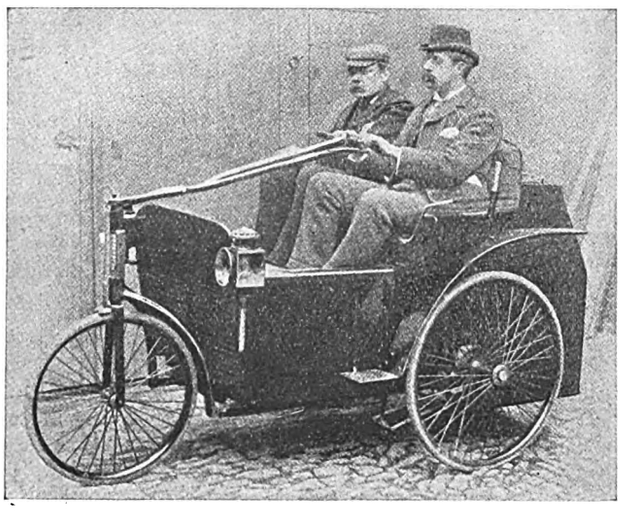
showed that the laws governing propagation of signals along wires were in many essential respects identical with the laws for electric waves in free space, thus paving the way for long-distance and wireless telephony.

In the period of his adversity, Heaviside found a staunch friend in C. H. W. Biggs, then editor of the ELECTRICIAN. Like every genuis, Heaviside was apt to exhibit idiosyncrasies. He had almost a passion for having his work published exactly as it was written, and he once went so far as to say that experience had taught him that "the refusal of a paper by any journal, for unconvincing conventional reasons, implies that the paper is unusually original and good." He was undoubtedly a "difficult" contributor, and the editor's recognition of his work was all the more creditable. In the opinion of Mr. Rollo Appleyard (author of "Pioneers of Electrical Communication"), the stalwart support of Heaviside by Biggs—amidst strife, satire and probable financial loss—remains the finest action to the credit of technical literature in our time. It ought also to be recorded that it was in the pages of this journal that Heaviside introduced and built up the new terminology needed for the development of his epoch-making theory.

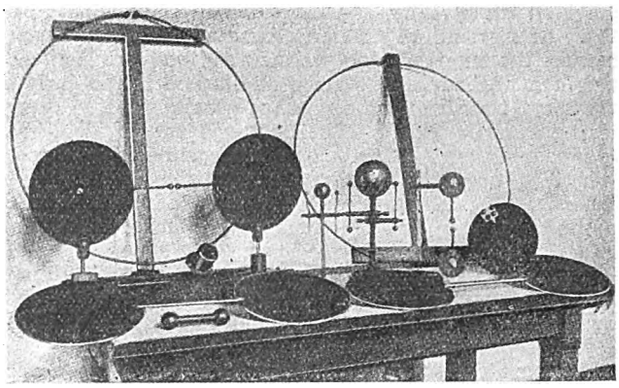
Among other notable contributions published in the early volumes of the ELECTRICIAN was Dr. (now Sir) Oliver Lodge's "Signalling across Space without Wires." This pioneer treatise was first issued in 1894 under the title "The Work of Hertz and his Successors," and it comprised the lecture given by the author before the Royal Institution on June 1 of that year. The subject was further developed a few months later at Oxford, at the annual meeting of the British Association, when Dr. Lodge gave the first public demonstration of wireless telegraphy. In the amazing progress of subsequent years, when the subject was taken up on a commercial scale by Marconi, it was the ELECTRICIAN that once more championed a pioneer inventor. In the issue of September 17, 1897, an abstract of the Patent Specification granted that year to Marconi was followed by a note drawing attention to the earlier work in England.

"In connection with the patent of Signor Marconi," the Editor stated, "we are able to present our readers with two illustrations taken from photographs of some Hertzian-wave apparatus shown by Dr. Lodge at the Oxford meeting of the British Association in 1894. . . . In fact, Dr. Lodge published enough three years ago to enable the most simple-minded 'practician' to compound a system of practical telegraphy without deviating a single hair's-breadth from Lodgian methods. Both at Oxford and at the Royal Institution, Dr. Lodge described and exhibited publicly in operation a combination of sending and receiving apparatus constituting a system of telegraphy substantially the same as that now claimed in the patent we have referred to.

"It is reputed to be easy enough for a clever lawyer to drive a coach and four through an Act of Parliament. If this patent be upheld in the courts of law it will be seen that it is equally easy for an eminent patent-counsel to compile a valid patent from the publicly described and exhibited products of another man's brain. No longer is it necessary to devise even so much as 'a novel combination of old instrumentalities,' and the saying



"New Machinery," 1896. *With this title, the above picture of the new "horseless carriage" appeared in the* BRITISH TRADE JOURNAL. *Its maximum speed was* 13 *miles per hour.*



Some of the apparatus used for the first wireless demonstration by Sir Oliver Lodge at Oxford in 1894, *photographed by the* ELECTRICIAN.

ex nihilo nihil fit evidently was not intended to apply to English patents at the end of the nineteenth century."

In reprinting these paragraphs it is not intended to revive the controversy that was settled by Marconi's acquisition of the Lodge patent in 1911. But the facts emphasise the important part played by the trade press in the story of scientific invention. The publication of technical research continues to be an important plank in the policy of the paper, which is now edited by Mr. G. H. Lepper and managed by Mr. R. D. Savage. Both men have had practical experience in the electrical industry, as well as in journalism. The Editor was for some years attached to telephone companies in the United States, and in South Africa, and served in the signals branch of the Royal Engineers during the War.

In a recent message of congratulation to the publishers, Mr. Thomas Edison said that notwithstanding the marvellous progress of the past half-century "we have only just stepped over the threshold and are entering into still more wonderful developments beyond the scope of prediction. The grateful thanks and appreciation of those interested are due to the ELECTRICIAN for the faithful service it has rendered during all these years, and I trust its days may be prolonged to record the ever onward progress of electrical science and industry."

Transport Problems.

As has been noted, the Electrician Publishing Company was also responsible for a second journal at the time when its interests were acquired by Benn Brothers. This was the FRUIT GROWER, which had been established in 1895 under the title of the GREENGROCER, FRUITERER AND MARKET GARDENER. The nearest approach to a periodical of this kind has been the HORTICULTURAL TIMES, which did not profess to be a trade journal in the full sense of the term and was closed down about the year 1891. In the trades embraced by the new journal there were "probably more persons employed than in any other group of businesses in the country." That this original claim was scarcely exaggerated is evident when it is remembered that the publication embraced commercial agriculture and all the interests, both wholesale and retail, concerned in the distribution of produce to the general public.

The FRUIT GROWER was not merely concerned with things as they were. It kept a shrewd lookout for beneficial innovations. In 1896, when motoring was in its infancy, the journal predicted the supreme value of motor transport, and published a series of articles on its application to agriculture. The development of long distance carriage brought into prominence the question of cold storage facilities on board ship. Again the details published in the technical press went far to develop this new transport from all parts of the world. The "compression" system of cooling now in general use was first applied commercially in 1880, when the *Strathleven* brought a small cargo of frozen meat to this country from Australia, but the transport of fruit raised entirely new problems. It was not until 1901 that the *Port Morant* brought her first cargo of cold stored bananas from the West Indies. As recently as 1922, about one quarter of the 2,000,000 cases of apples shipped from Australia reached England in a damaged condition. This experience was mainly responsible for the extensive study since made at the Low Temperature Research Station at Cambridge. The subsequent progress in this branch of industry is evident from the increasing range of overseas fruits that now find their way on to the British home market at all seasons of the year.

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The kind of advisory assistance which is now part of the Ministry of Agriculture's technical and educational scheme for promoting the interests and welfare of food production, had its origin in the advisory service established in the early days of the journal and is continued at the present time. Answers to correspondents in regard to horticultural and legal difficulties were supplemented by a pathological department, to which any grower who found his plants affected by disease could send specimens for examination. This service commenced with the appointment of Mr. W. F. Emptage as technical adviser, a position he retained until he assumed the general editorship. The success attending these efforts was so great that personal advice was requested from all parts of the United Kingdom. The visiting of markets was accordingly undertaken by Mr. W. Vestey, who has since become manager of the journal. It may be added that the staff in recent years has travelled abroad extensively, the countries visited including France, Holland, Belgium, Denmark, Algeria, Morocco and Spain.

War Food Campaign.

The Great War proved a searching time for the FRUIT GROWER, since the industries it serves were virtually nationalised. It continued to appear, however, and in 1917 on the death of its proprietor, Mr. W. Tucker, the journal passed into the hands of Benn Brothers. The new imprint was used on March 22, 1917, and a year later Mr. Herbert Wardle was appointed editor on Mr. Emptage's retirement. In February, 1918, when the need for increased home production of foodstuffs was an urgent problem, a Food Production Number was published, which comprised 104 pages and was by far the largest trade paper enterprise ever attempted, up to that time, on behalf of the fruit and vegetable industry. A letter of commendation was printed from the late Lord Rhondda, then Food Controller. On another occasion Mr. Lloyd George, as Prime Minister, contributed an autographed appeal for increased production, as part of the national food campaign.

Throughout its career the journal has taken every opportunity of advocating the better organisation of the industry. The London and Home Counties Retail Fruiterers' Association was first suggested by Mr. Vestey, and the scheme for its organisation drawn up in conjunction with Mr. Frank Mash. Later on, the formation of the Fruiterers' and Florists' Benevolent Fund was also initiated by Mr. Vestey, and with the valuable help of Mr. John Poupart was carried through successfully.

In 1920 the FRUIT GROWER published its first Empire Trade Number, anticipating by a year the first Imperial Fruit Show of 1921. An article on the three provincial shows urged that the reputation and prosperity of the industry would gain immensely by a national show. Since 1927 the paper has been even more closely identified with the Imperial Fruit Show by means of "Grower's Day," financed by the proprietors and originated by the enterprise of the editor. This annual function comprises two conferences and a luncheon, and has increased in importance in both aspects, the guests having grown in two years from 80 to 350.

To Bouverie Street.

In the restricted conditions of personnel in 1917, a third publishing concern joined forces with Benn Brothers. This was John Allan & Co., the proprietors of the GAS WORLD. The offices of this old-established journal were located at 6-8, Bouverie Street, where further space was available in the building owned by the NEWS OF THE WORLD. As the premises at Christopher Street were no longer large enough, Benn Brothers accordingly moved their original publications to this new address.

In thus introducing the trade and technical press into the heart of the newspaper area, it was anticipating by a few years the next big step, when the firm built its own premises on the most prominent site in Fleet Street. That belongs to a later part of this story but the remarkable rise in the status of the trade journal in recent years may be remarked here. Before the war the journalist's profession was generally regarded as among the least reputable—witness how in plays the reporter is made to vie in ridicule with the policeman. Among the members of the press themselves, the most humbly regarded were those connected with trade papers. Why such an attitude was adopted it is difficult to say, since those engaged in technical work deal with highly specialised matters, of more rather than less ultimate value to the community than much of the material in the daily press. Probably its origin was connected with the contempt, until comparatively recent years attached to everything to do with "trade," in contrast with professional occupations. However that may be, a significant change has come about since the War, and among the factors contributing to the improved status of the trade paper, Benn Brothers' move to Fleet Street may claim a predominant place.

A Pioneer Development.

A passage from the CABINET MAKER of April 7, 1917, shows that the move was consciously a pioneer development. Some opening notes on the associations of Fleet Street remarked that the histories written about it record many failures as well as brilliant successes. "We frankly confess that if we were newcomers to the newspaper world we should regard our entry into the Fleet Street area as a very risky adventure indeed at the present time. But as our readers know, the position is otherwise. . . . Development is the reason for our change of address. We hold the view that trade journalism of the future must of necessity be of greater importance and assistance to the trading community than it has been in the past, and no effort to this end will be spared by us at No. 8 Bouverie Street. The developments noted above are naturally a source of strength. From the point of view of readers, the benefit accruing therefrom can hardly be calculated—a publishing house of such dimensions enjoys facilities which a single journal, working a lone furrow, cannot hope to obtain." The article might have added that the original trade papers of 1880, whatever may have been their quality from the trade point of view, cannot be considered as serious publishing propositions in the modern sense of the term.

Looking back on their history it will be noticed that they were in the control of men who, while able to claim some knowledge of the trade they were concerned with, knew for the most part nothing about the trade of publishing. Students of these matters may be a little puzzled on studying Benn Brothers' present list to notice that no two papers have very much in common from the trade point of view. The secret of the firm's success is that they recognised early the need for publishing knowledge as well as technical knowledge. They are primarily publishers and are thus able to put at the back of a trade paper the expert machinery of a large organisation. The technical excellence of the old paper remains, and is able to develop in a way which would be impossible without the strength of adequate publishing arrangements.

In the twelve years since Benn Brothers moved to Fleet Street, not only has trade journalism ceased to be regarded as the "poor relation" of the daily press but prominent figures in the latter field have actually abandoned it in favour of trade and technical publishing. For some time past the staff of Benn Brothers has been considerably strengthened in this way, and without naming particular instances, it may be safely asserted that certain leading editors who adopted this course have done so with advantage to themselves and to the firm they serve.

One of the latest recruits in this matter is the present deputy-chairman of Benn Brothers, Mr. Gordon Robbins, who resigned an important position on THE TIMES to take up his present occupation. The eldest son of Sir Alfred Robbins, he entered journalism on leaving the City of London School, and on his twenty-first birthday was already in charge of the Leeds office of the YORKSHIRE OBSERVER with four reporters under him. In 1906 a bigger opening occurred on the TRIBUNE and was soon followed by an appointment to THE TIMES, with which newspaper he was connected for over twenty years before joining Benn Brothers. During this period Mr. Robbins had a unique experience in all branches of this leading national newspaper and before he was appointed Day-Editor by Lord Northcliffe, he had worked side by side with his father as Lobby Correspondent in the House of Commons. The esteem in which he is held by everyone at Bouverie House may be best expressed in the words of the Editor of THE TIMES, who in making a presentation to Mr. Robbins on behalf of his colleagues, said that Sir Ernest Benn was "wise and fortunate" in adding to his board a distinguished member of a distinguished Fleet Street family.

"The Gas World."

Without any great stretch of the imagination the GAS WORLD may be said to have originated in a little general printing shop in the Grassmarket, Edinburgh, beneath the shadow of Edinburgh Castle. From that little printing shop the late John Allan, the founder of the journal, issued in the 'seventies a little weekly called LIGHT, which dealt mainly with Scottish gas affairs. Perhaps Allan was attracted to the subject by his intimate friendship with William Young, for many years the

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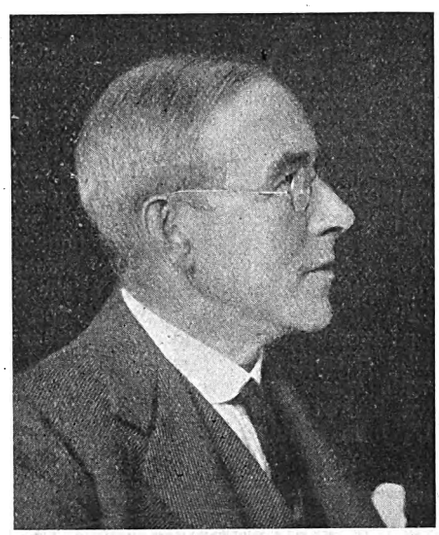
DIRECTORS OF BENN BROTHERS, LIMITED.

H. B. CROLE-REES.
Managing Director.



SIR ERNEST BENN.
Chairman.

GORDON ROBBINS.
Deputy-Chairman.

C. E. HUGHES.

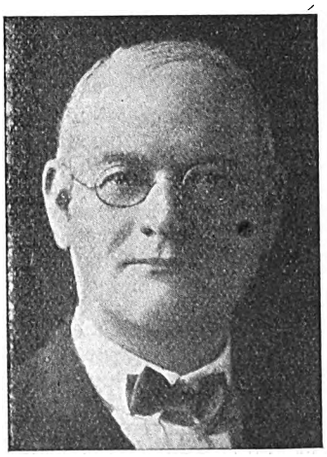
E. E. STARKE.

J. A. BENN.

A. R. PAIN.

E. G. BENN.

FLORENCE ROBINSON.



F. E. HAMER.

K. E. HUGHES.
(*Ernest Benn, Ltd.*)

Benn Brothers, Ltd., is fortunate in having a Board consisting entirely of working directors who give their whole time to the business. The third generation of Benns is now represented on the Board, which has set a precedent in Fleet Street by electing its first woman member.

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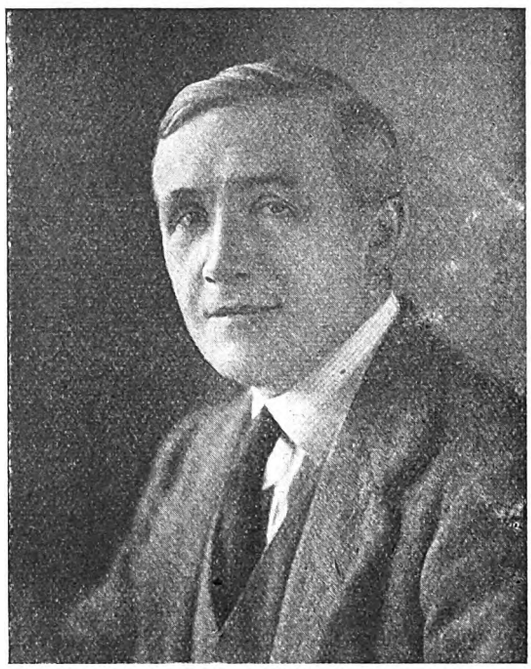
grand old man of the Scottish gas industry, and to whose memory the North British Association of Gas Managers have founded an annual lecture. Perhaps, too, he found in it relaxation from the somewhat dreary work of reporting law cases in the Court of Session for a Scottish daily newspaper. The journal was short-lived but later Allan found an opportunity to embark upon gas journalism on a wider scale, and in 1884 he came to London and founded GAS AND WATER, the direct forerunner of the present-day GAS WORLD. Offices were taken in Crane Court, off Fleet Street, nearby the house of the Scottish Corporation. At one time it seemed likely that the staff would be obliged to fall back upon this charitable institution, but the storm was weathered, and eventually there developed a robust and growing journal. Gas and water were probably associated in the title because some companies supplied both materials, but after two years' existence it was decided to drop the latter and to devote exclusive attention to gas supply and gas uses. The title was then altered to its present form, and the GAS WORLD appeared. When Mr. Allan died in 1894 the journal was taken over by a private partnership, the principal partners being two of his journalistic friends, Mr. James Stewart and Mr. John Douglas, with whom was associated Mr. E. P. Haslam, a well known figure in the advertising world. At the beginning of 1917, John Allan & Co., as the proprietors continued to be styled, amalgamated with Benn Brothers.

Forty years ago trade and technical journalism was a somewhat stodgy and slow affair. If a meeting was held on a Wednesday, readers of any particular journal had often to wait until the next Saturday week for a report. If a conference extended over two or three days the reports in the trade journals took the form of a serial in a weekly paper, the only difference being that the break was not so abrupt as in the serial novel. Nevertheless, the method was equally tantalising. The reader interested in a big conference early in the summer did not get to the end of it until late in the autumn. The GAS WORLD started out to alter this. Perhaps it was the first trade journal to make use of telegraphy to report a meeting, as was done for the first number of what was then GAS AND WATER. On another occasion a full report of an important meeting held at noon on the Friday was on subscribers' breakfast tables on the Saturday morning. Judgment was given in the famous Welsbach patent cases on a Friday morning in 1896. The GAS WORLD had two special men in court. One man went straight from the court to the printers with one judgment, the second man followed with the second judgment, and the results appeared in that week's paper. That was pretty brisk weekly journalism in those days. For many years the paper has given full reports of three-day conferences, beginning on the Tuesday morning and ending on the Thursday afternoon, in the same week's issue published on Saturday. Whether the conference is held in London, Dublin, Belfast, Glasgow, or Aberdeen makes no difference.

Readers of the daily press will no doubt reflect that matters occurring on the other side of the world are reported the following morning, but this is not an accurate analogy. The staff of a weekly trade journal is in no way comparable in size with that of a daily newspaper, moreover the matters dealt with are invariably of technical character and demand expert knowledge in reporting. Proofs have often to be checked half-a-dozen times and in the case of gas reports there are invariably substantial sections of chemical formulæ.

No one connected with the GAS WORLD did more to improve its service in these respects than the late Peter Robertson, who joined the staff in the 'eighties and edited the paper from 1918 to 1928. Starting his career in the offices of the GLASGOW HERALD, he eventually joined John Allan & Co. and remained in charge after the amalgamation. He was succeeded in the editorial chair by Mr. A. C. Slaughter, who ably carries on this tradition in co-operation with the manager, Mr. E. H. Hallows.



THE RT. HON. WEDGWOOD BENN, D.S.O., M.P.
Secretary of State for India.

From its earliest days the GAS WORLD had devoted much space to chemistry. As the War progressed, the value of chemistry as a weapon in the struggle became increasingly realised. Many processes hitherto carried out in Germany had to be operated in this country and remarkable developments took place in the industrial applications of the science. It was not surprising that the need arose for a new trade journal to reflect this extended activity, nor that it should be promptly founded by the proprietors of the leading gas publication.

"The Chemical Age."

As soon as conditions allowed, not many months after the Armistice, the CHEMICAL AGE was started by Benn Brothers as "a weekly journal devoted to industrial and engineering chemistry." It was launched with the warm recommendations of eminent public men and scientists, among them the Rt. Hon. H. A. L. Fisher, Minister of Education, Lord Sydenham, President of the British Science Guild, Sir Edward Thorpe, and Lord Brotherton. The first number appeared on June 21, 1919, and on December 28, 1929, its Annual Review Number was the largest published in its history. The enterprise was a natural outcome of the immense debt that the nation owed to applied science in the final victory of the Allied Forces.

How successfully the original aims of less than eleven years ago have been realised may be judged from the bare mention of some principal achievements. Before the War Great Britain imported about 80 per cent. of its essential dyestuffs, mainly from Germany, and during the War the great textile industries found themselves suddenly deprived of the colours on which they depended. To-day the position is almost reversed. We import rather less than 20 per cent. of foreign dyestuffs and the remainder are manufactured in this country, providing, incidentally, a school of organic chemists and essential reserves should a similar time of national emergency unhappily recur. During the War, again, while we were laboriously and at a great risk and cost, shipping natural nitrate from Chile for the manufacture of fertilisers and explosives, Germany was obtaining her supplies of nitrogen from the air, by the synthetic process perfected by two of her great chemists, Drs. Bosch and Fritz Haber. To-day our country is producing ample supplies both for the home market and for the Empire, at the great works established by Imperial Chemical Industries at Billingham-on-Tees for the fixation of atmospheric nitrogen.

Chemical engineering, which a decade ago was little more than a name, is to-day a vigorous applied science, with a well-established Institution of Chemical Engineers, and an enormous field in the design and construction of chemical plant. In the same period our former dependence on Germany for scientific glassware and laboratory furnishings has been ended. In the important field of fine chemicals, British chemists have also made immense strides and British products are not only being produced in great variety but have already attained a reputation throughout the world for their standards of purity and dependability.

In the period covered by the comparatively short life of the CHEMICAL AGE, this industry has undergone an amazing transformation, in which the journal may claim to have played a notable part. Its history has demonstrated how a great publishing house, with its resources for news collection, for the instruction of public opinion and the stimulation of enterprise, may bring even into a difficult scientific field like chemistry the spirit and atmosphere of progress. The journal has not only interpreted chemistry to the public and helped to make the nation sensible of its debt to it; it has interpreted chemistry to chemists themselves and put new heart into them by emphasising the vital importance of their work. From the outset the paper has been edited by Mr. F. E. Hamer, now a director of Benn Brothers, who had a distinguished career in journalism before joining the company. Many years with the MANCHESTER

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GUARDIAN culminated in his election in 1914 as President of the National Union of Journalists. During the War his assistance was constantly sought in press matters, one of his achievements being an important amendment of the Defence of the Realm Regulations. Mr. Hamer's mementoes of this active period include a telegram from the King and letters from King Albert and M. Poincaré. The manager of the CHEMICAL AGE is Mr. L. J. Moolenaar, who is steadily improving its position.

Since the science of chemistry is international, its industrial applications are largely international also. The journal has become an international centre for enquiries from points as far distant as Leningrad, the Malay States, India, Australia, South Africa, and especially Canada and the United States.

The international character of the Benn journals generally, is largely due to Sir Ernest Benn's policy, not merely of travelling widely himself, but of enabling editors, advertisement managers and heads of departments to refresh their minds and methods by periodical visits to overseas countries. His eldest son, Mr. John Benn, was a student for some time at Princeton University, where he studied chemistry before joining the firm. His second son, Mr. Glanvill Benn, gained an inside knowledge of American newspaper ways on the staff of the NEW YORK TIMES, and visits to Canada have made him acquainted at first hand with Canadian publishing enterprise. Mr. F. E. Hamer, attending the annual convention in New York of the Associated Business Newspapers of America, has met personally the leading representatives of the American trade and technical press, and learnt all that a visitor can learn of the amazing enterprises of American firms.

The result is that the firm of Benn Brothers and its publications are known to publishing and newspaper firms throughout the vast continent of the States and the great Dominion of Canada almost as well as their own firms and productions. Both sides benefit from this close international contact. They both learn the best that their overseas rivals can teach, and readers and advertisers get the benefit of this vast organisation. Beyond all this, there is the broad national advantage of a mutual understanding of conditions and of personal friendships, which help to safeguard the good relations essential to the peace of the world.

"Ways and Means."

Another publishing enterprise that was the outcome of the War was not so successful. WAYS AND MEANS appeared a few months after the Armistice as a weekly review of industry, commerce and social progress, and was conducted somewhat on the lines of the SPECTATOR. It was not strictly speaking a trade journal, but in so far as its interests were common to the business community at large, the publishers felt the enterprise to be justified. More than a decade after the events it is difficult to recall the atmosphere of uncertainty which prevailed, while vast industries like iron and steel were endeavouring to readjust themselves to peace-time requirements, and other trades were still in process of denationalisation. Thousands of men were being demobilised and had again to be absorbed in business. Mr. Ernest Benn was at the time an active member of the Ministry of Reconstruction and while enthusiastic in its work was among the first to recognise the limitations of the bureaucracy, with which nearly every department of the national life was still surrounded.

The new weekly was issued on March 8, 1919, under his personal editorship, assisted by Mr. Henderson Pringle (now Principal of the Birmingham Commercial College). The atmosphere of hope that prevailed after the enormous struggle of the previous five years was reflected in the opening pages. "WAYS AND MEANS," we read, "starts its career at the beginning of a new era; it will be working on new ground; its purpose is to establish a new point of view. It aims at being the organ of industry and it makes its appeal to the great public, a bold and exceptional thing to do and one which a few years ago would have been regarded as entirely impossible. . . . The universal demand is for an improvement in the standard of living and that demand can only be satisfied by industry. The man who produces a few tons of rubber or leather or jam is doing far more to 'win the peace' than the government that establishes a Ministry of Something, or the inventor of another pension or dole panacea which accentuates instead of removing a bit of need." In the same article the editor admitted that the journal was in the nature of an experiment, which might not succeed for many years to come. As events turned out, only three volumes of WAYS AND MEANS were published, yet in the paragraph just quoted there was a prescience which was truly remarkable. Without entering here into the controversies of

Some Jubilee Dates.

1861. John Williams Benn an office boy in Mincing Lane.

1868. Draughtsman to a furnishing firm at 20s. a week.

1880. First issue of the CABINET MAKER, published monthly from 5 Finsbury Square.

1885. "J. W. Benn & Brothers"—John, Julius, Davis and Henry—move to 42 City Road.

1889. J. W. Benn elected original member of London County Council.

1891. Ernest J. P. Benn enters the business.

1892. John Williams Benn enters Parliament for St. George's-in-the-East.

1897. Establishment of THE HOUSE.

1899. HARDWARE TRADE JOURNAL purchased.

1900. IRONMONGERY incorporated with the HARDWARE TRADE JOURNAL.

1903. Wedgwood Benn edits the CABINET MAKER.

1904. John Williams Benn Chairman of the London County Council.

1905. Receives the honour of knighthood.

1906. Benn Brothers move to Christopher Street. New offices opened by Lord Monkswell. Wedgwood Benn leaves business to become M.P. for his father's first seat.

1907. EXPORT WORLD founded.
EL COMERCIANTE ARGENTINO (published in Spanish in Buenos Ayres) founded.

1910. Sir John Benn visits South America as guest of the Argentine Government.

1914. Sir John Benn created a Baronet.

1915. Oliver Benn killed in Gallipoli.

1917. ELECTRICIAN and FRUIT GROWER acquired.
Move to Bouverie Street.
GAS WORLD purchased.

1919. CHEMICAL AGE founded.
Acquisition of GARDENING ILLUSTRATED.

1919-24. WAYS AND MEANS and EUROPEAN COMMERCIAL published as journals of post-war reconstruction.

1921. Book Department founded for the publication of technical books.
First issue of SPACE.

1922. Death of Sir John Benn, "Father" of the L.C.C.

1923. Ernest Benn, Ltd., incorporated.

1924. DISCOVERY added to list of publications.

1925. William Rider & Son, publishers of TIMBER TRADES JOURNAL, taken over.

1926. Move to Bouverie House, Fleet Street.
Third generation joins the Board; Mr. John A. Benn elected a Director.

1927. John Benn Hostel for working boys opened by the Prince of Wales.
Mr. Gordon Robbins resigns Day Editorship of THE TIMES to become Deputy-Chairman of Benn Brothers.
NURSERY WORLD purchased.

1929. Wedgwood Benn becomes Secretary of State for India.
BRITISH TRADE JOURNAL, MILLER and LEATHER TRADES REVIEW acquired.

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politics, its conclusion may be emphasised ten years later, when a Minister of the Labour Government has been obliged to admit that there is no magic cure for the revival of trade.

But WAYS AND MEANS did not confine itself to criticism. Its pages were crammed with constructive proposals in regard to every aspect of industry. Perhaps its failure was accounted for by making too wide an appeal. The early issues contained contributions from the Rt. Hon. J. H. Whitley, who explained the Industrial Councils which were then being set up in the leading industries of the country, and were soon to exercise a profound influence in the cause of industrial peace. Benn Brothers were closely allied with the movement and through their trade journals also took an active part in promoting this new instrument in industry. Another writer was Mr. J. R. Clynes, the present Home Secretary, who took as his subject the responsibility of trade unions.

National Service.

Only in perspective can any period be accurately judged, and it is still not generally realised how perilous the situation was in 1919. Apart from the vast problems of reconstruction, the natural tendency to reaction from the efforts and strain of war had to be combated. WAYS AND MEANS not only forms a permanent record of this period but at the time it undoubtedly performed an important national service. If its sphere of influence was limited, the journal attracted considerable attention among the leaders of industry and those engaged in all ranks of trade and commerce. It was to the forefront in supporting every movement to promote the better relations of employers and employed—work that was to bear full fruit during the succession of strikes and lock-outs shortly after the "boom" period, which were singularly free from the bitterness characteristic of earlier struggles.

Having started WAYS AND MEANS to deal with the problems of industrial reorganisation at home, Benn Brothers soon followed this with a similar effort on an international scale. This was known as the EUROPEAN COMMERCIAL and was published in Vienna from the autumn of 1922 till early in 1924. The first years of peace had seen a succession of conferences on reparations, with indifferent results owing to the political animosity that still prevailed. Leaders of business were beginning to realise that international settlement did not demand further elaborate machinery, so much as mutual trust and good will. "The new spirit of to-day," said the EUROPEAN COMMERCIAL, "demands that more definite steps be taken to ensure that, free from bias toward any country whatsoever, and honestly in the interests of Europe as a whole, facts regarding the commercial and economic position of the various business centres of Europe should be made available to all concerned." The first number published reports from its own representatives in Brussels, Sofia, Prague, Copenhagen, Amsterdam, Budapest, Trieste, Warsaw, Constantinople, Bucharest, Stockholm—and even Moscow—besides from London, Paris and Berlin, and it met with enthusiastic approval in all countries. The British Prime Minister sent his congratulations on the enterprise, as did the leaders of commerce throughout the Continent.

Apart from its mission of reconstruction, the new journal was following a tradition already established by Benn Brothers, such as EL COMERCIANTE, for promoting British trade abroad. It was therefore of direct value to the publishing business as a whole. The circulation on the Continent which the trade journals enjoyed before the War was slowly being recovered, and the EUROPEAN COMMERCIAL was in the nature of a traveller for every Benn publication. More important still, its representatives in every large centre provided an organisation covering the whole of Europe, for the provision of facts required by the journals issued in London. The English staff in Vienna numbered six, and was strengthened by four Austrian journalists and experts. The Editor was Mr. T. Mortimore Sparks, who for some time had been financial editor of the SHEFFIELD TELEGRAPH before joining Benn Brothers to conduct the HARDWARE TRADE JOURNAL. Shortly afterwards he was selected by Sir Ernest for Vienna, when he also visited the principal European capitals. The manager of the new enterprise was Mr. F. Kirby, who had joined the firm many years previously when VANITY FAIR ceased publication.

Readers will remember the rent restriction measures to which Vienna was subject at this time. One effect was that the new journal occupied a magnificent office in the Hohenstaufengasse, which seemed like a palace to the London staff who had been sent out to run the enterprise. The building was situated in the banking quarter of the city, with frontages on two streets. The printing arrangements were complicated by the fact that the compositors did not understand English, and every line of copy had thus to be typewritten. But the work was carried out in premises described by visitors as "the finest of its class that we have seen anywhere in the world." In spite of strikes and uncertainty, Vienna was already putting itself in the forefront as regards industrial welfare—work that was assisted by the depreciated currency. "A typical staff restaurant, not very far from our offices, serves 850 dinners every day, from beautiful modern kitchens, attached to a sort of roof-garden restaurant of the most attractive description. A plate of meat, vegetables and a sweet are daintily served to this vast army of employees, at the price of 5,000 crowns, or the equivalent of about 3½d. each."

THE LATE SIR JOHN BENN.
From the portrait by Sir William Orpen.

When figures like these are quoted, it is not surprising to learn that the EUROPEAN COMMERCIAL had to be abandoned in 1924, largely owing to the unstable conditions that continued to prevail. But in the history of journalism and the "post-war period" the enterprise was unique and the publishers look back on it with nothing but pride. The connections formed on the Continent have proved of lasting value.

It has been convenient to describe the activities of the War and its outcome in a consecutive story. We must now consider other landmarks in the period. The first of these unhappily was the death in 1919 of Mr. Julius Benn, the first partner in the firm which for fifty years has been able to justify literally its designation as "Benn Brothers." One of his early successes was in the production of furniture trade catalogues. In the days when the arts of advertising were not so highly developed as they now are, Julius Benn was responsible for the production of the largest volumes that had, up to that time, appeared. Notable among these was the Whiteley catalogue, which he personally arranged for many years in succession. His reputation spread overseas, and he was entrusted with the issuing of an important periodical for a firm in Cape Town, a commission which he held until his retirement from business. When in 1889 his elder brother entered political life, Julius became the senior director of the firm.

Until the day of his death he was always proud of his ability to take a shorthand note, having been one of the first to learn the Pitman system. Julius used this shorthand in social work, and for forty years held regular classes in connection with men's clubs, where he trained hundreds of pupils. For neatness and accuracy his own hand was unsurpassed, and there must be many people still working in the City to-day who owe their skill to his training. If an explanation were needed for this philanthropy, it would be found in the deep-seated love of his fellows that was characteristic of the man. Like Sir John, moreover, he never forgot his early struggles and throughout life it was to helping others to

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rise from the ranks that Julius devoted his leisure and skill, "Mr. Julius was in a sense the father confessor to many in the trade," said a memoir writer in the CABINET MAKER. "If it was a question of partnership or a financial rearrangement, or the development of a new department at home or overseas, or even of the engagement of a manager or traveller, they would seek his advice and assistance. The measure of his success in obtaining the confidence and affection of his contemporaries is in no way better shown than in the fact that it was the exception to add the word Benn to Mr. Julius."

A Business Romance.

In the two years after the move to Bouverie Street the facilities of Benn Brothers for dealing with a group of publications had steadily improved, but the firm had confined its activities to trade journalism. A departure from this policy now occurred, in 1919, when two papers having a popular as well as a technical appeal were acquired—GARDENING ILLUSTRATED and FARM AND HOME. The latter dealt with agriculture from the standpoint of the small farm-owner, but mainly owing to an endeavour to cover interests that were too ambitious for a single paper, it had to be discontinued. By contrast with this failure, GARDENING ILLUSTRATED was a romantic success.

"My horticultural guide, philosopher and friend," was how Sir Rider Haggard described GARDENING ILLUSTRATED, a tribute typical of the affection in which this paper is held by the more advanced amateur and professional gardeners. As the first penny gardening journal, it had instantly achieved a memorable success. William Robinson, its founder and first editor—the author of "The English Flower Garden," "The Vegetable Garden" and other horticultural classics—discovered that there was a big public waiting for an attractive paper at a popular price, and in the short space of nine months after its foundation on March 15, 1879, this new weekly acquired a very large circulation. The newsagents described it as "the penny startler," so sensational was its success. On the personal side the enterprise was not less romantic. Robinson had started life as a garden boy, and in the course of time was to purchase Gravetye Manor, a grand Elizabethan mansion in the heart of Sussex, where he is now living in retirement in his ninety-fourth year. Not that he regards himself as an old man; he looks forward with confidence to his hundredth birthday, and is meanwhile making plans for the further development of the gardens. The Gravetye Manor Estate comprises many hundreds of acres, including some of the finest timber in the county, and is a source of joy every year to thousands of visitors from all parts of the world.

From the outset Robinson's enterprise attracted the support of the biggest gardening celebrities. Dean Hole, Gertrude Jekyll, Peter Barr, and many others dipped their pens assiduously for him in propaganda for the betterment of English gardens. The paper's practical features, experienced writers, and unique illustrations gave it a foremost place in amateur gardening journalism, and even the professionals welcomed it as a paper they could make their own. Early readers will also remember the colour plates by Moon, which no gardening paper has ever surpassed in standard. The editorial policy has been consistent, and the founder's right-hand man and disciple, William Thomson, who succeeded him as editor in 1893, faithfully carried on the Robinson traditions until he died in 1927 after forty years' prodigious service to the paper. He was awarded the Veitch Memorial Gold Medal in 1926 for his contributions to horticultural journalism. The present editor, Mr. H. Cowley, widely known as a plant-hunter, is a popular figure in gardening circles, as also is the manager, Mr. H. W. Duck.

SIR ERNEST BENN, BART.
From the portrait by Sir William Orpen.

We are dealing with events in chronological order and the next to be noted is the presentation to Sir John Benn which was made by the staff on his seventieth birthday (November, 1920). A book containing over two hundred names conveyed the congratulations of those to whom the "Chairman" was a familiar figure. Since his entry into public life, Sir John had remained a frequent visitor to the office. Every year he made a point of handing the Christmas bonus personally to each member of the staff. His renewed activity during the war period brought him into further touch with Bouverie Street. On his seventieth birthday it had been intended to hold a complimentary luncheon, to commemorate his thirty-two years of consecutive service on the London County Council, but Sir John's health at the time made it impossible to proceed with the idea.

The function accordingly took place in the following spring, in April, 1921, when the Marquis of Lincolnshire presided over a large company of business and political acquaintances gathered to honour the "Father" of the L.C.C. A telegram was received from Lord Stamfordham stating that His Majesty was "interested and pleased to hear of this recognition of Sir John Benn by his friends and admirers for his long service in the government of London."

Proposing the chief toast, the chairman said that although there were many present at the luncheon who could look back a long time, Sir John Benn was the only original member of the L.C.C. who was now a member. In reply Sir John said that the question would naturally be asked: "What did these people do for London?" The Council (he stated) was preceded by the Metropolitan Board of Works, which left them a glorious legacy in the shape of the Thames Embankment.

What memorials had the old L.C.C. left? Sir John continued. "One of the most important was the Strand improvement. In the early days it was one of the most disgraceful slum areas in London, but it had been removed and the most remarkable transformation scene in any city in the world had been effected. A rateable value of £92,000 had already become one of £117,000, and when all the buildings were up it would reach £360,000. When the whole scheme was completed the ratepayers would possess one of the greatest municipal assets in the world." He referred with pride to what the Council had accomplished for the health of London, the reduction of the death rate, the provision of tramway services and housing schemes. On the latter they had spent nearly £300,000 and these were paying their way on economic rents. Many acres were added to the parks, and the amusements of the Metropolis had been purified and made more popular by their wholesome policy. "The record of the L.C.C.," Sir John claimed, "would bear examination and was a source of justifiable pride. Those present should preserve as a precious heritage the ideals of those early days."

The Joy of Work.

In the following spring (1922) Sir John contested yet another election and was returned again for Kennington. Side by side with his work on the L.C.C. he had in earlier years been a Member of Parliament. At the 1892 election he gained St. George's-in-the-East for the Liberal cause, defeating the Conservative candidate, Mr. C. T. Ritchie, by 398 votes. The victory set up a record in the election, as Mr. Ritchie was President of the Local Government Board and was the only Cabinet Minister to suffer defeat—and that at the hands of a newcomer among aspirants for Parliamentary honours. During his membership of the House of Commons Sir John Benn consistently fought for the cause that he had supremely at heart—the new and brighter London. He was defeated at the

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1895 election and two years later contested the Dartford by-election. He was again unsuccessful at Bermondsey in the "Khaki Election" of 1900, but in another by-election he provided in 1904 a foretaste of the great landslide of 1906, by winning Devonport with a majority of 5,179. He easily retained his seat in 1906, but lost it in 1910 by 140 votes. Thenceforward he confined his efforts to municipal government.

Commenting on the 1922 election result a writer in SPACE took the opportunity to discuss the Joy of Work, and the latest example of the unceasing effort of Benn Brothers' Chairman. "The man who started in the City as an office boy at the tender age of eleven and who can fight a strenuously contested election in his seventy-second year, is made of the real stuff—the stuff that success is composed of, the stuff which is essential to every live newspaper enterprise. Sixty-one years of unceasing effort in journalism and politics is more than most of us will achieve; but it does give to all of us an example to live up to. Our Chairman has for three or four years past been under something of a cloud. The serious illness which attacked him in the middle of the War robbed us of the active young man that he was up to sixty-eight—for there surely never was a younger sixty-eight. The County Council election, with its canvassing, its meetings and all its strenuous effort, is delightful proof that the effects of the illness are passing and that being so, there is no telling what new standards of effort our rejuvenated chief may not be setting for us."

But the fulfilment of these hopes was a brief one, for a month later Sir John was taken suddenly ill at his home at Limpsfield. In April, 1922, he died after ten days' struggle to regain consciousness. He had always been a fighter and those of his family who watched his last brave struggle for life could only conclude that the end was a fitting close to his career. Sir John had died in harness, for two days before his illness he was actively engaged in Council matters and on the same morning had played his accustomed round of golf.

Business and Politics.

Although for twenty years Sir John had devoted the greater part of his time to public work, he had never ceased to be a business man, and yet so admirably and truly was he able to balance matters that there was no confusion or connection between his public and his private work. Sir John was immensely proud of his business and particularly of the developments which he lived to see in the last years of his life. At the same time he never tried to disguise the fact that he regarded it as a stepping-stone to public life; once it was established and others had been trained to carry it on, he soon gave his major attention to the London County Council. As Mr. T. P. O'Connor said in a Memoir in the DAILY TELEGRAPH, most of Sir John's public and political associates were unaware of his business activities. It was, of course, impossible to keep his business associates in ignorance of his public life, and not a few of them followed his fortunes with interest and personal assistance, for example, in election work. But a simple illustration of the consistent line which he followed in these matters may be found in the fact that in the early days of the London County Council he declined to allow any of the official announcements of that body to appear as advertisements in his paper.

The question soon arose as to what form a memorial to Sir John Benn might most fittingly take. While his name will be remembered most widely on account of political activities, he was also the founder of an important business, and something commemorating both aspects of his career was desirable. The solution of the question came in 1924, when Mr. J. J. Mallon, Warden of Toynbee Hall, obtained an option to purchase the Barnardo Building in Stepney. The proposal was brought to Sir Ernest Benn that he should take this over as a hostel for working boys—in the district where John Benn had rendered much political service and where he had lived as an "office boy" himself in 1860. With the aid of the Carnegie Trustees and subscriptions from many friends, Sir Ernest bought the freehold and work was put in hand to make the building suitable for a resident hostel for boys. In 1927 the Prince of Wales honoured this new activity by opening the "John Benn Hostel," which provides a home in every sense of the word for about eighty boys between the ages of 14 and 18, who have no home or parents of their own, or who are "on probation" as first offenders.

Of the cost of running this valuable institution, which is entirely dependent on voluntary support, the boys themselves contribute £2,000 a year towards the budget of £6,000. No better tribute to its success can be mentioned than that the Prince felt justified in visiting the Hostel again in 1928, thus maintaining the personal interest in its work which had prompted His Royal Highness to perform the opening ceremony.

Book Publishing.

Among the romances of post-war business must be numbered the rapid rise to prominence of the book publishing company formed by Sir Ernest Benn in 1923. For some years a series of technical books had been issued by Benn Brothers, later a series of volumes on Ceramics and Oriental Art was added, and the rapid growth of this department made it advisable to launch it as a separate organisation. In less than seven years, all classes of production have been successfully undertaken, from art books priced in many guineas at one extreme to the famous Sixpenny Library at the other, with works of biography, fiction, history and *belies lettres* in between. Factors which led to the creation of a separate company included organisation and finance, in which there are considerable differences between a journal and a book. The one is produced and published in seven days, the other may involve work extending over many months and even years.

Ernest Benn, Limited, arose out of Benn Brothers and the closest co-operation has continued to exist between the two companies. The CABINET MAKER, for example, was the parent of Mr. H. P. Shapland's classic work on "The Practical Decoration of Furniture," while from its earliest days the ELECTRICIAN had published many standard volumes, notably Heaviside's monumental "Electromagnetic Theory." The TIMBER TRADES JOURNAL, again, had built up a library of books like "Shipping Marks on Timber" and the "Zebra Code," which are known and used by the timber industries the world over. These several series were brought together and enlarged by Ernest Benn, Ltd., and other departments of technology developed, always with the idea of providing expert help for those engaged in the leading industries. Thus the chemical engineering list includes Stanley Green's "Industrial Catalysis." Under the heading of mining and metallurgy is Mr. Clements' great work on "Blast Furnace Practice." Agriculture, horticulture and fruit growing form another important section of the scientific list, which besides technology comprises important books on pure science, like Sir Oliver Lodge's "Atoms and Rays."

Before the end of their first year's trading, Ernest Benn, Ltd., had taken a full-page advertisement in THE TIMES, the first space of the size to be reserved in this newspaper by any publisher. A dominant position had been reached in a field where the Continental art publishers were previously unchallenged. Art books demand the most skilled typography obtainable and the closest attention to the pictorial aspects of production—the selection of originals suitable for the block-maker, the process to be employed, the passing of the proofs (sometimes requiring six operations), the choice of paper and ink. All these factors are vital to success. Ernest Benn, Ltd., was fortunate in having from the outset the services of Mr. C. E. Hughes, a director of the older company, and the author of several books on painting. For many years he had collected and studied pictures, and was recognised as an authority on water-colour. Mr. Hughes was therefore already *persona grata* with the officials of the principal art galleries and museums, before the new business made their co-operation invaluable. It is no secret among his colleagues that the art books owe their success on the production side to his unusual qualifications.

"The Eumorforpoulos Catalogue."

To name the art books issued by Ernest Benn would require several columns. Highly specialised subjects like Mediæval Wall Painting have appeared in the firm's list, but perhaps the most notable contribution to the permanent literature of art is the "Catalogue of the George Eumorfopoulos Collection." It is generally agreed among orientalists that the collection owned by Mr. George Eumorfopoulos, the doyen of the Greek community in London, is the most wonderful of its kind in the world. Pictures, sculpture, jewellery, metalwork, jade, glass and ceramics comprise the principal departments, in which every branch of Chinese art is represented by material of the first importance. The volumes which Ernest Benn have undertaken now number fourteen. The initial series was devoted to Ceramics, and the services of Mr. R. L. Hobson of the British Museum were enlisted as editor. A scholarly introduction to each volume is followed by ample coloured plates of the finest specimens, with illustrations of others in collotype. Nothing of importance is omitted, and by turning its pages the reader can view practically the whole collection, besides reading a description of every piece. Ceramics was followed by other volumes on paintings, bronzes, jades and sculptures, and the Catalogue, now nearing completion, is agreed to be the most sumptuous publication on Chinese art ever issued in any country.

By a happy coincidence one of the first volumes of a general character which the firm produced was Mr. A. G. Gardiner's

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EDITORS OF BENN BROTHERS' JOURNALS.

E. W. GREGORY.
"The Cabinet Maker."

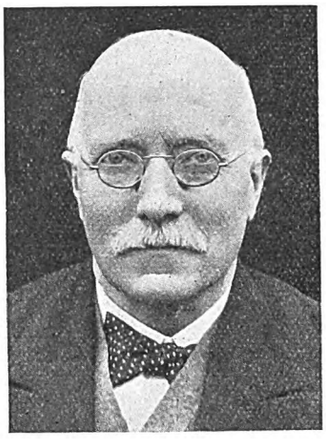
N. FRENCH.
"The Hardware Trade Journal."

G. H. LEPPER.
"The Electrician."

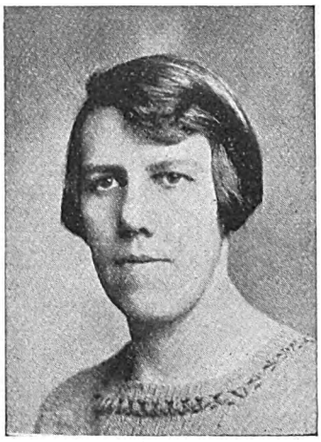
A. C. SLAUGHTER.
"The Gas World."

H. H. WARDLE.
"The Fruit Grower."

H. COWLEY.
"Gardening Illustrated."



T. M. SPARKS.
"The Timber Trades Journal."



M. S. CODY.
"The Nursery World."

A. R. EDGE.
"The British Trade Journal."

E. HEUNER.
"The British Trade Journal."

J. C. HARRINGTON.
"The Leather Trades Review."

H. G. CATCHPOOL.
"The Miller."

Other editors of Benn Brothers' journals are **F. E. HAMER** (THE CHEMICAL AGE) and J. A. BENN (DISCOVERY), who are directors of the company. About two thousand inquiries and technical problems are dealt with every week by this team of journalists.

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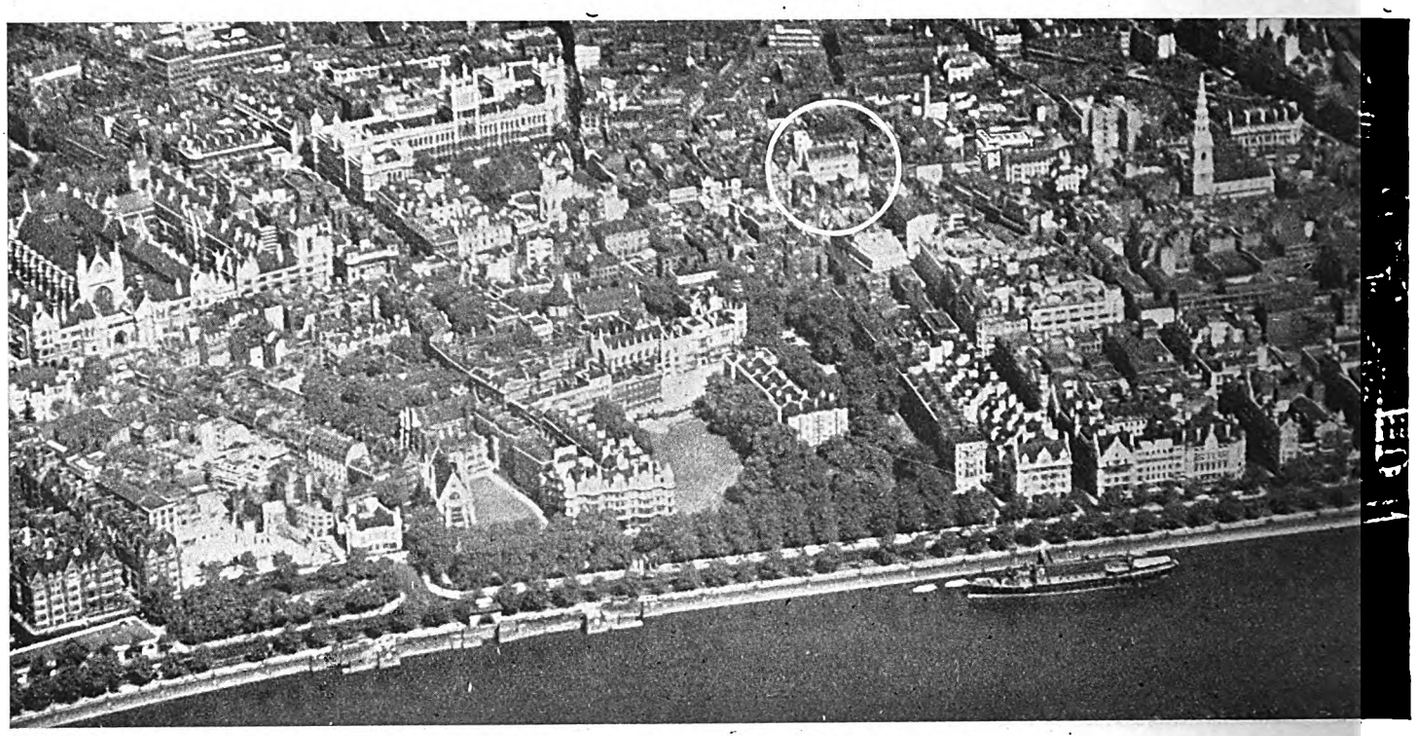

Bouverie House, Fleet Street, photographed from the air. [Aerofilms

Biography of Sir John Benn. Apart from giving a full account of the early activities of the founder of the firm, this book made an important contribution to contemporary history. The title was "John Benn and the Progressive Movement," and in its pages the story of the London County Council was told for the first time.

The book which may be said to have established the reputation of Ernest Benn, Limited, as publishers of biography was, however, published in 1926, when the first two volumes of the now famous "Intimate Papers of Colonel House" appeared. Since then many important biographies and memoirs have been offered to Ernest Benn, Limited, and of the subsequent publications may be mentioned the "Life of Lord Curzon," by Lord Ronaldshay (now Marquis of Zetland), "The Memoirs of Mr. T. P. O'Connor," and "The Letters of Gertrude Bell."

In addition to Sir Ernest Benn, the directors of the company are Mr. Gordon Robbins (vice-chairman), Mr. C. E. Hughes, Mr. J. A. Benn, Mr. E. G. Benn (general manager), and Mr. K. E. Hughes. The sales manager is Mr. G. Gilman, and the technical book department is in charge of Mr. L. P. Shapland and Mr. E. G. Hawke.

The next addition to Benn Brothers' list in 1924 was the journal known as DISCOVERY. Founded in 1920 and first published by Mr. John Murray, this "popular journal of knowledge" was established under a Trust, of which the present members are Sir J. J. Thomson, the Master of Trinity College, Cambridge; Sir Frederic Kenyon, director of the British Museum; Professor A. C. Seward (Cambridge), and Professor R. S. Conway (Manchester). To safeguard the editorial policy and to secure the co-operation of expert writers, a committee representing the principal learned societies and scholastic associations was formed, and from the outset has met twice yearly to promote the interests of the enterprise.

Perhaps the most spectacular of the discoveries so far published in its columns was the achievement of television, first announced by the inventor in the issue of April, 1925. At that time Mr. John Baird was transmitting outline images on an apparatus that the editor described as "astonishingly crude." The optical system was composed of bicycle lamp lenses and the framework could only be termed "an unimpressive erection of old sugar boxes." When the Editor (at that time Major Pollard) was asked to inspect the new invention, it had just been placed on view by Messrs. Selfridge's at their Oxford Street premises. The scope for television had long been recognised as enormous, but it needed great courage to predict early success for the Baird method. Nothing more than shadow outlines could be transmitted and the inventor lacked any financial support. Major Pollard foresaw the possibilities of the apparatus, which less than five years later sufficiently developed to justify an experimental service through the B.B.C. station. Since 1926 DISCOVERY has been edited by Mr. J. A. Benn, and the manager is now Mr. G. P. Grieve.

The popular papers in Benn Brothers' list were augmented in 1927 by another entitled the NURSERY WORLD. This weekly periodical had been founded in 1925 by Messrs. Faber & Gwyer, to meet the problems of mothers and nurses but in less technical terms than the professional papers; at the same time there were pages of recreational interest. The staff was enlisted from the ranks of trained nurses and a principal feature was the enquiry bureau, to give readers free advice on all matters of child welfare. By June, 1927, it became obvious that a larger publishing organisation was required to maintain the paper, and the copyright was sold to Benn Brothers. At that time its advertisement pages numbered only one-sixth of the contents. The subsequent improvement, under Mr. Washington Flatt's management, has been such that about one-half of each issue is now devoted to advertisements. The editor is Miss Cody.

"The Timber Trades Journal."

The next trade journal to come to Bouverie Street was bought in 1925, when the old-established business of William Rider and Son was amalgamated with Benn Brothers. THE TIMBER TRADES JOURNAL had been founded in 1873, and was issued from Bartholomew Close where J. & W. Rider, as the proprietors were styled at the time, had carried on a printing business for more than a hundred years. During the first half of the nineteenth century all imported timber was dutiable with a tariff in favour of the Colonies; the importing business was in the hands of a few firms who conducted it on very conservative lines. The outlay attaching to the payment of the duty and the necessity of passing the entries before the delivery of the goods prevented the small buyer from meddling with the import trade, to the advantage of the large merchant. Not until the abolition of the duty in 1866 did appreciable expansion occur; the free importation of Scandinavian wood then brought about great developments, which continued apace until the Franco-Prussian War of 1870. For the next few years the timber market positively boomed, in common with the trade generally in Europe. In 1873—when the TIMBER TRADES JOURNAL was founded—the softwood timber imported was alone estimated at £17,000,000, an increase of five millions over the preceding year. Free Trade in wood had increased the number of firms engaged in the business and new methods were being introduced. At this transitional period the need was felt for a trade paper as an independent medium between exporters, importers, and merchants. The first volume was scarcely concluded when the trade reaction of 1874 occurred, making the continuance of the journal no easy task.

At the outset, in the early seventies, much of the timber trade of the metropolis was concentrated above London Bridge, on the south bank of the river. Half of the population of Lambeth is said to have been employed in this work; wharves

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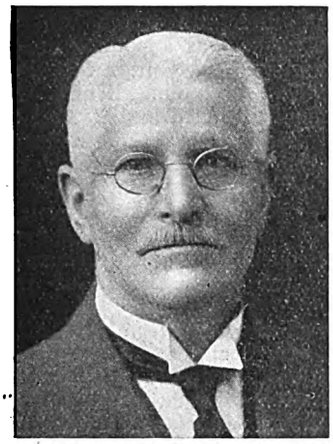
MANAGERS OF BENN BROTHERS' JOURNALS.

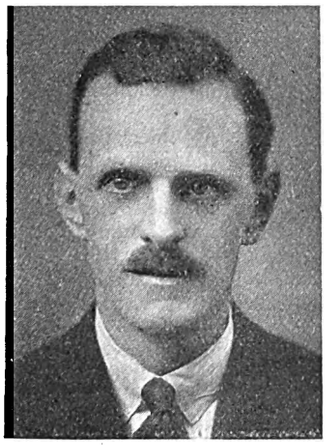


J. A. KNIVETT.
"The Hardware Trade Journal."
(London Manager.)

W. VESTEY.
"The Fruit Grower."

R. L. WEBB.
"The Timber Trades Journal."

H. W. DUCK.
"Gardening Illustrated."



E. H. HALLOWS.
"The Gas World."

L. J. MOOLENAAR.
"The Chemical Age."

R. D. SAVAGE.
"The Electrician."

F. WASHINGTON FLATT.
"The Nursery World."

N. B. MELLOR.
"The Cabinet Maker."

J. V. F. BUCKINGHAM.
"The British Trade Journal."

J. H. WATERFALL.
"Miller" and
"Leather Trades Review."

G. P. GRIEVE.
"Discovery."

The manager of THE HARDWARE TRADE JOURNAL is E. E. STARKE, a director of Benn Brothers, Ltd. Certain of the Benn journals publish more than five thousand pages of advertisements each in the course of the year.

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were numerous and extended at intervals from Blackfriars to Stansgate in Essex. At that time shipbuilding had not finally left the Thames, house-building was going ahead rapidly in all the outer suburbs, and the timber trade shared in the general prosperity. Most of the wood coming to London was disposed of to merchants who possessed waterside premises, on the river or canals, and provincial firms filled their requirements from London stocks. Gradually a new element entered the trade, when certain merchants moved to offices in the City. In the course of time the Surrey Commercial Docks, where shedding accommodation was provided, became the timber yard of the City firms.

The predominant importance of overseas trade in timber was recognised from the start, and representatives of the journal have paid regular visits to the Scandinavian countries, to Russia and to the United States. The most recent tour was made by Sir Ernest Benn in 1929 to the Baltic States, where he lectured extensively before the Chambers of Commerçe and other business organisations. Perhaps the most vigorous traveller on behalf of the enterprise was Mr. Edwin Haynes, who almost from the beginning had guided its destinies. His early adventures included being among the few English people to escape from Paris just before the siege by the Prussians, and he soon became an equally popular figure with the timber traders abroad, as among his colleagues in this country. It was, indeed, to the unfailing energy of Mr. Haynes during more than fifty years' service as editor and director that the TIMBER TRADES JOURNAL owed its strong position in 1925, when Benn Brothers acquired the business. Soon after the amalgamation the editorship was taken over by Mr. T. Mortimore Sparks. Like Mr. Roland Webb, who has ably managed the journal for many years, the Editor already enjoys a wide circle of friends in the trade.

It was the late Sir James Ball, when Government Timber Controller during the War, who remarked to a deputation that "he found the TIMBER TRADES JOURNAL was the timber merchant's bible."

Bouverie House.

By 1924 it had become clear to Sir Ernest Benn that new premises were required if the development of his various businesses was to continue. The advantages of a situation in the Fleet Street area had been proved beyond question during the previous seven years. A careful survey of existing premises led to the conclusion that adequate accommodation could only be secured by erecting a new building. Accordingly Nos. 154-160, Fleet Street were purchased and the several offices and shops demolished to provide a site large enough for the purpose. The next eighteen months were a period of ceaseless activity on the part of the contractors, and there emerged the seven-storeyed building known as Bouverie House, to which Benn Brothers, Ltd., and its associated companies moved in the spring of 1926. A feature of the Portland stone façade is the balcony on which trees are planted—now generally referred to as the "Four Trees of Fleet Street"—and from the roof of Bouverie House a unique view of the Metropolis is obtained, extending for thirty miles to the south. The significance of placing trade journalism in Fleet Street has been remarked on already; the erection of a special building on the finest site in what was previously the preserve of the leading newspapers, was a gesture that finally removed trade journalism from the "side street" atmosphere in which it had been born and nurtured for seventy years.

The move to Bouverie House coincided with the entry of the third generation of Benn Brothers into the business. Mr. John Benn, who joined the staff in 1925, was elected to the Board of William Rider and Son, publishers of the TIMBER TRADES JOURNAL and on its amalgamation with Benn Brothers became a director of the parent company. After a year's work with THE CHEMICAL AGE, he took over the editorship of DISCOVERY, and later of The Sixpenny Library also. Mr. Glanvill Benn entered the business in 1927, and has devoted his main attention to Ernest Benn, Ltd., of which, on Mr. Gollancz's resignation a year later, he was appointed general manager. In this connection he visited the United States and Canada in the autumn of 1929. Sir John Benn's third grandson, Mr. Keon Hughes, joined the firm in 1927 and was appointed a director of Ernest Benn, Ltd., in the following year. The family tradition in the business had already been strengthened in 1923 when Mr. A. Richard Pain, brother-in-law to Sir Ernest, resigned an important practice as solicitor to become secretary of the various companies. His legal knowledge proved invaluable in subsequent business developments and in 1927 Mr. Pain was elected to the Board of Benn Brothers.

Shortly before the firm moved into Bouverie House the General Strike of May, 1926, was declared. For the first time in the history of the publications the weekly issue had to be suspended. On the declaration of the Trade Union Council, the first move made by the Benn staff was to pass a resolution of confidence in the directors.

The steps which have always been taken to ensure the welfare of the staff have been one factor in the sense of goodwill prevailing during half a century. In 1916 a "five-day week" was instituted. The office was closed on Friday night, and for fourteen years past the office boy, in common with the managing director, has been able to enjoy the leisure of a full Saturday at home. A personal link between all those working in the company was the institution of a house magazine called SPACE in 1921.

For many years Benn Brothers have provided pensions for superannuated members of the firm, and the facilities for looking after the interests of the retired list are being augmented this year (1930) by the institution of a Jubilee Pension Fund. For this purpose the directors have allocated a sum of £5,000, from which various pensions and allowances will now be paid. In future years the Board hopes to make an annual allocation to this fund, subject to the approval of the shareholders.

In January, 1928, on the occasion of the Silver Wedding of Sir Ernest and Lady Benn, the staff presented Sir Ernest with his portrait, which was painted by Sir William Orpen. This choice was a particularly good one, since the artist had painted Sir John some ten years before on the private commission of his family. At a gathering in Bouverie House, which was attended by Elizabeth Lady Benn, the chairman was also presented with an album containing the congratulations and signatures of every member of the staff.

It sometimes happens that a business which has remained largely in the control of a single family for a considerable period, does not offer the same scope for those outside the family circle as is available in other organisations. Sometimes families continue to own a business without taking an active interest in the management of its affairs. Neither of these criticisms is ever heard in regard to Benn Brothers. The family takes pride in the fact that its members during three generations have worked in the business, but not less in the fact that half of the seats on the board are filled by others who have earned their positions by their own enterprise and endeavour. The latest recruits from the staff are Mr. F. E. Hamer (Editor of THE CHEMICAL AGE) and Miss Florence Robinson (secretary to Sir Ernest), who were elected to the Board in January, 1930. The election of Miss Robinson to the Board should finally

The Prince of Wales playing ping-pong with the boys of the John Benn Hostel, the memorial to the founder of Benn Brothers, Ltd., which His Royal Highness formally opened in 1927.

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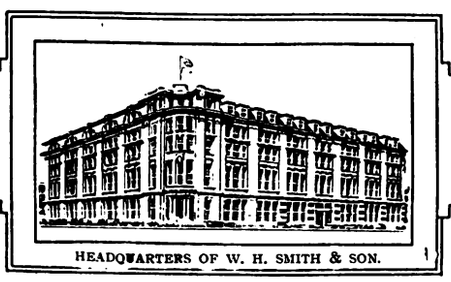

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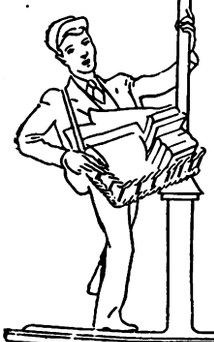

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dispel the notion still prevalent in some quarters that the same opportunities are not open to women as to men. Not only as secretary to Sir Ernest, but as the person more than anyone else responsible for the welfare of the staff, Miss Robinson fills her post with untiring efficiency. She is equally qualified as being one of the first women recipients of the Oxford M.A. degree. At the end of the War Miss Robinson conducted the propaganda of the Industrial Reconstruction Council, and was for a time on the staff of King's College for Women.

"The British Trade Journal."

The close of 1928 saw the most recent expansion in Benn Brothers' activities, when the firm acquired the interests of William Agnew, Ltd., proprietors of the BRITISH TRADE JOURNAL, THE MILLER, and the LEATHER TRADES REVIEW.

The BRITISH TRADE JOURNAL was established in 1863 by the export firm of Morgan Brothers, and the first number consisted of eighty pages. The Civil War was then raging in the United States, and one result was seen in the rising prices of cotton and wheat. Ten years later Mr. W. Agnew Pope acquired an interest in the proprietorship and the name "William Agnew" appeared as publisher. Up to this time the manufacturers and exporters of this country, although told to appeal to foreign buyers in their native language, had no trade publication to assist them in such methods. This disability was removed in 1881 when the journal issued the first number of its "Supplemento Espanola" for circulation among the business men of Spanish-speaking countries. It was immediately successful.

Encouraged by this enterprise, at the time controlled by Mr. George Evans, the management initiated further efforts of the kind, and issues were accordingly printed in the Dutch language for distribution in the Netherlands Indian Colonies, and in Italian. In 1888 Mr. W. J. Rivington acquired an interest in the business and two years later became managing proprietor on the death of Mr. Pope. Shortly afterwards a Japanese edition known as "Zasshi" was established, being translated and printed at Tokio. In the interests of this project a visit was paid by Mr. Rivington to Japan, and as the result of another journey to Russia in 1897 a Russian issue, the "Vestnik," was brought out from offices at Moscow. Ten years later a Chinese edition was published at Shanghai. With the exception of the "Supplemento Espanol," which has continued to progress and is now one of the most valuable features of the BRITISH TRADE JOURNAL, the foreign interests had to be abandoned on the outbreak of war. On the death of Mr. W. J. Rivington in 1914 the business passed into the hands of his son, Mr. W. G. Rivington, who for the next four years held a commission in the Coldstream Guards.

The editors are Mr. Heuner, who has given able service to the BRITISH TRADE JOURNAL for many years, and Mr. A. R. Edge. The manager is Mr. F. Buckingham. On the change of proprietorship in 1929 the first Portuguese edition was published.

Fifty Years' Progress.

The next of the Agnew journals, THE MILLER, was founded in 1875 by William Dunham, a practical miller and millstone engineer who had a thorough knowledge of the trade. The first issue appeared at the time of the great crisis when the 10,000 small mills of the country were faced with the problem of combating the importation of flour ground on the new roller system. On every hand there was a keen desire for knowledge of this new process, and of its chances of sweeping the old millstones out of existence. It was then that the founder, in response to urgent requests, decided to publish a technical journal of the craft, to spread knowledge of the new machinery and of the attempts to improve the old.

Almost from the first William Dunham had the assistance of Mr. Edward Martin, who joined the staff in 1881, and since his retirement in 1929 has remained advisory editor. "In my opinion," Mr. Martin writes of the early days, "there is not the slightest doubt that flour milling as a British industry would have, at that period, received a most crushing blow, had not the MILLER come into existence at the psychological moment. It is an old axiom that in most emergencies the man needed appears on the scene, and unquestionably the new journal saved the situation. It is pleasing to recognise in our columns of that period, several of the good old names who are still regular advertisers, as they have been, without a break, for a period of over fifty years."

Shortly after this crisis there arose the urgent necessity of forming a trade association and the MILLER once more took the lead in doing the spade work which led to the foundation of the National Association of British and Irish Millers. The present Editor of the journal is Mr. H. G. Catchpool, and the Manager Mr. J. H. Waterfall.

The LEATHER TRADES' REVIEW, although the junior of Bouverie House, was founded in 1867 and is the oldest leather trade journal in the world. Like several of its associates, it was "born in the trade," its founder and first Editor having been Mr. Cleeve Hooper, a leather and tanning material merchant of Bermondsey. All its editors since have been men who have given practical service in the trade, and Mr. J. C. Harrington, the present occupier of the chair, is no exception to that tradition. It is a coincidence that the first number was published at 75, Fleet Street, a position very near to where Bouverie House now stands.

The tanning and manufacture of leather in 1867 differed greatly from the methods followed to-day. There were no large tanneries employing hundreds of men, on the other hand every small town and many a village had its little tanyard, where the hides from cattle killed in the district were dealt with, and the resultant leather was to a large extent consumed locally. One modern tannery will produce more leather in a day than some of the country tanneries of 1867 could produce in a year. From the outset the LEATHER TRADES REVIEW urged the application of scientific principles, long before the thought had been seized by the trade mind. It was uphill work, but thanks largely to the splendid support of the late Professor Procter—the father of leather chemistry—in the articles which appeared in the paper, success was gradually achieved, and culminated in the establishment of the Procter Research Laboratory at Leeds University. The value of the achievement is shown by the numerous research institutions in France, Australia and the United States, which have since been modelled on the Procter Laboratory.

The King's Message.

On February 1, 1930, the Jubilee banquet of Benn Brothers was held in London and attended by distinguished leaders in journalism, industry, and politics. The company was honoured by a telegram from the King, sent in reply to a loyal message from the Chairman. "The King is interested to hear that to-day you are commemorating the fiftieth anniversary of the foundation of your firm, and that on this auspicious occasion representatives of so many important trades are joining in the celebration. I am commanded to convey to all present the sincere thanks of His Majesty for your message of loyal greetings and to express the hope that every success may attend the efforts of your publishing house for the development of British trade."

No more gratifying tribute to the past endeavours of Benn Brothers or greater encouragement for their future could be desired. His Majesty has recognised with unerring insight the important service which trade journals render to industry, stimulating, guiding, and truthfully reflecting the activities of thousands of men and women engaged in commercial pursuits. The message sent from Sandringham shows how deep is his concern for British trade and how sincere his wishes for the continued success of an organisation whose very existence is bound up in the progress of industry. Every speaker at the Jubilee banquet reflected the unanimous sentiments of the four hundred guests of the firm, in testifying to the sincerity of purpose which has guided the policies of the house since its inception by Sir John Benn fifty years ago. It has been a record of unbroken progress and has been achieved on lines which had their origin in personal enterprise and endeavour.

One of the greatest characteristics of British commerce it its idea of permanence, its vision of continuance from generation to generation, in a word, its tradition. All that is best in British industry has this great respect for the past and this belief in continuity of purpose in the future. From the Throne downwards the support of old institutions is part and parcel of British policy, and the House of Benn to-day stands as an example of what can be achieved by two or three generations of consistent activity carried on from father to son.

Rapid as has been the rise of the trade and technical journal, no limit can be set to its prospects of expansion. Vast areas of publicity are still untapped, and an increasing demand for the co-operation of the trade journal will arise not only from old industries rejuvenated, but from new industries eager for markets. The King, in his stimulating message, looks forward to no uncertain goal—the development of British trade. The influence of the trade journal will grow in the ratio in which British trade develops, and each will be the more secure for the unqualified co-operation of the other.

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SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

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'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

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Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CENTRAL ELECTRICITY BOARD.

SOUTH EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite Tenders for the Supply, Delivery and Erection of 33 000 VOLT OVERHEAD TRANSMISSION LINES in South East England.

Copies of the Specification No. S.E.E.—S.L.3 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Wednesday, January 8th, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a bona fide Tender.

Tenders on the form supplied, endorsed "Tender for Specification No. S.E.E.—S.L.3," must be delivered to the offices of the Board not later than 12 o'clock noon on Saturday, February 1st, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

COUNTY BOROUGH OF DEWSBURY.

THE Corporation of Dewsbury invite Tenders for the supply, delivery and erection of Rotary Converter Plant (1 500 kWt and 500 kWt).

Specification and Form of Tender may be had on application to R. W. Grubb, Esq., M.I.E.E., Borough Electrical Engineer, Bradford Road, Dewsbury.

Tenders, endorsed "Rotary Plant," and addressed to the undersigned, must be delivered not later than 12 noon, on Monday, January 13th, 1930.

The Corporation does not bind itself to accept the lowest or any tender.

HOLLAND BOOTH,
Town Clerk.

Town Hall,
Dewsbury.
December 19th, 1929.

COUNTY BOROUGH OF GRIMSBY.

ELECTRICITY DEPARTMENT.

THE Corporation of Grimsby are prepared to receive Tenders for the manufacture, delivery and complete erection of

ONE 10,000 KILOWATT, THREE-PHASE TURBO ALTERNATOR WITH CONDENSING PLANT.

The Specification and Form of Tender can be obtained from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby, upon payment of a deposit of £2 2s. (Two Guineas).

The deposit will only be returned after a *bona fide* Tender has been opened by the Committee, and after the Specification and Form of Tender has been returned intact.

Sealed tenders, endorsed "Tender for Works Plant," must be delivered to the undersigned not later than noon on Thursday, the twenty-third day of January, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

S. R. WINDLE,
Borough Electrical Engineer.

Electricity Offices,
Moss Road,
Grimsby.
December 16th, 1929.

CORPORATION OF LIVERPOOL ELECTRICAL SUPPLY DEPARTMENT.

CONTRACTS FOR SUPPLY OF MATERIALS.

THE Corporation are prepared to receive Tenders for the supply and delivery, as required during the twelve months ending March 31st, 1931, of the various materials scheduled as below.

Firms are required to state clearly when making application for the necessary tender forms the name and number of the Form desired.

Duplicate Forms of Tender for record purposes will not be supplied.

ES.1. Cables, Compounds and Tapes for Street Mains.
ES.2. Insulated Cables.
ES.3. Electric Meters.
ES.4. Steam, Water and Gas Tubes, Flanges and Fittings.
ES.5. Incandescent Electric Lamps.
ES.6. Brass and Copper Castings.
ES.7. A.C. Electric Motors and Starting Gear.
ES.8. Stoneware Troughing, Tiles and Concrete Cable Covers.
ES.9. Lubricating Oils.
ES.10. Creosoted Red Firwood Poles, Baulks and Cattle Guards.
ES.11. Electric Cookers and Kettles.

Tender Forms will be forwarded upon receipt of application in writing to:

THE CITY ELECTRICAL ENGINEER,
24, Hatton Garden,
Liverpool.

Latest date for receipt of tenders—Thursday, January 23rd, 1930.

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CITY OF BATH.

ELECTRICITY DEPARTMENT.

TENDERS are invited for the supply of the following plant and cables:—

1. One 60 000 lb. Boiler.
2. One 7 000 Kilowatt Turbo-Alternator.
3. E.H.T., H.T. and L.T. cables, required over a period of twelve months.

Specifications and Forms of Tender may be obtained from the undersigned upon application with a deposit of £2 2s. for each section.

Deposits will be returned only after receipt of a *bona fide* tender by the appointed date.

Sealed tenders endorsed: "Tender for Boiler," "Tender for Turbo-Alternator," or "Tender for Cables," as the case may be, must be delivered to the undersigned not later than 12 noon on Wednesday, January 22nd, 1930.

The Corporation does not bind itself to accept the lowest or any tender.

J. W. SPARK,
City Electrical Engineer.

Electricity Offices,
7, Dorchester Street,
Bath.
January 1st, 1930.

ELECTRICAL INSTALLATION.

THE Committee of Visitors of the Mental Hospital, Barming Heath, Maidstone, invite Tenders for an electrical installation for lighting, heating, etc., at the above-mentioned hospital.

Electrical energy will be supplied from the mains of the Maidstone Corporation.

Specification, conditions of contract, and tender form may be obtained on application to the Consulting Engineer, Mr. E. E. Hoadley, Corporation Electricity Works, Maidstone.

Plans of the Mental Hospital may be inspected at the office of the Consulting Engineer by appointment.

Applications for specifications must be accompanied by a cheque for two guineas, payable to Mr. E. E. Hoadley.

This sum will be returned on receipt of a *bona fide* tender.

Tenders, in a sealed envelope endorsed "Tender for Electrical Installation," are to be delivered to Mr. H. J. Bracher, 44, Earl Street, Maidstone, before 11 a.m. on Thursday, January 16th, 1929.

The Committee does not bind itself to accept the lowest or any tender.

H. J. BRACHER,
Clerk to the Committee.

44, Earl Street, Maidstone.

NOTICE.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

FULHAM BOROUGH COUNCIL ELECTRICITY DEPARTMENT

LADY Showroom Assistant and Demonstrator Required (temporary staff appointment). Experienced in demonstrating use of electric cookers and other electrical apparatus at consumers' houses as well as in showrooms essential. Applications, stating age, qualifications, experience, and salary required, with copies of recent testimonials, to be delivered not later than January 11, to Town Clerk, Town Hall, Fulham, S.W.6. Canvassing strictly prohibited.

£275/325 ACCORDING to Qualifications.—A man, age about 30, is required by a firm of Ironmongers in the Midlands to take charge of an Electrical Showroom, including estimating for wiring and small power installations.—Applicants should state age, qualifications, and experience to Box A.U.K., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

APPLICATIONS are invited for the posts of Technical Assistant in the Admiralty Technical Pool to fill the vacancies at the Admiralty Compass Department, Slough.

Practical knowledge of, and training in, light mechanical engineering with workshop and drawing office experience are required. An elementary knowledge of electrical principles and their applications in electrical test rooms are essential qualifications. The scale of salary is £140, rising by annual increments of £10 to £190, plus Civil Service bonus, making a present commencing total of £219 per annum. Preference will be given to ex-Service men. Applications, together with copies of testimonials, should be forwarded to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1, not later than January 13th, 1930. No application forms are required.

APPLICATIONS are invited for the post of Senior Technical Assistant in the Admiralty Technical Pool to fill a vacancy at the Admiralty Compass Department, Slough.

Candidates should have had workshop experience in light mechanical engineering, and preferably in a supervisory or inspecting capacity. A knowledge of low-power electrical machinery and of the testing methods applicable thereto, together with ability to read and interpret mechanical and electrical drawings, are also required.

The scale of salary is £200, rising by annual increments of £10 to £290, plus Civil Service bonus, making a present commencing total of £299 per annum.

Preference will be given to ex-Service men.

Applications, together with copies of testimonials, should be forwarded to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1, not later than January 13th, 1930. No application forms are required.

MAINS SUPERINTENDENT.

THE Barnes Urban District Council invite applications for this post. Candidates must have had a sound technical training, a thorough knowledge of and experience in H.T. Transmission, Rotary Converter Sub-stations and Low Tension D.C. 3-wire distribution.

The selected candidate will be required to undergo medical examination and to contribute to the Council's superannuation scheme.

National Joint Board's conditions, Class "D," Grade 3.

Applications, in own handwriting, stating age and giving full and concise particulars of training and experience, together with copies of recent testimonials, to be sent to the ENGINEER AND MANAGER, Electricity Works, Mortlake, S.W.14.

COUNTY BOROUGH OF WEST HARTLEPOOL.

APPOINTMENT OF BOROUGH ELECTRICAL ENGINEER.

APPLICATIONS are invited from qualified Electrical Engineers, who must have sound commercial ability and experience, for the position of Borough Electrical Engineer, upon forms to be obtained from me, which must be delivered duly completed and endorsed "Borough Electrical Engineer," at the Municipal Buildings, West Hartlepool, not later than Saturday, January 11th, 1930.

The salary, which will be in accordance with the National Minimum Scale of Salaries for Chief Electrical Engineers of authorised Electricity Supply Undertakings, amounts to £1,125 for the current year.

The person appointed will in all probability be appointed to the position of Transport Manager, which would carry with it an additional salary of £150 per annum.

Canvassing directly or indirectly will be a disqualification.

HAROLD W. STANTON,
Town Clerk.

Municipal Buildings,
West Hartlepool.
December 20th, 1929.

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MISCELLANEOUS ADVERTISEMENTS

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Plans of the Mental Hospital may be inspected at the office of the Consulting Engineer by appointment.

Applications for specifications must be accompanied by a cheque for two guineas, payable to Mr. E. E. Hoadley.

This sum will be returned on receipt of a *bona fide* tender.

Tenders, in a sealed envelope endorsed "Tender for Electrical Installation," are to be delivered to Mr. H. J. Bracher, 44, Earl Street, Maidstone, before 11 a.m. on Thursday, January 16th, 1929.

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Clerk to the Committee.

44, Earl Street, Maidstone.

COUNTY BOROUGH OF GRIMSBY.

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S. R. WINDLE,
Borough Electrical Engineer.

Electricity Offices,
Moss Road,
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December 16th, 1929.

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ES.9. Lubricating Oils.
ES.10. Creosoted Red Firwood Poles, Baulks and Cattle Guards.
ES.11. Electric Cookers and Kettles.

Tender Forms will be forwarded upon receipt of application in writing to:

WALTER MOON,
Town Clerk.

24, Hatton Garden,
Liverpool.

Latest date for receipt of tenders—Thursday, January 23rd, 1930.

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ARMY CONTRACTS.

NOTICE is hereby given that tenders for quantities of the undermentioned manufactured goods are invited from time to time, as required :—

METAL TRADES :—

Aluminium ingot, Brass, Brass rod and sheet, Bronze stampings, Copper ingot and sheet, Lead, pig and sheet, Metal rod, Nickel, Pig-iron, Steel plate, rounds, sheets, etc. Shell steel, Tin ingot, Tinplates, Zinc ingot and sheets.

Baths, Bicycles, Building Materials and fitments, Cutlery (including safety razors and blades), Enamelled ware, Hollow-ware, Horse Shoes, Ironmongery, Machinery, Pipes, steel and cast iron, Stable Fitments, Stoves and Ovens, Sanitary Appliances, Tinware, Tools, Vehicles, Wire, Wire Rope.

ELECTRICAL AND SCIENTIFIC INSTRUMENT TRADES :—

Cables, Electrical Plant, Electrical and Wireless Stores, Scientific Instruments.

TEXTILE TRADES :—

Blankets and Rugs, Braid and Lace, Canvas and Canvas Goods, Clothing (made up from department's own materials), Cotton Piece Goods and Cotton Goods, Cordage, Flannel (Union), Headdresses, Horse Rugs, Hosiery, Linen Piece Goods, Silk Cloth and Webbing and Sewing Silk, Towels, Woollen Cloths.

FOODSTUFFS, COAL AND COKE.

OTHER TRADES :—

Badges and Buttons, Basketware, Bedding, Boots and Shoes, Brooms and Brushes, Chemicals and Gases, China and Earthenware, Furniture, Harness and Saddlery, Leather and Leather Goods, Linoleum, Medical Supplies, Oils and Spirits, Paints and Varnishes, Rubber Boots and Clothing, Timber, Woodware.

Manufacturers who are not already on the War Office List of Tenderers, and who may wish to be invited to tender for Army requirements of the above stores, should apply to the Director of Army Contracts at the address given below for Form 1, on which formal application for inclusion on the list of tenderers may be made. The services of an intermediary are unnecessary in approaching the Department for this purpose.

Before being placed on the lists of tenderers, firms will have to satisfy the Department that they actually manufacture goods for which they wish to be noted, and will be required to furnish the names of at least two well-known firms or public bodies who have purchased from them and are in a position to certify as to the quality of their productions. They will further have to give an undertaking that they will comply with the Fair Wages Resolution of the House of Commons.

Attention is called to the following resolution passed by both Houses of Parliament on February 16th, 1926 :—

"That, in the opinion of this House, it is the duty of the Government in all Government contracts to make provision for the employment to the fullest possible extent of disabled ex-service men, and to this end to confine such contracts, save in exceptional circumstances, to employers enrolled on the King's National Roll."

SALES.

From time to time the Department has for sale surplus Army stores of various descriptions, among which may be mentioned Machinery, Steel Girder Bridges, Scrap Metals, Hutting, Motor Vehicles, Drugs, Medical and Dental Stores, Veterinary Stores, Optical and Scientific Instruments, Electrical and Wireless Stores Clothing, Boots, Textile Goods, Paint.

Firms who wish to be invited to tender for the purchase of surplus stores should apply as directed below.

All applications should be in writing and should be addressed to the Director of Army Contracts, Caxton House (West), Tothill Street, Westminster, London, S.W.1. No application is necessary from firms whose names are already on the War Office lists, unless they have extended the range of their manufactures.

FRANCIS OSBORN,
Director of Army Contracts.

COUNTY BOROUGH OF DEWSBURY.

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Specification and Form of Tender may be had on application to R. W. Grubb, Esq., M.I.E.E., Borough Electrical Engineer, Bradford Road, Dewsbury.

Tenders, endorsed "Rotary Plant," and addressed to the undersigned, must be delivered not later than 12 noon, on Monday, January 13th, 1930.

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HOLLAND BOOTH,
Town Clerk.

Town Hall, Dewsbury
December 19th, 1929.

CITY OF BATH.

ELECTRICITY DEPARTMENT.

TENDERS are invited for the supply of the following plant and cables :—

1. One 60 000 lb. Boiler.
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3. E.H.T., H.T. and L.T. cables, required over a period of twelve months.

Specifications and Forms of Tender may be obtained from the undersigned upon application with a deposit of £2 2s. for each section.

Deposits will be returned only after receipt of a *bona fide* tender by the appointed date.

Sealed tenders endorsed: "Tender for Boiler," "Tender for Turbo-Alternator," or "Tender for Cables," as the case may be, must be delivered to the undersigned not later than 12 noon on Wednesday, January 22nd, 1930.

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J. W. SPARK,
City Electrical Engineer.

Electricity Offices,
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BOROUGH OF CAERNARVON.

THE Caernarvon Corporation invites applications for the post of Engineer and Manager of its Electricity Undertaking.

Terms and conditions with forms of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope.

JOHN WILLIAMS,
Town Clerk.

Caernarvon.

ELECTRICAL LABORATORY requires Research Assistant with Electrical or Physics Degree. Salary, £200-£250 per year, according to qualifications and experience.—Apply to Box A.V.K., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

£275/325 ACCORDING to Qualifications.—A man, age about 30, is required by a firm of Ironmongers in the Midlands to take charge of an Electrical Showroom, including estimating for wiring and small power installations.—Applicants should state age, qualifications, and experience to Box A.U.K., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

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Baths, Bicycles, Building Materials and fitments, Cutlery (including safety razors and blades), Enamelled ware, Hollow-ware, Horse Shoes, Ironmongery, Machinery, Pipes, steel and cast iron, Stable Fitments, Stoves and Ovens, Sanitary Appliances, Tinware, Tools, Vehicles, Wire, Wire Rope.

ELECTRICAL AND SCIENTIFIC INSTRUMENT TRADES :—

Cables, Electrical Plant, Electrical and Wireless Stores, Scientific Instruments.

TEXTILE TRADES :—

Blankets and Rugs, Braid and Lace, Canvas and Canvas Goods, Clothing (made up from department's own materials), Cotton Piece Goods and Cotton Goods, Cordage, Flannel (Union), Headdresses, Horse Rugs, Hosiery, Linen Piece Goods, Silk Cloth and Webbing and Sewing Silk, Towels, Woollen Cloths.

FOODSTUFFS, COAL AND COKE.

OTHER TRADES :—

Badges and Buttons, Basketware, Bedding, Boots and Shoes, Brooms and Brushes, Chemicals and Gases, China and Earthenware, Furniture, Harness and Saddlery, Leather and Leather Goods, Linoleum, Medical Supplies, Oils and Spirits, Paints and Varnishes, Rubber Boots and Clothing, Timber, Woodware.

Manufacturers who are not already on the War Office List of Tenderers, and who may wish to be invited to tender for Army requirements of the above stores, should apply to the Director of Army Contracts at the address given below for Form 1, on which formal application for inclusion on the list of tenderers may be made. The services of an intermediary are unnecessary in approaching the Department for this purpose.

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THE Corporation are prepared to receive Tenders for the supply and delivery, as required during the twelve months ending March 31st, 1931, of the various materials scheduled as below.

Firms are required to state clearly when making application for the necessary tender forms the name and number of the Form desired.

Duplicate Forms of Tender for record purposes will not be supplied.

ES.1. Cables, Compounds and Tapes for Street Mains.
ES.2. Insulated Cables.
ES.3. Electric Meters.
ES.4. Steam, Water and Gas Tubes, Flanges and Fittings.
ES.5. Incandescent Electric Lamps.
ES.6. Brass and Copper Castings.
ES.7. A.C. Electric Motors and Starting Gear.
ES.8. Stoneware Troughing, Tiles and Concrete Cable Covers.
ES.9. Lubricating Oils.
ES.10. Creosoted Red Firwood Poles, Baulks and Cattle Guards.
ES.11. Electric Cookers and Kettles.

Tender Forms will be forwarded upon receipt of application in writing to :

WALTER MOON,
Town Clerk.

24, Hatton Garden,
Liverpool.

Latest date for receipt of tenders—Thursday, January 23rd, 1930.

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COUNTY BOROUGH OF GRIMSBY.

ELECTRICITY DEPARTMENT.

THE Corporation of Grimsby are prepared to receive Tenders for the manufacture, delivery and complete erection of

ONE 10,000 KILOWATT, THREE-PHASE TURBO ALTERNATOR WITH CONDENSING PLANT.

The Specification and Form of Tender can be obtained from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby, upon payment of a deposit of £2 2s. (Two Guineas).

The deposit will only be returned after a ***bona fide*** Tender has been opened by the Committee, and after the Specification and Form of Tender has been returned intact.

Sealed tenders, endorsed "Tender for Works Plant," must be delivered to the undersigned not later than noon on Thursday, the twenty-third day of January, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

S. R. WINDLE,
Borough Electrical Engineer.

Electricity Offices,
Moss Road,
Grimsby.
December 16th, 1929.

CITY OF BATH.

ELECTRICITY DEPARTMENT.

TENDERS are invited for the supply of the following plant and cables:—

1. One 60 000 lb. Boiler.
2. One 7 000 Kilowatt Turbo-Alternator.
3. E.H.T., H.T. and L.T. cables, required over a period of twelve months.

Specifications and Forms of Tender may be obtained from the undersigned upon application with a deposit of £2 2s. for each section.

Deposits will be returned only after receipt of a *bona fide* tender by the appointed date.

Sealed tenders endorsed: "Tender for Boiler," "Tender for Turbo-Alternator," or "Tender for Cables," as the case may be, must be delivered to the undersigned not later than 12 noon on Wednesday, January 22nd, 1930.

The Corporation does not bind itself to accept the lowest or any Tender.

J. W. SPARK,
City Electrical Engineer.

Electricity Offices,
7, Dorchester Street,
Bath.
January 1st, 1930.

APPOINTMENTS VACANT.

BOROUGH OF CAERNARVON.

THE Caernarvon Corporation invites applications for the post of Engineer and Manager of its Electricity Undertaking.

Terms and conditions with forms of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope.

JOHN WILLIAMS,
Town Clerk.

Caernarvon.

TECHNICAL ASSISTANT required by, say, February 3rd, for Committee work and to translate technical articles from German and French. Electrical engineering degree or equivalent desirable. Commencing salary from £250 according to qualifications.—Apply by letter stating age, qualifications and salary required.—ELECTRICAL RESEARCH ASSOCIATION, 36 and 38, Kingsway, W.C.2.

ELECTRICAL LABORATORY requires Research Assistant with Electrical or Physics Degree. Salary, £200-£250 per year, according to qualifications and experience.—Apply to Box A.V.K., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

SENIOR and Junior Draughtsmen required for High and Low Tension Switchboards; also for Automatic Sub-station Control Gear and Metal-clad Switchgear.—Apply, stating age, full experience, and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

SUDAN GOVERNMENT RAILWAYS require the services of an ELECTRICAL FOREMAN for quay machinery at Port Sudan. Candidates should be capable of carrying out repairs and maintenance of motors, wiring, electrical equipment of cranes, transporters and general quay machinery. Should be used to outside work and climbing of high structures. Only candidates used to similar employment will be considered. Special consideration to men capable of making lead joints on large single and concentric cables. Age 25 to 30, single preferred. Starting rate of pay £E.300 to 360 per annum according to age and qualifications (£E.1=£1 0s. 6d.). Probationary contract for eighteen months. Permanent and progressive post to successful candidates. Free second-class passage. Liberal leave on full pay if retained in the service.

Apply by letter stating age, qualifications and experience to: ADVISORY ENGINEER, Sudan Government London Office, Wellington House, Buckingham Gate, S.W.1, marking envelope "Electrical Foreman."

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

APPOINTMENT OF DISTRIBUTION ENGINEER.

APPLICATIONS are invited for the position of distribution engineer to take charge of the construction, subsequent maintenance and operation of a low tension distribution system and also of main and secondary transmission lines in connection therewith.

The salary will be £650 per annum.

Applicants must have received a sound technical training, and preference will be given to men having had previous experience on a large undertaking with 33 000 V and 11 000 V transmission lines and overhead distribution systems in rural areas.

The successful applicant will be required to undergo an approved medical examination and contribute to the Authority's Superannuation Scheme, under the Local Government and Other Officers' Superannuation Act, 1922.

Applications, giving full particulars of technical training, experience and stating age and the earliest date on which duties could be commenced, accompanied by copies of not more than three recent testimonials, should be addressed to the undersigned, endorsed "Distribution Engineer," and delivered at this office not later than January 25th, 1930.

H. F. CARPENTER,
Clerk and Treasurer.

January 6th, 1930.
Offices of the Authority:
Phœnix Buildings,
Dudley Road,
Wolverhampton.

T.I.G.B. TRAINING FOR RESULTS.

WHATEVER be your aim—a Better Technical Equipment; a Professional Examination Qualification; Advancement to a Responsible Post—you can select T.I.G.B. Correspondence Training with complete confidence.

Here is proof in the form of Typical Tributes from Successful Examination Candidates:—

A.M.I.E.E. Exam.

B. W., Stoke.—"I have passed the A.M.I.E.E. Exam. The happy issue of this attempt was very largely due to your efficient training."

A.M.I.Mech.E. Exam.

H. W. M., Rochdale.—"Have passed. I was surprised to find so many questions similar to those set during the course."

A.M.Inst.C.E. Exam.

T. N., Sutton.—"I beg to say that I sat for the recent A.M.Inst.C.E. Exam., Part C., and have passed."

Write TO-DAY for a FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of engineering courses in the world, and state the *Qualification, Post or Branch that interests you.*

The T.I.G.B. guarantees training until successful.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN (Established 1917), 10, TEMPLE BAR HOUSE, LONDON, E.C.4

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

TENDERS INVITED.

METROPOLITAN BOROUGH OF HAMMERSMITH.

GENERAL ELECTRICITY STORES, ETC.

THE Borough Council invites Tenders for the supply of Stores and Materials, and the execution of the works, set out hereunder, for a period of twelve calendar months, commencing April 1st, 1930:—

1. Electrical Lighting Sundries.
2. Files.
3. Firebricks and Clay.
4. Insulated Wires.
5. Metals (Solder, Lead Pipe, etc.)
6. Iron and Steel.
7. Bolts, Nuts and Metal Screws.
8. Steam Tubes and Fittings.
9. Steam Packings.
10. Tools (Small Engineers').
11. Ironmongery (Hardware).
12. Joint Boxes and Connections.
13. Cast Iron Draw Box Frames and Covers.
14. Public Lamp Columns.
15. Meters (Ordinary and Prepayment).
16. Stoneware Conduit.
17. Insulating Compound for Joint Boxes.
18. High and Low-Tension Concentric Paper Insulated Cables.
19. Lubricating and Diesel Fuel Oils.
20. Broad Salt for water softening purposes.
21. Disposal of Ashes and Flue Dust.
22. Sundry Cartage work.
23. Plywood Meter Boards.

Forms of Tender and particulars may be obtained from the Borough Electrical Engineer, 85, Fulham Palace Road, W.6, upon receipt of a stamped addressed brief envelope, and where duplicate copies are required, a remittance of 2s. 6d. must be made.

Sealed Tenders, endorsed "Tender for Electricity Stores," must be delivered to the undersigned at the Town Hall, Hammersmith, W.6, not later than 12 noon, on Wednesday, 26th February, 1930.

The Council does not bind itself to accept the lowest or any Tender.

HUGH ROYLE, Town Clerk.

Town Hall, Hammersmith, W.6.
20th January, 1930.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

ELECTRICAL INSTALLATION WORK.

THE Bethnal Green Borough Council invites Tenders for Electric Lighting Installations at a block of tenement dwellings in Bethnal Green.

Copies of the form of tender, conditions and specification may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* tender. Technical inquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Wiring Scheme—Huntingdon Buildings," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Thursday, January 30th, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

CLEETHORPES URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the supply and installation at the Cleethorpes Bathing Pool of a Gramophone and Microphone Equipment, including Microphone Gramophone Amplifier (output 200 watts), Electric Gramophone Turn-table and Loud Speakers (Electricity Supply A.C. 230 volts, 50 cycles.)

Also Tenders for the above together with a Wireless Receiver.

Tenders, with full detailed particulars of the apparatus proposed to be installed, to be delivered to the undersigned not later than 5 p.m. on February 5th, 1930.

A. S. BAXTER.
Clerk to the Council.

Council Offices,
Cleethorpes.
January 20th, 1930.

APPOINTMENTS VACANT.

TRACTION.—Junior traction engineer required by large manufacturing firm. Technical graduate with experience run curve, etc., calculations preferred.—Write Box A.Z.K., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

TECHNICAL ASSISTANT required by, say, February 3rd, for Committee work and to translate technical articles from German and French. Electrical engineering degree or equivalent desirable. Commencing salary from £250 according to qualifications.—Apply by letter stating age, qualifications and salary required.—ELECTRICAL RESEARCH ASSOCIATION, 36 and 38, Kingsway, W.C.2.

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ELECTRICAL LABORATORY requires Research Assistant with Electrical or Physics Degree. Salary, £200-£250 per year, according to qualifications and experience.—Apply to Box A.V.K., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

SENIOR and Junior Draughtsmen required for High and Low Tension Switchboards; also for Automatic Sub-station Control Gear and Metal-clad Switchgear.—Apply, stating age, full experience, and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC Co., LTD., Witton, Birmingham.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.—Assistant Examiners in the Patent Office (20-25 with extension in certain cases).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, Civil Service Commission, Burlington Gardens, London, W.1. The latest date for the receipt of application forms is March 6th, 1930.

SUDAN GOVERNMENT RAILWAYS require the services of an ELECTRICAL FOREMAN for quay machinery at Port Sudan. Candidates should be capable of carrying out repairs and maintenance of motors, wiring, electrical equipment of cranes, transporters and general quay machinery. Should be used to outside work and climbing of high structures. Only candidates used to similar employment will be considered. Special consideration to men capable of making lead joints on large single and concentric cables. Age 25 to 30, single preferred. Starting rate of pay £E.300 to 360 per annum according to age and qualifications (£E.1 = £1 0s. 6d.). Probationary contract for eighteen months. Permanent and progressive post to successful candidates. Free second-class passage. Liberal leave on full pay if retained in the service.

Apply by letter stating age, qualifications and experience to: ADVISORY ENGINEER, Sudan Government London Office, Wellington House, Buckingham Gate, S.W.1, marking envelope "Electrical Foreman."

MUNICIPALITY OF SINGAPORE, STRAITS SETTLEMENTS.

ELECTRICITY DEPARTMENT.
ASSISTANT POWER STATION SUPERINTENDENT.
ADVERTISEMENT.

THE Municipal Commissioners of Singapore require an Assistant Power Station Superintendent, age not exceeding 40 years, for service at their New Power Station, the appointment being on the permanent staff of their Electricity Department, and being, in the first instance, upon a three years' agreement.

The capacity of the plant is over 20 000 kilowatts.

Candidates should have a thorough experience in extra high tension three-phase generation, steam turbines, water-tube boilers and mechanical stokers, and must have held a similar position previously. Preference will be given to Corporate Members of the Institution of Electrical Engineers, and the possession of a first-class Board of Trade Engineer's Certificate is desirable.

The selected candidate will be required to deputise for the Power Station Superintendent and will be expected to take shifts when necessary.

Strict medical examination.

Salary, $6,240, $6,720 and $7,200 per annum respectively for the three years of the agreement, and rising thereafter, if service be continued, in accordance with the Commissioners' Salary Scheme. The Exchange value of the dollar is 2s. 4d. sterling, at which rate the salary for the first year would amount to £728. There is at present no Income Tax. Free partially furnished quarters provided, with an allowance for lighting.

Free passage will be provided, with half salary during the voyage out, and if the selected candidate is married, passages will be provided for his wife and family (if any). Eight months' leave with full pay is normally granted after four years' service. Liberal Provident Fund.

Applications, stating whether married or single, and giving age and birthplace with details of education, training and experience and referring particularly to the qualifications mentioned above, and accompanied by copies (not originals) of testimonials, to be lodged with Messrs. Peirce and Williams, M.M.Inst.C.E., 1, Victoria Street, London, S.W.1, Agents to the Commissioners, not later than Monday, January 27th, 1930.

Further particulars, if desired, can be obtained from the Agents.

BOROUGH OF CAERNARVON.

THE Caernarvon Corporation invites applications for the post of Engineer and Manager of its Electricity Undertaking.

Terms and conditions with forms of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope.

JOHN WILLIAMS,
Town Clerk.

Caernarvon.

CANNOCK URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

APPOINTMENT OF METER DEPARTMENT ASSISTANT.

APPLICATIONS are invited for the above appointment and should be made on form obtainable from the undersigned on receipt of a stamped addressed envelope.

The official appointed must have had a sound technical and practical training in the repair, testing and calibration of all types of alternating current meters and indicators. He must have a knowledge of meter room routine and installation inspection. He will be required to assist in the Distribution Department if called upon.

Preference will be given to candidates who have had a general testing experience in connection with high tension mains, transformers, etc.

The salary offered is in accordance with the E.P.E.A. schedule Class B, Grade 8, the present value of which is £246 0s. 5d. per annum.

Canvassing in any form will be deemed a disqualification.

Completed application forms must reach the undersigned on or before February 8th, 1930.

H. L. THOMSON, A.M.I.E.E.,
Chief Engineer and General Manager,
Cannock Urban District Council,
Electricity Department,
Wolverhampton Road,
Cannock, Staffs.

AIR MINISTRY.

DIRECTORATE OF TECHNICAL DEVELOPMENT.

THE following Draughtsmen are required at the Royal Aircraft Establishment:—

REFERENCE No. A. 392.—One Draughtsman, Grade II, for work in connection with aircraft. Salary £125 plus Civil Service Bonus per annum, giving a present total starting remuneration of £199 16s. per annum, on the basic scale £125—£7 10s.—£150 plus bonus.

REFERENCE NOS. A. 373-390 AND 403.—Three Draughtsmen, Grade III. One (A.373) for work on plant and ground equipment, requiring general experience in mechanical and structural work, and preferably some surveying experience. One (A.390) for detail work in the design of wireless apparatus. One (A.403) for detail work in the design of small mechanical apparatus, such as indicating and recording instruments.

Salary:—40s. to 52s., plus Civil Service Bonus per week, depending on experience; present equivalent of 40s. to 52s., plus bonus, is £3 6s. 2d. to £4 2s.

Candidates should have had good technical training and experience appropriate to the position for which application is made. Preference given, other things being equal, to ex-service men.

Write (quoting appropriate reference Number), stating age and full particulars of training and experience, to the Chief Superintendent, Royal Aircraft Establishment, South Farnborough, Hants.

T.I.G.B. TRAINING FOR RESULTS.

WHATEVER be your aim—a Better Technical Equipment; a Professional Qualification; Advancement to a Responsible Post—you can select T.I.G.B. Correspondence Training with complete confidence.

I.E.E., I.Mech.E., Inst.C.E., I.Struct.E., B.O.T., C. and G., etc. At the 1928 and 1929 Examinations (according to available results) T.I.G.B. students achieved THE RECORD PASS FIGURE OF 94·7%.

Write TO-DAY for a FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of Engineering Courses in the world, and state the *Qualification, Post, or Branch that interests you.*

The T.I.G.B. Guarantees Training until Successful.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN (Established 1917), 10, TEMPLE BAR HOUSE, LONDON, E.C.4.

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SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CENTRAL ELECTRICITY BOARD.

CENTRAL ENGLAND ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for the Supply, Delivery and Erection of Transformer Oil Treating Plant for 18 transformer stations in the area of the Central England Scheme.

Copies of the Specification No. C.E.—P.S.2 and Form of Tender may be obtained from the offices of the Board, on application to the undersigned on or after Monday, February 3rd, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a bona-fide tender.

Tenders on the form supplied, endorsed "Tender for Specification No. C.E.—P.S.2," must be delivered to the offices of the Board not later than 12 o'clock noon on Saturday, February 22nd, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CLEETHORPES URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the supply and installation at the Cleethorpes Bathing Pool of a Gramophone and Microphone Equipment, including Microphone Gramophone Amplifier (output 200 watts), Electric Gramophone Turn-table and Loud Speakers (Electricity Supply A.C. 230 volts, 50 cycles.)

Also Tenders for the above together with a Wireless Receiver.

Tenders, with full detailed particulars of the apparatus proposed to be installed, to be delivered to the undersigned not later than 5 p.m. on February 5th, 1930.

A. S. BAXTER.
Clerk to the Council.

Council Offices,
Cleethorpes.
January 20th, 1930.

CITY OF LEEDS.

ELECTRICITY DEPARTMENT.

ANNUAL CONTRACTS FOR STORES.

THE Leeds Corporation invite Tenders for the supply of the following goods required for the Electricity Department during the year ending March 31st, 1931 :—

C. Castings of Gunmetal, Copper and Iron.
D. Bolts, Nuts, Screws, etc.
E. Gas and Weldless Steel Tubes.
G. Lead Sleeves and other Plumbers' Materials.
H. Tinners' and Ironmongers' Sundries and Engineers' Furnishings (including Packings, Rubber Goods, Files and Sundry Metals).
J. Oils and Chemists' Sundries.
K. Cotton Waste and Wipers (bleached rags).
L. Ropes, Twines, Tarpaulin Goods, etc.
N. India-rubber Covered Cables, Mains Boxes and Fittings, Jointing and Insulating materials, Fittings and Sundries.
P. Wood Bushes, Hammer Shafts, etc.
Q. Building Materials—Fire and other Bricks, etc.
R. India Grey Tapes.

Schedules, Conditions of Contract and Forms of Tender may be had on application to Mr. C. Nelson Hefford, General Manager, Electricity Department, 1, Whitehall Road, Leeds, stating the section for which the applicant desires to tender.

Tenders in sealed envelopes, endorsed "Electricity—Tender for Stores," must be delivered to me at my office, 26, Great George Street, Leeds, on or before Tuesday, February 18th, 1930.

The Corporation do not bind themselves to accept the lowest or any of the Tenders sent in.

THOS. THORNTON,
Town Clerk.

Leeds.
January 25th, 1930.

NOTICES.

ELECTRICITY (SUPPLY) ACT, 1926.

NORTH-EAST ENGLAND ELECTRICITY SCHEME, 1929.

NOTICE is hereby given that in exercise of the powers conferred upon them by Section 4 of the Electricity (Supply) Act, 1926, the Central Electricity Board have adopted (subject to certain modifications) the scheme intituled "North-East England Electricity Scheme, 1929," and transmitted to them by the Electricity Commissioners, and have published the Scheme as so adopted.

Copies of the Scheme may be obtained at the price of one shilling and sixpence each from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, and 120, George Street, Edinburgh.

Dated this 24th day of January, 1930.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, London, W.C.2.

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THE Eastern Extension Australasia and China Telegraph Company, Limited.—Notice is Hereby Given that the Four Per Cent. Mortgage Debenture Stock Register will be closed from the 27th to the 31st instant, both days inclusive.—EDWARD WILSHAW, General Manager and Secretary, Electra House, Moorgate, London, E.C.2. January 21st, 1930.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London. S W.1.

APPOINTMENTS VACANT.

TRACTION.—Junior traction engineer required by large manufacturing firm. Technical graduate with experience run curve, etc., calculations preferred.—Write Box A.Z.K., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DRAUGHTSMEN, Senior and Junior, required, with good experience on Electric Control Apparatus.—Write fullest particulars of training, experience, age and salary, Box 724, SELLS, Fleet Street, E.C.4.

GOOD OPPORTUNITIES FOR PROGRESSIVE MEN.

SEVERAL vacancies exist for men with practical experience in planning, installing and testing modern telephone equipment. Permanent positions for men of proved ability.—Apply, stating details of previous experience, to Box A.A.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

TECHNICAL ASSISTANT required by, say, February 3rd, for Committee work and to translate technical articles from German and French. Electrical engineering degree or equivalent desirable. Commencing salary from £250 according to qualifications.—Apply by letter stating age, qualifications and salary required.—ELECTRICAL RESEARCH ASSOCIATION, 36 and 38, Kingsway, W.C.2.

SENIOR and Junior Draughtsmen required for High and Low Tension Switchboards; also for Automatic Sub-station Control Gear and Metal-clad Switchgear and Contractor Gear.—Apply, stating age, full experience, and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.—Assistant Examiners in the Patent Office (20-25 with extension in certain cases).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, Civil Service Commission, Burlington Gardens, London, W.1. The latest date for the receipt of application forms is March 6th, 1930.

REQUIRED.—Experimental Assistant (male, under 21). Applicants should hold a Matriculation or equivalent certificate, including mathematics and a scientific subject.

Scale of pay, according to age—

From 17s. per week, plus Civil Service Bonus at 16 years of age.

To 26s. per week, plus Civil Service Bonus at 20 years of age.

The present total emoluments of the above rates, including Civil Service Bonus, are 28s. 11d. and 44s. 3d. per week respectively.

Normal hours of duty—42 a week.

Applications should be made in writing to the SUPERINTENDENT, Air Defence Experimental Establishment, Biggin Hill, near Westerham, Kent, stating qualifications and giving two personal references.

WANTED by electrical firm of high standing near London, Stores Manager with considerable organising ability and experience of up-to-date stores methods; commencing salary £35 per month.—Write stating age and experience to Box A.B.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPARTMENT.

APPOINTMENT OF CHIEF ASSISTANT ELECTRICAL ENGINEER.

APPLICATIONS for the vacant position of CHIEF ASSISTANT ELECTRICAL ENGINEER are invited from fully qualified Electrical Engineers who have had experience in the design and operation of large Generating Stations, Extra High Tension Transmission Systems, Sub-stations and Low Tension Distribution Networks.

Salary will be at the rate of £1 200 per annum, payable monthly.

The successful candidate will be required to undergo an approved medical examination and contribute to the Corporation's Superannuation Scheme.

Forms of application and particulars of duties may be obtained from the undersigned and will require to be returned, with copies of not more than three recent testimonials, by Saturday, February 15th, 1930, endorsed "Chief Assistant Electrical Engineer."

Canvassing either directly or indirectly will disqualify.

E. J. JENNINGS,
Secretary and Commercial Manager.

14, Dale End,
Birmingham.
January 25th, 1930.

AIR MINISTRY.

DIRECTORATE OF TECHNICAL DEVELOPMENT.

THE following Draughtsmen are required at the Royal Aircraft Establishment:—

REFERENCE No. A. 392.—One Draughtsman, Grade II, for work in connection with aircraft. Salary £125 plus Civil Service Bonus per annum, giving a present total starting remuneration of £199 16s. per annum, on the basic scale £125—£7 10s.—£150 plus bonus.

REFERENCE NOS. A. 373-390 AND 403.—Three Draughtsmen, Grade III. One (A.373) for work on plant and ground equipment, requiring general experience in mechanical and structural work, and preferably some surveying experience. One (A.390) for detail work in the design of wireless apparatus.. One (A.403) for detail work in the design of small mechanical apparatus, such as indicating and recording instruments.

Salary:—40s. to 52s., plus Civil Service Bonus per week, depending on experience; present equivalent of 40s. to 52s., plus bonus, is £3 6s. 2d. to £4 2s.

Candidates should have had good technical training and experience appropriate to the position for which application is made. Preference given, other things being equal, to ex-service men.

Write (quoting appropriate reference Number), stating age and full particulars of training and experience, to the Chief Superintendent, Royal Aircraft Establishment, South Farnborough, Hants.

METROPOLITAN BOROUGH OF HAMMERSMITH.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the following appointments on the Clerical Staff:—

1. SECOND ASSISTANT CLERK.—Salary £280 per annum, rising, subject to satisfactory service, by annual increments of £15, to £340 per annum. Applicants must have had experience in a responsible position in an Electricity Supply Department, and preference will be given to those also in possession of a certificate of a recognised professional Institute.

2. ENQUIRIES CLERK.—Salary £210 per annum, rising, subject to satisfactory service, by annual increments of £10, to £250 per annum. Applicants must have had experience in interviewing consumers and of schemes for Assisted Wiring and Hire of Domestic Electrical Apparatus.

3. JUNIOR CLERK.—Salary £52 to £65 per annum, according to age and qualifications of selected applicant.

Each appointment will be subject to the provisions of the Council's Grading and Superannuation Schemes, and to the selected applicant passing a medical examination.

Form of Application for each appointment can be obtained from the undersigned upon receipt of a stamped addressed foolscap envelope, and must be returned suitably endorsed not later than 12 noon on Friday, February 14th, 1930.

Canvassing will disqualify.

HUGH ROYLE,
Town Clerk.

Town Hall, Hammersmith, W.6.
January 28th, 1930.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column Inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CENTRAL ELECTRICITY BOARD.

SOUTH-EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite Tenders for the construction of Site Works, Foundation Works, and Buildings in the area of the South-East England Electricity Scheme.

Copies of the Specification No. S.E.E.–P.F.5 and Form of Tender may be obtained from the Offices of the Board on application to the undersigned on or after Monday, February 10th, 1930, on payment of a deposit of Two Guineas for the first copy, and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied endorsed "Tender for Specification No. S.E.E.–P.F.5" must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, March 3rd, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

ELECTRICAL INSTALLATION WORK.

THE Bethnal Green Borough Council invites Tenders for Electric Lighting Installations at four blocks of tenement dwellings in Bethnal Green.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Wiring Scheme—Waterlow Buildings," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Thursday, February 20th, 1930.

The Council does not bind itself to accept the lowest or any Tender.

DAVID J. KEEP,
Town Clerk.

CENTRAL ELECTRICITY BOARD.

CENTRAL ENGLAND ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for the Supply, Delivery and Erection of Transformer Oil Treating Plant for 18 transformer stations in the area of the Central England Scheme.

Copies of the Specification No. C.E.—P.S.2 and Form of Tender may be obtained from the offices of the Board, on application to the undersigned on or after Monday, February 3rd, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied, endorsed "Tender for Specification No. C.E.—P.S.2," must be delivered to the offices of the Board not later than 12 o'clock noon on Saturday, February 22nd, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CITY OF LEEDS.

ELECTRICITY DEPARTMENT.

ANNUAL CONTRACTS FOR STORES.

THE Leeds Corporation invite Tenders for the supply of the following goods required for the Electricity Department during the year ending March 31st, 1931:—

C. Castings of Gunmetal, Copper and Iron.
D. Bolts, Nuts, Screws, etc.
E. Gas and Weldless Steel Tubes.
G. Lead Sleeves and other Plumbers' Materials.
H. Tinners' and Ironmongers' Sundries and Engineers' Furnishings (including Packings, Rubber Goods, Files and Sundry Metals).
J. Oils and Chemists' Sundries.
K. Cotton Waste and Wipers (bleached rags).
L. Ropes, Twines, Tarpaulin Goods, etc.
N. India-rubber Covered Cables, Mains Boxes and Fittings, Jointing and Insulating materials, Fittings and Sundries.
P. Wood Bushes, Hammer Shafts, etc.
Q. Building Materials—Fire and other Bricks, etc.
R. India Grey Tapes.

Schedules, Conditions of Contract and Forms of Tender may be had on application to Mr. C. Nelson Hefford, General Manager, Electricity Department, 1, Whitehall Road, Leeds, stating the section for which the applicant desires to tender.

Tenders in sealed envelopes, endorsed "Electricity—Tender for Stores," must be delivered to me at my office, 26, Great George Street, Leeds, on or before Tuesday, February 18th, 1930.

The Corporation do not bind themselves to accept the lowest or any of the Tenders sent in.

THOS. THORNTON,
Town Clerk.

Leeds.
January 25th, 1930.

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NOTICES.

ELECTRICITY (SUPPLY) ACT, 1926.

NORTH-EAST ENGLAND ELECTRICITY SCHEME, 1929.

NOTICE is hereby given that in exercise of the powers conferred upon them by Section 4 of the Electricity (Supply) Act, 1926, the Central Electricity Board have adopted (subject to certain modifications) the scheme intituled "North-East England Electricity Scheme, 1929," and transmitted to them by the Electricity Commissioners, and have published the Scheme as so adopted.

Copies of the Scheme may be obtained at the price of one shilling and sixpence each from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, and 120, George Street, Edinburgh.

Dated this 24th day of January, 1930.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, London, W.C.2.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

DRAUGHTSMEN, Senior and Junior, required, with good experience on Electric Control Apparatus.—Write fullest particulars of training, experience, age and salary, Box 724, SELLS, Fleet Street, E.C.4.

WANTED, a Junior Electrical Test Engineer, of good athletic type. Technical Graduate preferred. Excellent opportunity for acquiring good electrical experience.—Box A. D. L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

GOOD OPPORTUNITIES FOR PROGRESSIVE MEN.

SEVERAL vacancies exist for men with practical experience in planning, installing and testing modern telephone equipment. Permanent positions for men of proved ability.—Apply, stating details of previous experience, to Box A.A.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

SENIOR and Junior Draughtsmen required for High and Low Tension Switchboards; also for Automatic Sub-station Control Gear and Metal-clad Switchgear and Contractor Gear.—Apply, stating age, full experience, and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

REQUIRED.—Experimental Assistant (male, under 21).

Applicants should hold a Matriculation or equivalent certificate, including mathematics and a scientific subject.

Scale of pay, according to age—

From 17s. per week, plus Civil Service Bonus at 16 years of age.

To 26s. per week, plus Civil Service Bonus at 20 years of age.

The present total emoluments of the above rates, including Civil Service Bonus, are 28s. 11d. and 44s. 3d. per week respectively.

Normal hours of duty—42 a week.

Applications should be made in writing to the SUPERINTENDENT, Air Defence Experimental Establishment, Biggin Hill, near Westerham, Kent, stating qualifications and giving two personal references.

CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPARTMENT.

APPOINTMENT OF CHIEF ASSISTANT ELECTRICAL ENGINEER.

APPLICATIONS for the vacant position of CHIEF ASSISTANT ELECTRICAL ENGINEER are invited from fully qualified Electrical Engineers who have had experience in the design and operation of large Generating Stations, Extra High Tension Transmission Systems, Sub-stations and Low Tension Distribution Networks.

Salary will be at the rate of £1 200 per annum, payable monthly.

The successful candidate will be required to undergo an approved medical examination and contribute to the Corporation's Superannuation Scheme.

Forms of application and particulars of duties may be obtained from the undersigned and will require to be returned, with copies of not more than three recent testimonials, by Saturday, February 15th, 1930, endorsed "Chief Assistant Electrical Engineer."

Canvassing either directly or indirectly will disqualify.

E. J. JENNINGS,
Secretary and Commercial Manager.

14, Dale End,
Birmingham.
January 25th, 1930.

METROPOLITAN BOROUGH OF HAMMERSMITH.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the following appointments on the Clerical Staff:—

1. SECOND ASSISTANT CLERK.—Salary £280 per annum, rising, subject to satisfactory service, by annual increments of £15, to £340 per annum. Applicants must have had experience in a responsible position in an Electricity Supply Department, and preference will be given to those also in possession of a certificate of a recognised professional Institute.

2. ENQUIRIES CLERK.—Salary £210 per annum, rising, subject to satisfactory service, by annual increments of £10, to £250 per annum. Applicants must have had experience in interviewing consumers and of schemes for Assisted Wiring and Hire of Domestic Electrical Apparatus.

3. JUNIOR CLERK.—Salary £52 to £65 per annum, according to age and qualifications of selected applicant.

Each appointment will be subject to the provisions of the Council's Grading and Superannuation Schemes, and to the selected applicant passing a medical examination.

Form of Application for each appointment can be obtained from the undersigned upon receipt of a stamped addressed foolscap envelope, and must be returned suitably endorsed not later than 2 noon on Friday, February 14th, 1930.

Canvassing will disqualify.

HUGH ROYLE,
Town Clerk.

Town Hall, Hammersmith, W.6.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.

APPLICATIONS are invited by letter only for the post of Electrical (Traction) Engineer, for service on the above Railway. The Bombay Surburban Section operated by electric traction is about 26 route miles in length, and the equipment comprises 40 four-coach trains operating at 1 500 Volts D.C., 3 rotary converter substations and the overhead track equipment.

The successful candidate must have had sufficient experience to enable him efficiently to take charge of the operation and maintenance of the foregoing equipment.

The appointment is on the permanent staff of the Railway and the agreement in the first instance will be for three years, extensible by mutual consent.

SALARY.—The salary will depend upon the candidate's age and qualifications, but will be approximately Rs. 1 150 per month, plus £30 per month "Overseas pay," plus "Bombay allowance" of Rs. 135 per month. The salary is payable from the date of departure from this country. Provident Fund, gratuity and leave will be in accordance with the rules applicable to the Company's Officers. A free first class passage to India and a return passage on the termination of the agreement are provided.

The selected candidate will be required to pass a strict medical examination, and should preferably be not less than 35 years of age or more than 45.

Applications should give full details of education and career to date, stating age, salary required, and whether married or single.

Applications accompanied by copies only of testimonials should be addressed to Messrs. MERZ AND PARTNERS, 32, Victoria Street, London, S.W.1. not later than February 21st, 1930.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

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Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

BOROUGH OF BEDFORD.

ELECTRICITY DEPARTMENT.

TENDERS are invited from British manufacturers in the United Kingdom for the following supplies during the year ending March 31st, 1931 :—

Section 1. E.H.T., H.T., and L.T. Underground Cables.

Section 2. Incandescent Electric Lamps.

For particulars and specifications apply to the Borough Electrical Engineer, Prebend Street, Bedford.

Extra copies of specification will be supplied at 5s. each.

Sealed Tenders, endorsed respectively "Cable Contract" or "Lamp Contract," and addressed to the Chairman, Electricity Committee, Electricity Works, Prebend Street, Bedford, must be delivered on or before noon on Monday, March 10th, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. DARLOW,
Town Clerk.

Town Hall,
Bedford,
February, 1930.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

PRE-PAYMENT METERS.

THE Bethnal Green Borough Council invites Tenders for the supply of Pre-payment Meters.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a bona fide tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Pre-payment Meters," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Monday, 24th February, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

STORES.

THE Electricity Committee invite Tenders for the supply of the undermentioned materials for Twelve Months commencing 1st April, 1930.

Form No.

1. Engine Room Stores.
2. Lubricating Oils and Petrol.
3. Transformer Oil.
4. Oilskin Coats, Tarpaulins, Rubber Jointing, etc.
5. Bricks, Firebricks, Cement, Road Metal, Sand, etc.
6. Brushes, Rope and Twine.
7. Steam and Water Tubing and Fittings, Ironmongery and Spare Parts for Mechanical Stokers.
8. Electrical Accessories.
9. Lamps.
10. Carbon Brushes.
11. Refined Trinidad Bitumen.
12. Bitite Strip, Prepared Tape and Rubber Tape for Joints and Joint Box Compound.
13. Tools.
14. C.I. Street Box Frames and Covers.
15. Stoneware Troughing and Glazed Stoneware Conduits.
16. Feeder and Section Pillars.
17. Glazed Stoneware Cable Bridges.
18. Copper Cable Connectors and Solder.
19. Electricity Meters and Instrument Transformers.
20. Electricity Maximum Demand Indicators.
21. Automatic Time Switches.
22. House Service Cut-Outs.
23. Transformers.
24. Electric Cables and Joint Boxes.
25. Creosoted Spruce.
26. V.I.R. Electric Cables, Wires and Flexibles.

Forms of Tender and further particulars may be obtained from Mr. F. H. Whysall, City Electrical Engineer and General Manager, East Bridge Street, Belfast.

The whole or any part of a Tender sent in may be accepted and Tenders shall be open for acceptance until 1st May next.

Sealed Tenders, on official forms only, enclosed in the envelope supplied with the Tender Form, endorsed with the name and address of the firm tendering, and marked "Tender for Stores, Electricity Department," to be lodged in, or posted so as to arrive at, my office not later than 10 a.m. on Monday, 3rd March, 1930.

The lowest or any Tender will not necessarily be accepted.

An official receipt should be obtained for every Tender delivered by hand. Tenders sent by post should be registered.

R. MEYER, Town Clerk.

City Hall, Belfast.
February 4th, 1930.

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NOTICES.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

ELECTRICAL DRAUGHTSMAN required with experience of steel tower design and overhead transmission lines. State age, full experience and salary required.—BOX A.F.L. THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

WANTED, a Junior Electrical Test Engineer, of good athletic type. Technical Graduate preferred. Excellent opportunity for acquiring good electrical experience.—Box A. D. L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

REQUIRED, Junior Assistant in Electrical Engineers' Office in London, with experience in small switchgear, to deal with enquiries and quotations. Electrical knowledge and Commercial experience essential. Age 20 to 25. Write, giving full particulars of age, experience, and salary required.—Box A.E.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

SKILLED Test Room Assistants required.—Apply by letter, stating experience, to W. G. PYE AND CO., "Granta Works," Newmarket Road, Cambridge.

PENMAENMAWR URBAN DISTRICT COUNCIL.

THE above Council invite applications for the post of Resident Electrical Engineer. Commencing salary £260 per annum. Terms and conditions, with Form of Application, may be obtained from the undersigned on receipt of a stamped addressed envelope.

GEORGE J. HUGHES,
Clerk to the Council.

Council Offices,
Penmaenmawr,
North Wales.

VACANCIES FOR TWO JUNIOR TECHNICAL OFFICERS.

APPLICATIONS are invited for two vacant posts of Junior Technical Officer in the Admiralty Technical Pool at an Admiralty Experimental Establishment. The work will consist chiefly of design in connection with acoustical and electrical apparatus, including the preparation of specifications, etc., or of research in connection with electrical apparatus.

Candidates should possess either an honours degree or its equivalent in Engineering, together with workshop experience, or an honours degree or its equivalent in Physics, together with some research or works' experience.

The Admiralty Technical Pool includes the following grades:—

Chief Technical Adviser (£800 by £50 to £1 000 per annum).
Principal Technical Officer (£650 by £25 to £750 per annum).
Senior Technical Officer (£500 by £25 to £600 per annum).
Technical Officer (£250 by £20 to £450 per annum).
Junior Technical Officer (£175 by £15 to £235 per annum).

In addition to the above scales Civil Service bonus is paid. Entry will be made at the bottom of the scale for Junior Technical Officer, the bonus on which at present is approximately £91. Promotion to the higher grades is governed entirely by merit and is dependent upon the existence of vacancies.

Applications should be made to the SECRETARY OF THE ADMIRALTY C.E. Branch), Whitehall, London, S.W.1, not later than 28th February, 1930. No application forms are required.

GOOD OPPORTUNITIES FOR PROGRESSIVE MEN.

SEVERAL vacancies exist for men with practical experience in planning, installing and testing modern telephone equipment. Permanent positions for men of proved ability.—Apply, stating details of previous experience, to Box A.A.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

REQUIRED.—Experimental Assistant (male, under 21).

Applicants should hold a Matriculation or equivalent certificate, including mathematics and a scientific subject.

Scale of pay, according to age—

From 17s. per week, plus Civil Service Bonus at 16 years of age.
To 26s. per week, plus Civil Service Bonus at 20 years of age.

The present total emoluments of the above rates, including Civil Service Bonus, are 28s. 11d. and 44s. 3d. per week respectively.

Normal hours of duty—42 a week.

Applications should be made in writing to the SUPERINTENDENT, Air Defence Experimental Establishment, Biggin Hill, near Westerham, Kent, stating qualifications and giving two personal references.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.

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The successful candidate must have had sufficient experience to enable him efficiently to take charge of the operation and maintenance of the foregoing equipment.

The appointment is on the permanent staff of the Railway and the agreement in the first instance will be for three years, extensible by mutual consent.

SALARY.—The salary will depend upon the candidate's age and qualifications, but will be approximately Rs. 1 150 per month, plus £30 per month "Overseas pay," plus "Bombay allowance" of Rs. 135 per month. The salary is payable from the date of departure from this country. Provident Fund, gratuity and leave will be in accordance with the rules applicable to the Company's Officers. A free first class passage to India and a return passage on the termination of the agreement are provided.

The selected candidate will be required to pass a strict medical examination, and should preferably be not less than 35 years of age or more than 45.

Applications should give full details of education and career to date, stating age, salary required, and whether married or single.

Applications accompanied by copies only of testimonials should be addressed to Messrs. MERZ AND PARTNERS, 32, Victoria Street, London, S.W.1. not later than February 21st, 1930.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATIONS.—Male Assistant Superintendent of Traffic (Class II) in the London Telephone Service and Male Assistant Traffic Superintendent in the Provinces, General Post Office (18–23, with extension for service in H.M. Forces).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, Civil Service Commission, Burlington Gardens, London, W.1. The latest date for the receipt of application forms is March 6th.

T.I.G.B. TRAINING FOR RESULTS.

WHATEVER be your aim—a Better Technical Equipment; a Professional Qualification; Advancement to a Responsible Post—you can select T.I.G.B. Correspondence Training with complete confidence.

I.E.E., I.Mech.E., Inst.C.E., I.Struct.E., B.O.T., C. and G., etc. At the 1928 and 1929 Examinations (according to available results) T.I.G.B. students achieved THE RECORD PASS FIGURE OF 94·7%.

Write TO-DAY for a FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of Engineering Courses in the world, and state the *Qualification, Post, or Branch that interests you.*

The T.I.G.B. Guarantees Training until Successful.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN (Established 1917), 10, TEMPLE BAR HOUSE, LONDON, E.C.4.

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SEMI-DISPLAY, 12s. per Column Inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

BOROUGH OF BEDFORD.

ELECTRICITY DEPARTMENT.

TENDERS are invited from British manufacturers in the United Kingdom for the following supplies during the year ending March 31st, 1931:—

Section 1. E.H.T., H.T., and L.T. Underground Cables.

Section 2. Incandescent Electric Lamps.

For particulars and specifications apply to the Borough Electrical Engineer, Prebend Street, Bedford.

Extra copies of specification will be supplied at 5s. each.

Sealed Tenders, endorsed respectively "Cable Contract" or "Lamp Contract," and addressed to the Chairman, Electricity Committee, Electricity Works, Prebend Street, Bedford, must be delivered on or before noon on Monday, March 10th, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. DARLOW,
Town Clerk.

Town Hall,
Bedford,
February, 1930.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

PRE-PAYMENT METERS.

THE Bethnal Green Borough Council invites Tenders for the supply of Pre-payment Meters.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a bona fide tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Pre-payment Meters," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Monday, 24th February, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

STORES.

THE Electricity Committee invite Tenders for the supply of the undermentioned materials for Twelve Months commencing 1st April, 1930.

Form No.

1. Engine Room Stores.
2. Lubricating Oils and Petrol.
3. Transformer Oil.
4. Oilskin Coats, Tarpaulins, Rubber Jointing, etc.
5. Bricks, Firebricks, Cement, Road Metal, Sand, etc.
6. Brushes, Rope and Twine.
7. Steam and Water Tubing and Fittings, Ironmongery and Spare Parts for Mechanical Stokers.
8. Electrical Accessories.
9. Lamps.
10. Carbon Brushes.
11. Refined Trinidad Bitumen.
12. Bitite Strip, Prepared Tape and Rubber Tape for Joints and Joint Box Compound.
13. Tools.
14. C.I. Street Box Frames and Covers.
15. Stoneware Troughing and Glazed Stoneware Conduits.
16. Feeder and Section Pillars.
17. Glazed Stoneware Cable Bridges.
18. Copper Cable Connectors and Solder.
19. Electricity Meters and Instrument Transformers.
20. Electricity Maximum Demand Indicators.
21. Automatic Time Switches.
22. House Service Cut-Outs.
23. Transformers.
24. Electric Cables and Joint Boxes.
25. Creosoted Spruce.
26. V.I.R. Electric Cables, Wires and Flexibles.

Forms of Tender and further particulars may be obtained from Mr. F. H. Whysall, City Electrical Engineer and General Manager, East Bridge Street, Belfast.

The whole or any part of a Tender sent in may be accepted and Tenders shall be open for acceptance until 1st May next.

Sealed Tenders, on official forms only, enclosed in the envelope supplied with the Tender Form, endorsed with the name and address of the firm tendering, and marked "Tender for Stores, Electricity Department," to be lodged in, or posted so as to arrive at, my office not later than 10 a.m. on Monday, 3rd March, 1930.

The lowest or any Tender will not necessarily be accepted.

An official receipt should be obtained for every Tender delivered by hand. Tenders sent by post should be registered.

R. MEYER, Town Clerk.

City Hall, Belfast.
February 4th, 1930.

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CITY OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SUPPLY of (*a*) 5 000 kVA, 12 500 kVA, and 33 000 Volt Step-Down Transformers, and

(*b*) 6 000 Volt, and 33 000 Volt Metal-Clad Switchgear for Sub-stations.

The Corporation of Liverpool invite Tenders for the Supply of Step-Down Transformers and Switchgear.

Copies of Tender Form and Specification may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool.

Sealed Tenders endorsed "Transformers" and "Switchgear" to be addressed to the Town Clerk, Municipal Offices, Liverpool, and must be forwarded by post to him so as to be delivered not later than the first postal delivery on Wednesday, March 12th, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool.
February, 1930.

SALE BY AUCTION.

SALE BY AUCTION WITHOUT RESERVE AT

YORK HOUSE, SOUTHAMPTON ROW, W.C.1.
(Corner Theobalds Road).

ON WEDNESDAY, FEBRUARY 26TH, AT 1.30 SHARP.

A LARGE and varied HIGH CLASS Stock of NEW ELECTRICAL GOODS of all descriptions by G.E.C., B.T.H. and others. 2 000 Rotary and Tumbler Switches, 5 000 Lampholders various, 2 000 Ceiling Roses, 1 000 Coils 3/029 V.I.R. Cable, 200 Coils 3/036 Do., 200 coils 7/029 Lead and Rubber Covered Cable, 30 000 assorted Screwed Conduit Fittings $\frac{3}{8}$in. to 1 in.

HEAVY ORNAMENTAL FITTINGS including: Wall brackets, 200 Rings, Sets of Chains, Plates and Ornaments, 1 500 3$\frac{1}{4}$ in. Galleries, 150 Bowls, Silk Shades, 200 Glass Shades, 20 Flood Lights, Large Outside Lanterns, Watertight and Bulkhead Fittings, 30 Electric Daylight Signs, 60 Large Reflectors, 200 Hand Lamps, 100 High Volt Bells, 100 lb. Celastoid Sheet, 30 B.T.H. Fans.

2 000 HEAVY NICKEL PLATED TORCH CASES; large quantity inter-communication Telephone Material.

6 5-Valve Portable Sets, 2 500 Dubilier Condensers, 600 Variable do., Rheostats, Valve Holders, Terminals, Screws, Resistances, Knife Switches, etc.

To be offered in lots to suit large and small purchasers.

Catalogues of the Auctioneers. On view day prior and day of sale.

THE WEST CENTRAL MERCHANDISE MART,
YORK HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1
Telephones: Chancery 8136 and 8313.
Telegrams: Loudsigs, Holb, London.

NOTICES.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

ELECTRICAL Contractor requires the assistance of a respectable Lad as an Apprentice. Small premium, returned as wages. —Apply stating age to—48, Earls Court Road, London, W.8.

SKILLED Test Room Assistants required.—Apply by letter, stating experience, to W. G. PYE AND CO., "Granta Works," Newmarket Road, Cambridge.

ELECTRICAL DRAUGHTSMAN required with experience of steel tower design and overhead transmission lines. State age, full experience and salary required.—BOX A.F.L. THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

REQUIRED, Junior Assistant in Electrical Engineers' Office in London, with experience in small switchgear, to deal with enquiries and quotations. Electrical knowledge and Commercial experience essential. Age 20 to 25. Write, giving full particulars of age, experience, and salary required.—Box A.E.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

THE Brush Electrical Engineering Co., Ltd., of Loughborough, invites applications for the position of Works Superintendent of their Engineering Department. The manufacture embraces steam turbo-generators and electrical machinery of all types. Applicants must have had experience in similar capacity. Letters, giving full particulars of career and salary required (which will be treated confidentially), should be addressed to the SECRETARY OF THE COMPANY, Falcon Works, Loughborough.

PENMAENMAWR URBAN DISTRICT COUNCIL.

THE above Council invite applications for the post of Resident Electrical Engineer. Commencing salary £260 per annum. Terms and conditions, with Form of Application, may be obtained from the undersigned on receipt of a stamped addressed envelope.

GEORGE J. HUGHES,
Clerk to the Council.

Council Offices,
Penmaenmawr,
North Wales.

VACANCIES FOR TWO JUNIOR TECHNICAL OFFICERS.

APPLICATIONS are invited for two vacant posts of Junior Technical Officer in the Admiralty Technical Pool at an Admiralty Experimental Establishment. The work will consist chiefly of design in connection with acoustical and electrical apparatus, including the preparation of specifications, etc., or of research in connection with electrical apparatus.

Candidates should possess either an honours degree or its equivalent in Engineering, together with workshop experience, or an honours degree or its equivalent in Physics, together with some research or works' experience.

The Admiralty Technical Pool includes the following grades:—

Chief Technical Adviser (£800 by £50 to £1 000 per annum).
Principal Technical Officer (£650 by £25 to £750 per annum).
Senior Technical Officer (£500 by £25 to £600 per annum).
Technical Officer (£250 by £20 to £450 per annum).
Junior Technical Officer (£175 by £15 to £235 per annum).

In addition to the above scales Civil Service bonus is paid. Entry will be made at the bottom of the scale for Junior Technical Officer, the bonus on which at present is approximately £91. Promotion to the higher grades is governed entirely by merit and is dependent upon the existence of vacancies.

Applications should be made to the SECRETARY OF THE ADMIRALTY C.E. Branch), Whitehall, London, S.W.1, not later than 28th February, 1930. No application forms are required.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATIONS.—Male Assistant Superintendent of Traffic (Class II) in the London Telephone Service and Male Assistant Traffic Superintendent in the Provinces, General Post Office (18–23, with extension for service in H.M. Forces).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, Civil Service Commission, Burlington Gardens, London, W.1. The latest date for the receipt of application forms is March 6th.

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MISCELLANEOUS ADVERTISEMENTS

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Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

ELECTRIC CABLES, PIPES, ETC.

THE Bethnal Green Borough Council invites Tenders for the supply, delivery and laying of low tension cables, pipes, etc., in Bethnal Green.

Copies of the Form of Tender, Conditions and Specifications may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* Tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the Trade Unions in the locality where the work is done.

Tenders, endorsed "Cables," must be addressed to me, and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Monday, 17th March, 1930.

The Council does not bind itself to accept the lowest or any Tender.

DAVID J. KEEP,
Town Clerk.

CARDIFF CORPORATION.

ELECTRICITY DEPARTMENT.

TENDERS are invited from manufacturers on the King's National Roll for the following:—

Supply and delivery of E.H.T. and L.T. Paper-insulated Cable during 12 months commencing April 1st, 1930.

Further particulars, specifications, and forms of tender may be obtained from the City Electrical Engineer, The Hayes, Cardiff.

Tenders, duly endorsed, and addressed to the undersigned must be delivered on or before 10 a.m. on Thursday, March 20th.

The Corporation do not bind themselves to accept the lowest or any tender.

CECIL G. BROWN,
Town Clerk.

City Hall, Cardiff.
February, 1930.

CENTRAL ELECTRICITY BOARD.

NORTH WEST ENGLAND AND NORTH WALES ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite tenders for the supply, delivery and erection of Metering Equipment required in the area of the North West England and North Wales Electricity Scheme.

Copies of the Specification No. N.W.E.–G.M. 1 and form of tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, March 3rd, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied, endorsed "Tender for Specification No. N.W.E.–G.M. 1," must be delivered to the offices of the Board not later than 12 o'clock noon on Monday, March 31st, 1930.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CENTRAL ELECTRICITY BOARD.

NORTH WEST ENGLAND AND NORTH WALES ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite tenders for the supply, delivery and erection of 33 kV and Lower Voltage Transformers.

Copies of the Specification N.W.E.–S.T. 4 and form of tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, March 3rd, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona-fide* tender.

Tenders on the form supplied endorsed "Tender for Specification No. N.W.E.–S.T. 4" must be delivered to the offices of the Board not later than 12 o'clock noon on Monday, March 24th, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
Charing Cross, W.C.2.

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ERITH URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

THE above Council invite Tenders for the supply and delivery of the following materials during the twelve months ending March 31st, 1931 :—

HIGH TENSION AND LOW TENSION UNDERGROUND CABLE, JOINT BOXES AND OTHER ACCESSORIES.

The successful Tenderer will be required to enter into a Contract which will contain a "Fair Wages Clause."

Particulars and Form of Tender may be obtained from the Electrical Engineer, Walnut Tree Road, Erith.

Sealed Tenders, endorsed "Tender for Cables, etc.," must be addressed to and reach the undersigned not later than 12 noon on Friday, March 7th, 1930.

The Council do not bind themselves to accept the lowest or any Tender.

Council Offices, Erith.

DOUGLAS S. TWIGG, Clerk to the Council.

NOTICES.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E., General Secretary.

102, St. George's Square, London, S.W.1.

APPOINTMENTS VACANT.

ELECTRICAL Contractor requires the assistance of a respectable Lad as an Apprentice. Small premium, returned as wages. —Apply stating age to—48, Earls Court Road, London, W.8.

SKILLED Test Room Assistants required.—Apply by letter, stating experience, to W. G. PYE AND Co., "Granta Works," Newmarket Road, Cambridge.

ELECTRICAL DRAUGHTSMAN required with experience of steel tower design and overhead transmission lines. State age, full experience and salary required.—BOX A.F.L. THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

WANTED.—Thoroughly experienced and efficient controlling ELECTRICAL ENGINEER for Power Station, Transmission Lines and the application of electricity to collieries. State age, salary required, and give copies (only) of testimonials.—Apply Box A. H. L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

REQUIRED, Junior Assistant in Electrical Engineers' Office in London, with experience in small switchgear, to deal with enquiries and quotations. Electrical knowledge and Commercial experience essential. Age 20 to 25. Write, giving full particulars of age, experience, and salary required.—Box A.E.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

THE Brush Electrical Engineering Co., Ltd., of Loughborough, invites applications for the position of Works Superintendent of their Engineering Department. The manufacture embraces steam turbo-generators and electrical machinery of all types. Applicants must have had experience in similar capacity. Letters, giving full particulars of career and salary required (which will be treated confidentially), should be addressed to the SECRETARY OF THE COMPANY, Falcon Works, Loughborough.

APPLICATIONS are invited for the post of Junior Technical Assistant in the Admiralty Technical Pool to fill a vacancy in the Experimental Section of an Admiralty establishment at Portsmouth.

Qualifications must include a sound technical training in electrotechnics and practical experience in manufacture and testing of delicate electrical instruments.

The salary of a Junior Technical Assistant is £85 by £7½ to £130, plus Civil Service Bonus. Entry will be made at the bottom of the scale, the bonus on which at present is approximately £59 10s.

Applications should be made within ten days of the appearance of this notice to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1. No application form is required.

PENMAENMAWR URBAN DISTRICT COUNCIL.

THE above Council invite applications for the post of Resident Electrical Engineer. Commencing salary £260 per annum. Terms and conditions, with Form of Application, may be obtained from the undersigned on receipt of a stamped addressed envelope.

GEORGE J. HUGHES, Clerk to the Council.

Council Offices, Penmaenmawr, North Wales.

VACANCIES FOR ELECTRICAL INSPECTORS OF MINES.

THE Secretary for Mines invites applications from Electrical Engineers for the following posts :—

1 Deputy Electrical Inspector of Mines and Quarries. Scale of salary £550:25:750 per annum, plus cost of living bonus, which, on the current basis of cost of living figure of 70 above pre-war, amounts to £165 on a salary of £550 per annum.

3 Junior Electrical Inspectors of Mines and Quarries. Scale of salary £350:20:500 per annum, plus cost of living bonus, which, on the current basis of cost of living figure of 70 above pre-war, amounts to £135 on a salary of £350 per annum. In certain circumstances candidates with special qualifications or experience may be allowed to enter the scale at a salary above the minimum, but not exceeding £400 per annum.

The posts are permanent and pensionable, but the successful candidates will be regarded as on probation for a period of two years and their appointment will be confirmed only on satisfactory performance of their duties during that time.

Applicants for the post of Deputy Electrical Inspector should be not more than 45 years of age on the 24th March, 1930, the last date for receipt of applications, though applications from Electrical Engineers over that age with exceptional qualifications will be considered, and must

(*a*) hold a degree in Electrical Engineering, or have passed the examination of the Institution of Electrical Engineers; and

(*b*) have had not less than five years' practical experience, including substantial experience in a responsible position in the applications of electricity to mining.

Applicants for the post of Junior Electrical Inspector must be between the ages of 27 and 35 on the 24th March, 1930, the last date for receipt of applications, and

(*a*) hold a degree in Electrical Engineering, or have passed the examination of the Institution of Electrical Engineers, or be able to show that they gave been regularly trained as electrical engineers, and

(*b*) have had at least two years' practical experience in the applications of electricity to mining.

Forms of application, which must be returned not later than the 24th March, 1930, together with a memorandum on the conditions of appointment, can be obtained from the Under Secretary for Mines, Establishment Branch, Mines Department, Dean Stanley Street, London, S.W.1.

T.I.G.B. TRAINING FOR RESULTS.

WHATEVER be your aim—a Better Technical Equipment; a Professional Examination Qualification; Advancement to a Responsible Post—you can select T.I.G.B. Correspondence Training with complete confidence.

Here is proof in the form of Typical Tributes from Successfu Examination Candidates :—

A.M.I.E.E. Exam.

B. W., Stoke.—"I have passed the A.M.I.E.E. Exam. The happy issue of this attempt was very largely due to your efficient training."

A.M.I.Mech.E. Exam.

H. W. M., Rochdale.—"Have passed. I was surprised to find so many questions similar to those set during the course."

A.M.Inst.C.E. Exam.

T. N., Sutton.—"I beg to say that I sat for the recent A.M.Inst.C.E. Exam., Part C., and have passed."

Write TO-DAY for a FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of engineering courses in the world, and state the *Qualification, Post or Branch that interests you.*

The T.I.G.B. guarantees training until successful.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN (Established 1917), 10, TEMPLE BAR HOUSE, LONDON, E.C.4.

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CECIL G. BROWN,
Town Clerk.

City Hall, Cardiff.
February, 1930.

WEST HAM UNION.

THE Guardians invite Tenders for carrying out Electrical Work and the Laying of Main and Sub-main Cables and Wiring of various Blocks at their Central Home, Union Road, Leytonstone, E.11.

Specification and form of tender will be forwarded on application to the undersigned, and tenders must be delivered not later than 10 a.m. on Thursday, March 27th, 1930.

L. E. FRAQUET,
Clerk to the Guardians.

Board Room,
Union Road, Leytonstone, E.11.
March 4th, 1930.

CENTRAL ELECTRICITY BOARD.

MID-EAST ENGLAND ELECTRICITY SCHEME, 1929.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of 66 Kilovolt and Lower Voltage Transformers.

Copies of the Specification, No. M.E.E.-G.T.1, and Form of Tender, may be obtained from the offices of the Board on application to the undersigned on or after Monday, March 10th, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a bona-fide Tender.

Tenders on the form supplied, endorsed "Tender for Specification No. M.E.E.-G.T.1," must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, April 7th, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

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W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

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APPOINTMENTS VACANT.

REQUIRED the services of an experienced switchboard draughtsman.—Apply Box A. J. L., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

DESIGNER required with experience in the design of medium and large Induction Motors.—Apply, giving full particulars of training, career and salary required to Box A. K. L., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

EXPERIENCED SALES ORGANISER required by Domestic Electrification, Ltd., manufacturers of high-class electric cookers, fires and other domestic appliances. Must have a thorough knowledge of the trade and influential connection, with practical experience in representation and sales organisation. Applications will be treated in strict confidence.—Reply, stating age, previous experience and salary required, to MEASUREMENT, LTD., Townsend House, Greycoat Place, Westminster, S.W.1.

VACANCIES FOR ELECTRICAL INSPECTORS OF MINES.

THE Secretary for Mines invites applications from Electrical Engineers for the following posts:—

1 Deputy Electrical Inspector of Mines and Quarries. Scale of salary £550:25:750 per annum, plus cost of living bonus, which, on the current basis of cost of living figure of 70 above pre-war, amounts to £165 on a salary of £550 per annum.

3 Junior Electrical Inspectors of Mines and Quarries. Scale of salary £350:20:500 per annum, plus cost of living bonus, which, on the current basis of cost of living figure of 70 above pre-war, amounts to £135 on a salary of £350 per annum. In certain circumstances candidates with special qualifications or experience may be allowed to enter the scale at a salary above the minimum, but not exceeding £400 per annum.

The posts are permanent and pensionable, but the successful candidates will be regarded as on probation for a period of two years and their appointment will be confirmed only on satisfactory performance of their duties during that time.

Applicants for the post of Deputy Electrical Inspector should be not more than 45 years of age on the 24th March, 1930, the last date for receipt of applications, though applications from Electrical Engineers over that age with exceptional qualifications will be considered, and must

(*a*) hold a degree in Electrical Engineering, or have passed the examination of the Institution of Electrical Engineers; and

(*b*) have had not less than five years' practical experience, including substantial experience in a responsible position in the applications of electricity to mining.

Applicants for the post of Junior Electrical Inspector must be between the ages of 27 and 35 on the 24th March, 1930, the last date for receipt of applications, and

(*a*) hold a degree in Electrical Engineering, or have passed the examination of the Institution of Electrical Engineers, or be able to show that they gave been regularly trained as electrical engineers, and

(*b*) have had at least two years' practical experience in the applications of electricity to mining.

Forms of application, which must be returned not later than the 24th March, 1930, together with a memorandum on the conditions of appointment, can be obtained from the Under Secretary for Mines, Establishment Branch, Mines Department, Dean Stanley Street, London, S.W.1.

ENGINEERS, Novice or Expert, £300, £400, £500 per year or more is within your grasp. In our Handbook, "Engineering Opportunities," Prof. A. M. Low explains where the good posts abound. This Handbook has shown the way to better things to over 20 000 of your fellows. It contains details of A.M.I.Mech.E., A.M.I.E.E., A.M.I.C.E., A.M.I.A.E., A.M.I.Struct.E., Matric., C. & G., G.P.O., etc. Exams, outlines home study courses in all branches of Electrical, Mechanical, Motor and Wireless Engineering, and shows the unique advantages of our Appointments Department. Why stay in the "Hammer and File Brigade"? Send for our free Handbook at once, stating Branch, Post or Exam., which interests you.—BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 43, Shakespeare House, 29-31, Oxford Street, London, W.1.

T.I.G.B. TRAINING FOR RESULTS.

WHATEVER be your aim—a Better Technical Equipment; a Professional Qualification; Advancement to a Responsible Post—you can select T.I.G.B. Correspondence Training with complete confidence.

I.E.E., I.Mech.E., Inst.C.E., I.Struct.E., B.O.T., C. and G., etc. At the 1928 and 1929 Examinations (according to available results) T.I.G.B. students achieved THE RECORD PASS FIGURE OF 94·7%.

Write TO-DAY for a FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of Engineering Courses in the world, and state the *Qualification, Post, or Branch that interests you.*

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THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN (Established 1917), 10, TEMPLE BAR HOUSE, LONDON, E.C.4.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

APPOINTMENT WANTED.

ELECTRICIAN seeks employment. Maintenance or Constructional; 25 years' experience.—GUBB, 1, Churlwood Road, Putney.

EMPLOYMENT wanted by woman graduate (Hons. Maths.), with technical training in Wireless, Electrical and Optical Engineering. Reads German and French.—OMEGA, Box A.L.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

WANTED.—Position in Electrical line. Experienced in all branches.—Box A. G. L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

EDUCATIONAL NOTICES.

EXAMINATIONS HELD BY THE INSTITUTION OF ELECTRICAL ENGINEERS.

MR. A. J. ANIDO, B.Sc., A.C.G.I. (late R.E.), specialises in the personal preparation of candidates in all subjects of the above examinations. Arrangements are made to suit those engaged in business.

60, Chancery Lane, W.C.2. Telephone: Holborn 5776.

INTERNATIONAL CORRESPONDENCE SCHOOLS.

SCHOOL OF ELECTRICAL ENGINEERING.

THIS Institution—the largest in the world devoted to spare time training—has complete courses of instruction to cover the

ASSOCIATE MEMBERSHIP EXAM., I.E.E.,
and the
LIMITED COMPETITION FOR PROBATIONARY ASST. ENG., G.P.O.

Other courses meet the requirements of all who desire a thoroughly practical and profitable technical education, and all who wish to qualify for positions in the Design Office, Test Room or Drawing Office, or as Chief Engineers, Assistant Engineers, Shift Engineers, or Switchboard Attendants in Electric Power, Light and Traction Stations. Equally successful is our instruction for Telegraph and Telephone Engineers, Telegraphists and Telephonists.

All instruction is by correspondence from text-books specially prepared by many experts for tuition by post.

Prospectus post free from

INTERNATIONAL CORRESPONDENCE SCHOOLS, LTD.,
142, International Buildings, Kingsway, London, W.C.2

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SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

ELECTRIC CABLES, PIPES, ETC.

THE Bethnal Green Borough Council invites Tenders for the supply, delivery and laying of low tension cables, pipes, etc., in Bethnal Green.

Copies of the Form of Tender, Conditions and Specifications may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* Tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the Trade Unions in the locality where the work is done.

Tenders, endorsed "Cables," must be addressed to me, and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Monday, 17th March, 1930.

The Council does not bind itself to accept the lowest or any Tender.

DAVID J. KEEP,
Town Clerk.

CARDIFF CORPORATION.

ELECTRICITY DEPARTMENT.

TENDERS are invited from manufacturers on the King's National Roll for the following:—

Supply and delivery of E.H.T. and L.T. Paper-insulated Cable during 12 months commencing April 1st, 1930.

Further particulars, specifications, and forms of tender may be obtained from the City Electrical Engineer, The Hayes, Cardiff.

Tenders, duly endorsed, and addressed to the undersigned must be delivered on or before 10 a.m. on Thursday, March 20th.

The Corporation do not bind themselves to accept the lowest or any tender.

CECIL G. BROWN,
Town Clerk.

City Hall, Cardiff.
February, 1930.

BOROUGH OF SWINDON.

ELECTRICITY DEPARTMENT.

SALE OF COMPLETE GENERATING STATION EQUIPMENT.

THE Corporation of Swindon invite Tenders for the purchase and removal of the plant installed in their Generating Station in Corporation Street, Swindon, which is now out of commission.

The plant includes:—

Four—Babcock and Wilcox Water Tube Boilers, working pressure 200 lb., complete with superheaters and chain grate stokers.

One—Green's Cast Iron Tube Economiser. Feed pumps, induced draft fan, etc.

Two—1 000 kW Brush Ljungstrom Alternators, 440 volts 50 cycles, with 1 250 kVA Transformers, 440/3, 300 V complete with condensing plant, switchgear, etc.

One—1 000 kW Howden Zeolly Impulse Type Turbine, gear coupled to 1 000 kW Mather and Platt D.C. Generator, 440/520 V, complete with condensing plant, switchgear, etc.

One—500 kW Brush Parsons Mixed Pressure Turbo-Generator, 440/520 V D.C., complete with condensing plant, switchgear, etc.

Three—200 kW Browett Lindley High Speed Engines, direct coupled to Siemens Generators, 440/520 V D.C.

One—300 kW Westinghouse Rotary Converter, complete with transformer and A.C. and D.C. switchgear.

One—500 kW British Thomson-Houston Rotary Converter, complete with transformer and A.C. and D.C. switchgear.

One—Tudor Battery, consisting of 220 cells type H.Q. 25 (wood boxes), capacity 990 ampere hours.

One—Tudor Battery, consisting of 252 cells type H.E.15 (glass boxes), capacity 315 ampere hours.

Full particulars of the above and other plant for disposal can be obtained from the Electrical Engineer, Mr. A. NICKLIN, Electricity Works, Swindon, by arrangement with whom the plant may be inspected.

Tenders (endorsed "Tender for Plant"), which may be for the purchase of the whole or of any part of the plant, to be delivered to me at my office on or before Saturday, March 29th, 1930.

W. H. BENTLEY,
Town Clerk.

Town Hall, Swindon.
March 5th, 1930.

WEST HAM UNION.

THE Guardians invite Tenders for carrying out Electrical Work and the Laying of Main and Sub-main Cables and Wiring of various Blocks at their Central Home, Union Road, Leytonstone, E.11.

Specification and form of tender will be forwarded on application to the undersigned, and tenders must be delivered not later than 10 a.m. on Thursday, March 27th, 1930.

L. E. FRAQUET,
Clerk to the Guardians.

Board Room,
Union Road, Leytonstone, E.11.
March 4th, 1930.

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CENTRAL ELECTRICITY BOARD.

MID-EAST ENGLAND ELECTRICITY SCHEME, 1929.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of 66 Kilovolt and Lower Voltage Transformers.

Copies of the Specification, No. M.E.E.-G.T.1, and Form of Tender, may be obtained from the offices of the Board on application to the undersigned on or after Monday, March 10th, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a bona fide Tender.

Tenders on the form supplied, endorsed "Tender for Specification No. M.E.E.-G.T.1," must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, April 7th, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CITY OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SUPPLY OF TWELVE 1 000 kVA STEP-DOWN TRANSFORMERS.

THE Corporation of Liverpool invite Tenders for the supply of Twelve Step-down Transformers.

Copies of Tender Form and Specification may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool.

Sealed Tenders, endorsed "1 000 kVA Transformers" are to be addressed to the Town Clerk, Municipal Offices, Liverpool, and must be forwarded by post to him so as to be delivered not later than the first postal delivery on Friday, March 28th, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool.
March, 1930.

NOTICES.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENT WANTED.

ELECTRICIAN seeks employment. Maintenance or Constructional; 25 years' experience.—GUBB, 1, Churlwood Road, Putney.

EMPLOYMENT wanted by woman graduate (Hons. Maths.), with technical training in Wireless, Electrical and Optical Engineering. Reads German and French.—OMEGA, Box A.L.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

WANTED.—Position in Electrical line. Experienced in all branches.—Box A. G. L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

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DESIGNER required with experience in the design of medium and large Induction Motors.—Apply, giving full particulars of training, career and salary required to Box A. K. L., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

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1929 EXAMINATION RESULTS.

THE T.I.G.B. MAINTAINS ITS SPLENDID EXAM.-SUCCESS RECORD.

AT all the 1929 PROFESSIONAL EXAMINATIONS—A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., etc. — the candidates who were trained by the T.I.G.B. obtained a Pass Percentage of over 90%.

The T.I.G.B.'s policy of furnishing the highest possible standard of Tutorial Service has brought about a large increase in enrolments both from *bona fide* exam.-candidates and from other keen students.

T.I.G.B. TRAINING IS BEING CHOSEN BECAUSE IT IS OBVIOUSLY PRODUCTIVE OF SATISFACTION AND SUCCESS. Therefore, whatever your aim may be—a Recognised Professional Qualification, or the Special Technical Knowledge needed in a responsible post—you can select the appropriate T.I.G.B. course with complete confidence.

WRITE TO-DAY for FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of home-study engineering courses in the world, and mention the branch, post or qualification that interests you, to

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN
(Established 1917),
10, TEMPLE BAR HOUSE, LONDON, E.C.4.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

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60, Chancery Lane, W.C.2. Telephone: Holborn 5776.

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Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.
Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

TRANSFORMERS.

THE Bethnal Green Borough Council invites Tenders for the supply, delivery and erection of one 1 000 K.V.A. and two 500 K.V.A. three-phase Transformers.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Transformers," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Monday, March 31st, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

COUNTY OF LONDON.

THE London County Council invites Tenders from manufacturers only for the supply and delivery in the London area of High and Low Tension Electric Cables and for the reconstruction of existing low tension Cables.

The specification, form of tender, etc., may be obtained on application to the General Manager of Tramways, Tramways Offices, 23, Belvedere Road, S.E.1, upon payment of £2. This amount will be returnable only if the tenderer shall have sent in a *bona fide* tender and shall not have withdrawn the same. Full particulars of the work may be obtained and the contract document inspected on personal application before payment of the fee.

The Contractor will be bound to observe the provisions of a fair wages clause, the terms of which are set out fully in the instructions for tender and in the form of contract and in *The London County Council Gazette*.

No tender received by the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1, after 4 p.m. on Monday, April 14th, 1930, will be accepted.

The Council does not bind itself to accept the lowest or any tender.

MONTAGU H. COX,
Clerk of the London County Council.

CITY OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SUPPLY OF TWELVE 1 000 KVA STEP-DOWN TRANSFORMERS.

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Copies of Tender Form and Specification may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool.

Sealed Tenders, endorsed "1 000 kVA Transformers" are to be addressed to the Town Clerk, Municipal Offices, Liverpool, and must be forwarded by post to him so as to be delivered not later than the first postal delivery on Friday, March 28th, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool.
March, 1930.

METROPOLITAN BOROUGH OF SAINT PANCRAS.

E.H.T. SWITCHGEAR.

THE Council invite Tenders for the supply of E.H.T. Switchgear. Specifications, with conditions and form of Tender, may be obtained from the offices of the Electricity and Public Lighting Department, 57, Pratt Street, Camden Town, London, N.W.1, on the payment of a deposit of £2, which will be refunded on receipt of a *bona fide* Tender. Additional copies will be supplied on payment of the sum of 10s. 6d., which is not returnable.

Sealed Tenders endorsed "Tender for E.H.T. Switchgear" to be delivered to the undersigned on or before 12 noon on Thursday, 3rd April, 1930.

The Council do not bind themselves to accept the lowest or any Tender.

A. P. COKE,
Deputy Town Clerk.

Town Hall, Pancras Road,
London, N.W.1.

METROPOLITAN BOROUGH OF ST. PANCRAS.

L.T. SWITCHBOARDS.

THE Council invites Tenders for the supply of L.T. Switchboards. Specification with conditions and form of Tender may be obtained from the offices of the Electricity and Public Lighting Department, 57, Pratt Street, Camden Town, London, N.W.1, on payment of a deposit of £2, which will be refunded on receipt of a *bona fide* Tender. Additional copies will be supplied on payment of the sum of 10s. 6d., which is not returnable.

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The Council do not bind themselves to accept the lowest or any Tender.

A. P. COKE,
Deputy Town Clerk.

Town Hall, Pancras Road,
London, N.W.1.

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BOROUGH OF SWINDON.

ELECTRICITY DEPARTMENT.

SALE OF COMPLETE GENERATING STATION EQUIPMENT.

THE Corporation of Swindon invite Tenders for the purchase and removal of the plant installed in their Generating Station in Corporation Street, Swindon, which is now out of commission.

The plant includes :—

Four—Babcock and Wilcox Water Tube Boilers, working pressure 200 lb., complete with superheaters and chain grate stokers.

One—Green's Cast Iron Tube Economiser. Feed pumps, induced draught fan, etc.

Two—1 000 kW Brush Ljungstrom Alternators, 440 volts 50 cycles, with 1 250 kVA Transformers, 440/3, 300 V complete with condensing plant, switchgear, etc.

One—1 000 kW Howden Zeolly Impulse Type Turbine, gear coupled to 1 000 kW Mather and Platt D.C. Generator, 440/520 V, complete with condensing plant, switchgear, etc.

One—500 kW Brush Parsons Mixed Pressure Turbo-Generator, 440/520 V D.C., complete with condensing plant, switchgear, etc.

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One—500 kW British Thomson-Houston Rotary Converter, complete with transformer and A.C. and D.C. switchgear.

One—Tudor Battery, consisting of 220 cells type H.Q. 25 (wood boxes), capacity 990 ampere hours.

One—Tudor Battery, consisting of 252 cells type H.E.15 (glass boxes), capacity 315 ampere hours.

Full particulars of the above and other plant for disposal can be obtained from the Electrical Engineer, Mr. A. NICKLIN, Electricity Works, Swindon, by arrangement with whom the plant may be inspected.

Tenders (endorsed "Tender for Plant"), which may be for the purchase of the whole or of any part of the plant, to be delivered to me at my office on or before Saturday, March 29th, 1930.

W. H. BENTLEY,
Town Clerk.

Town Hall, Swindon.
March 5th, 1930.

GREAT WESTERN RAILWAY.—The Directors of this Company are prepared to receive Tenders for the supply of the undermentioned Stores :—

*20.—Electrical Wires and Cables.

21.—Telegraph Ironwork.

Samples and Patterns may be seen at Swindon, from Monday, March 24th, to Friday, March 28th (inclusive) between 10 a.m. and 5 p.m. on application at the Offices of the Stores Superintendent, Swindon. Samples and Patterns for articles on List No. 21 may also be seen at the Pattern Room, corner of Gt. Charles Street, adjoining Birmingham Snow Hill Station, on the same days between 10 a.m. and 5 p.m., except Monday, when the exhibition will be from 1 p.m. to 5 p.m.

Specifications, with Forms of Tender (upon which alone Tenders can be received) may be obtained at the Office of the Stores Superintendent, Swindon.

* Forms of Tender for List No. 20 will be issued on Monday April 14th, 1930.

Tenders addressed to the undersigned, and marked outside "Tender for General Stores," will be received not later than 10 a.m. on Friday, April 4th, 1930.

* Tenders for List No. 20 will be received not later than 10 a.m. on Thursday, April 24th, 1930.

The Directors do not bind themselves to accept the lowest or any tender.

F. R. E. DAVIS, Secretary.

Paddington Station, London, W.2.
18th March, 1930.

APPOINTMENT WANTED.

EMPLOYMENT wanted by woman graduate (Hons. Maths.), with technical training in Wireless, Electrical and Optical Engineering. Reads German and French.—OMEGA, Box A.L.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

NOTICES.

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY, LIMITED.

NOTICE IS HEREBY GIVEN that the Register of Members and Transfer Books of the Company will be closed from the 17th to the 27th March, 1930, both days included, preparatory to the payment on the 27th March of a Dividend of 7½%, free of Income Tax, to all shareholders on the Register on the 17th March.

By Order.
C. W. CLARKE, Secretary.

38, Old Broad Street, London, E.C.2.
13th March, 1930.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

COST ACCOUNTANT required with considerable practica experience, for General Electrical Instrument Works in London. Only applications giving particulars of age, experience and salary required will be considered.—Box A. M. L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

EXPERIENCED SALES ORGANISER required by Domestic Electrification, Ltd., manufacturers of high-class electric cookers, fires and other domestic appliances. Must have a thorough knowledge of the trade and influential connection, with practical experience in representation and sales organisation. Applications will be treated in strict confidence.—Reply, stating age, previous experience and salary required, to MEASUREMENT, LTD., Townsend House, Greycoat Place, Westminster, S.W.1.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council requires at the Hackney Technical Institute, Dalston Lane, E.8, a full-time assistant master to teach electrical engineering and elementary mathematics in the junior day technical school and senior evening institute. A good honours degree or its equivalent is required and teaching experience is essential. Works experience will be a recommendation, and if after the age of 21 years will count towards assessment of commencing rate of salary. For graduates the scale salary is £276, rising by annual increments of £15 to £528.

Apply Education Officer (T.1), The County Hall, Westminster Bridge, S.E.1 (stamped addressed foolscap envelope necessary), for form to be returned by 29th March. Canvassing disqualifies.

MONTAGU H. COX.
Clerk of the London County Council.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council requires, as soon as possible, a full time graduate assistant master with practical experience, to teach in the electrical engineering and physics departments at the School of Engineering and Navigation, High Street, Poplar. The candidate appointed will be required to teach in the junior day technical school, the senior day departments and in the evening classes. Scale of salary for graduates £276—£15—£528. Commencing salary according to experience.

Apply, Education Officer (T.1.), The County Hall, Westminster Bridge, S.E.1 (stamped addressed foolscap envelope necessary), for form to be returned by March 31st. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

TRANSFORMERS.

THE Bethnal Green Borough Council invites Tenders for the supply, delivery and erection of one 1 000 K.V.A. and two 500 K.V.A. three-phase Transformers.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Transformers," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Monday, March 31st, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

COUNTY OF LONDON.

THE London County Council invites Tenders from manufacturers only for the supply and delivery in the London area of High and Low Tension Electric Cables and for the reconstruction of existing low tension Cables.

The specification, form of tender, etc., may be obtained on application to the General Manager of Tramways, Tramways Offices, 23, Belvedere Road, S.E.1, upon payment of £2. This amount will be returnable only if the tenderer shall have sent in a *bona fide* tender and shall not have withdrawn the same. Full particulars of the work may be obtained and the contract document inspected on personal application before payment of the fee.

The Contractor will be bound to observe the provisions of a fair wages clause, the terms of which are set out fully in the instructions for tender and in the form of contract and in *The London County Council Gazette*.

No tender received by the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1, after 4 p.m. on Monday, April 14th, 1930, will be accepted.

The Council does not bind itself to accept the lowest or any tender.

MONTAGU H. COX,
Clerk of the London County Council.

DUNDEE ELECTRICITY SUPPLY DEPARTMENT.

CORPORATION OF DUNDEE, ELECTRICITY DEPARTMENT.

THE Corporation invites Tenders for the supply and delivery of: (1) Direct Current and Alternating Current House Service Meters; and (2) 35 000 pairs 8 mm. and 9 mm. by 15 ins. long Arc Lamp Carbons, for burning in "Angold" Magazine Flame Arc Lamps.

Specification, Schedule and Form of Tender may be obtained on application to the undersigned at the Head Office, Dudhope Crescent Road, Dundee.

Tenders (sealed in envelopes provided), to be lodged with the Town Clerk, City Chambers, Dundee, not later than April 10th, 1930.

The Corporation does not bind itself to accept the lowest or any Tender.

D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road, Dundee.
Saturday, March 22nd, 1930.

METROPOLITAN BOROUGH OF SAINT PANCRAS.

E.H.T. SWITCHGEAR.

THE Council invite Tenders for the supply of E.H.T. Switchgear. Specifications, with conditions and form of Tender, may be obtained from the offices of the Electricity and Public Lighting Department, 57, Pratt Street, Camden Town, London, N.W.1, on the payment of a deposit of £2, which will be refunded on receipt of a *bona fide* Tender. Additional copies will be supplied on payment of the sum of 10s. 6d., which is not returnable.

Sealed Tenders endorsed "Tender for E.H.T. Switchgear" to be delivered to the undersigned on or before 12 noon on Thursday, 3rd April, 1930.

The Council do not bind themselves to accept the lowest or any Tender.

A. P. COKE,
Deputy Town Clerk.

Town Hall, Pancras Road,
London, N.W.1.

METROPOLITAN BOROUGH OF ST. PANCRAS.

L.T. SWITCHBOARDS.

THE Council invites Tenders for the supply of L.T. Switchboards. Specification with conditions and form of Tender may be obtained from the offices of the Electricity and Public Lighting Department, 57, Pratt Street, Camden Town, London, N.W.1, on payment of a deposit of £2, which will be refunded on receipt of a *bona fide* Tender. Additional copies will be supplied on payment of the sum of 10s. 6d., which is not returnable.

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A. P. COKE,
Deputy Town Clerk.

Town Hall, Pancras Road,
London, N.W.1.

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GREAT WESTERN RAILWAY.—The Directors of this Company are prepared to receive Tenders for the supply of the undermentioned Stores:—

*20.—Electrical Wires and Cables.

21.—Telegraph Ironwork.

Samples and Patterns may be seen at Swindon, from Monday, March 24th, to Friday, March 28th (inclusive) between 10 a.m. and 5 p.m. on application at the Offices of the Stores Superintendent, Swindon. Samples and Patterns for articles on List No. 21 may also be seen at the Pattern Room, corner of Gt. Charles Street, adjoining Birmingham Snow Hill Station, on the same days between 10 a.m. and 5 p.m., except Monday, when the exhibition will be from 1 p.m. to 5 p.m.

Specifications, with Forms of Tender (upon which alone Tenders can be received) may be obtained at the Office of the Stores Superintendent, Swindon.

* Forms of Tender for List No. 20 will be issued on Monday April 14th, 1930.

Tenders addressed to the undersigned, and marked outside "Tender for General Stores," will be received not later than 10 a.m. on Friday, April 4th, 1930.

* Tenders for List No. 20 will be received not later than 10 a.m. on Thursday, April 24th, 1930.

The Directors do not bind themselves to accept the lowest or any tender.

F. R. E. DAVIS, Secretary.

Paddington Station, London, W.2.
18th March, 1930.

CENTRAL ELECTRICITY BOARD.

NORTH-WEST ENGLAND AND NORTH WALES ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for the construction of site works and foundation works, for the transforming stations at Ribble (Preston) and Lancaster.

Copies of the Specification N.W.E.—P.F.1 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Wednesday, April 2nd, 1930, on payment of a deposit of £2 2s. 0d. for the first copy and £1 1s. 0d. for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the Form supplied, endorsed "Tender for Specification N.W.E.—P.F.1," must be delivered to the offices of the Board not later than 12 o'clock noon on Wednesday, April 16th, 1930.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

APPOINTMENT WANTED.

EXPERIENCED WIREMAN, disengaged; light, power, a.c. and d.c.—G., 150, Windmill Road, Brentford.

EMPLOYMENT wanted by woman graduate (Hons. Maths.), with technical training in Wireless, Electrical and Optical Engineering. Reads German and French.—OMEGA, Box A.L.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

CONSUMERS' ENGINEER, at present with large undertaking covering 900 square miles, desires progressive post. Wide experience includes Bulk Supply, Engineering Works, Textile Mills, Domestic, etc. Excellent technical knowledge and general education Public School and University, Science and Arts Degree standard. Three years War Service. Good organiser and accustomed to satisfactory handling of all classes of temperament. Good address. Experienced Exhibition work, Advertising, public speaking and teaching; also design estimating and supervision of all classes of Installation work. Own Saloon Car. Excellent sales record. Age 32; salary required, £350, but good prospects a consideration. Reason for changing, desires wider scope.—Offers to BOX A.O.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

NOTICES.

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SCARBOROUGH CORPORATION.

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Apply Education Officer (T.1), The County Hall, Westminster Bridge, S.E.1 (stamped addressed foolscap envelope necessary), for form to be returned by 29th March. Canvassing disqualifies.

MONTAGU H. COX.
Clerk of the London County Council.

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Apply, Education Officer (T.1.), The County Hall, Westminster Bridge, S.E.1 (stamped addressed foolscap envelope necessary), for form to be returned by March 31st. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

COUNTY BOROUGH OF BRIGHTON.

ELECTRICITY DEPARTMENT.

APPOINTMENT OF ENGINEER AND MANAGER.

APPLICATIONS are invited for the office of Engineer and Manager of the Corporation's Electricity Undertaking.

Candidates must have held the appointment of Chief Engineer, Deputy Engineer or Chief Engineering Assistant in the Generating Station of a local authority or power company.

The inclusive salary will commence at £1 600 per annum.

Form of application and the particulars of the duties of the office can be obtained from the undersigned.

Applications, on the prescribed form, must be addressed to the undersigned at the Town Hall, Brighton, endorsed "Electrical Engineer," and delivered on or before 12 noon on Saturday, the 26th day of April, 1930.

Canvassing in any form is strictly prohibited, and will disqualify.

JAS. H. ROTHWELL,
Town Clerk.

Town Hall, Brighton.
March 21st, 1930.

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Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CENTRAL ELECTRICITY BOARD.

MID-EAST ENGLAND ELECTRICITY SCHEME, 1929.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of the 33 kV Transmission Line Crossing of the River Witham, Boston.

Copies of the Specification No. M.E.E.—S.L.3 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, April 7th, 1930, on payment of a deposit of Two Guineas for the first copy, and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* Tender.

Tenders on the form supplied endorsed "Tender for Specification No. M.E.E.—S.L.3" must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, May 5th, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
Charing Cross, W.C.2.

CENTRAL ELECTRICITY BOARD.

MID-EAST ENGLAND ELECTRICITY SCHEME, 1929.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of 66 Kilovolt and Lower Voltage Transmission Lines.

Copies of the Specification No. M.E.E.—S.L.2. and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Wednesday, April 9th, 1930, on payment of a deposit of Two Guineas for the first copy, and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* Tender.

Tenders on the form supplied endorsed "Tender for Specification M.E.E.—S.L.2" must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, May 12th, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
Charing Cross, W.C.2.

CENTRAL ELECTRICITY BOARD.

NORTH WEST ENGLAND AND NORTH WALES ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for 33 kV, 11kV and 6·6 kV Switchgear for connecting the Board's supply to Electricity Supply Undertakings.

Copies of the Specification No. N.W.E.—G.S.4 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, April 7th, 1930, on payment of a deposit of two guineas for the first copy and one guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the Form supplied endorsed "Tender for Specification No. N.W.E.—G.S.4" must be delivered to the offices of the Board not later than 12 o'clock noon on April 28th, 1930.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor

Trafalgar Buildings,
Charing Cross, W.C.2.

CENTRAL ELECTRICITY BOARD.

MID-EAST ENGLAND ELECTRICITY SCHEME, 1929.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of 66 Kilovolt and Lower Voltage Switchgear.

Copies of the Specification M.E.E.—G.S.1 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Wednesday, April 9th, 1930, on payment of a deposit of Two Guineas for the first copy, and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* Tender.

Tenders on the form supplied endorsed "Tender for Specification M.E.E.—G.S.1" must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, May 12th, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
Charing Cross, W.C.2

ATHERTON URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply and delivery of five miles of ·06 High Tension, Concentric, Paper Insulated, Lead Sheathed, Served, Steel Taped Armoured, Served and Compounded Cable, suitable for working pressures up to 2 500 V, Centre Point Earthed, and manufactured in accordance with the latest B.E.S.

Sealed Tenders, endorsed "Cable," are to be addressed to the Clerk, Town Hall, Atherton, and must be delivered not later than April 14th, 1930.

A. E. HOPE,
Clerk to the Council.

Town Hall, Atherton.

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COUNTY OF LONDON.

THE London County Council invites Tenders from manufacturers only for the supply and delivery in the London area of High and Low Tension Electric Cables and for the reconstruction of existing low tension Cables.

The specification, form of tender, etc., may be obtained on application to the General Manager of Tramways, Tramways Offices, 23, Belvedere Road, S.E.1, upon payment of £2. This amount will be returnable only if the tenderer shall have sent in a *bona fide* tender and shall not have withdrawn the same. Full particulars of the work may be obtained and the contract document inspected on personal application before payment of the fee.

The Contractor will be bound to observe the provisions of a fair wages clause, the terms of which are set out fully in the instructions for tender and in the form of contract and in *The London County Council Gazette.*

No tender received by the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1, after 4 p.m. on Monday, April 14th, 1930, will be accepted.

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MONTAGU H. COX,
Clerk of the London County Council.

DUNDEE ELECTRICITY SUPPLY DEPARTMENT.

CORPORATION OF DUNDEE, ELECTRICITY DEPARTMENT.

THE Corporation invites Tenders for the supply and delivery of: (1) Direct Current and Alternating Current House Service Meters; and (2) 35 000 pairs 8 mm. and 9 mm. by 15 ins. long Arc Lamp Carbons, for burning in "Angold" Magazine Flame Arc Lamps.

Specification, Schedule and Form of Tender may be obtained on application to the undersigned at the Head Office, Dudhope Crescent Road, Dundee.

Tenders (sealed in envelopes provided), to be lodged with the Town Clerk, City Chambers, Dundee, not later than April 10th, 1930.

The Corporation does not bind itself to accept the lowest or any Tender.

D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road, Dundee.
Saturday, March 22nd, 1930.

BOROUGH OF BEDFORD ELECTRICITY DEPARTMENT.

RURAL DEMONSTRATION SCHEME.

NOTICE.

FIRMS who have carried out important Contracts for Overhead Transmission Lines are invited to tender for the supply, delivery and erection of 11,000 volt overhead lines and auxiliary apparatus (other than Transformers) required for supplying an area of 100 square miles.

The exclusive employment of British labour and material is essential.

Copies of the Specification, Schedules and Form of Tender may be obtained from the Borough Electrical Engineer, Electricity Offices, Prebend Street, Bedford, if application is made on or before Monday, April 14th, 1930, on payment of Three Guineas for the first copy, which payment will be returned on receipt of a *bona fide* Tender from a Firm qualified as above. Additional copies of the Specification, etc., will be provided at a cost of Five Shillings per set, which will not be returnable.

Tenders on the Form supplied, endorsed "Tenders for Transmission Lines," must be sealed and addressed to:—

THE CHAIRMAN,
ELECTRICITY COMMITTEE,
ELECTRICITY OFFICES,
PREBEND STREET,
BEDFORD,

and delivered not later than noon on Monday, May 5th, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. DARLOW, Town Clerk.

TOWN HALL, BEDFORD.
April, 1930.

CITY AND ROYAL BURGH OF DUNDEE.

ELECTRICITY DEPARTMENT.

THE Corporation invites Tenders for the supply, delivery and erection of two electrically-driven Vertical Spindle Main Circulating Water Pumps, etc., in a pump room in connection with their Generating Station at Carolina Port, Dundee.

Specification, drawings, form of tender and general conditions of contract may be obtained from the undersigned on payment of a deposit of £2 2s., which sum will be returned upon receipt of a *bona fide* tender.

Tenders (sealed in envelopes provided) must be lodged with W. H. Blyth Martin, Esq., Town Clerk, City Chambers, Dundee, not later than by Saturday, May 10th, 1930.

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D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road,
Dundee.
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W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENT WANTED.

EXPERIENCED WIREMAN, disengaged; light, power, a.c. and d.c.—G., 150, Windmill Road, Brentford.

CONSUMERS' ENGINEER, at present with large undertaking covering 900 square miles, desires progressive post. Wide experience includes Bulk Supply, Engineering Works, Textile Mills, Domestic, etc. Excellent technical knowledge and general education, Public School and University, Science and Arts Degree standard. Three years War Service. Good organiser and accustomed to satisfactory handling of all classes of temperament. Good address. Experienced Exhibition work, Advertising, public speaking and teaching; also design estimating and supervision of all classes of Installation work. Own Saloon Car. Excellent sales record. Age 32; salary required, £350, but good prospects a consideration. Reason for changing, desires wider scope.—Offers to BOX A.O.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

APPOINTMENTS VACANT.

WANTED for temporary period of about six months, first-class Fitter-Turner. Expert experience in erection and maintenance of large steam turbines and auxiliaries essential.—Apply by letter, not later than first post on Tuesday, April 8th, 1930, to ENGINEER AND MANAGER, Stepney Borough Council Electricity Supply Undertaking, 27, Osborn Street, E.1, endorsed on envelope "Fitter-Turner" and enclosing *copies only* of not more than three recent references.

WANTED, Foreman for Cotton Covering Department.—Apply, giving full particulars, which will be treated in confidence, to BOX A.P.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

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Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

TENDERS INVITED.

TENDERS.

THE Commissioners of His Majesty's Works, etc., are prepared to receive Tenders before 11 a.m. on Tuesday, April 22nd, 1930, for the supply of Incandescent Electric Lamps.

Forms of Tender, etc., may be obtained on application to the CONTROLLER OF SUPPLIES, H.M. Office of Works, etc., King Charles Street, Westminster, London, S.W.1.

BOROUGH OF BEDFORD ELECTRICITY DEPARTMENT.

RURAL DEMONSTRATION SCHEME.

NOTICE.

FIRMS who have carried out important Contracts for Overhead Transmission Lines are invited to tender for the supply, delivery and erection of 11,000 volt overhead lines and auxiliary apparatus (other than Transformers) required for supplying an area of 100 square miles.

The exclusive employment of British labour and material is essential.

Copies of the Specification, Schedules and Form of Tender may be obtained from the Borough Electrical Engineer, Electricity Offices, Prebend Street, Bedford, if application is made on or before Monday, April 14th, 1930, on payment of Three Guineas for the first copy, which payment will be returned on receipt of a *bona fide* Tender from a Firm qualified as above. Additional copies of the Specification, etc., will be provided at a cost of Five Shillings per set, which will not be returnable.

Tenders on the Form supplied, endorsed "Tenders for Transmission Lines," must be sealed and addressed to:—

THE CHAIRMAN,
ELECTRICITY COMMITTEE,
ELECTRICITY OFFICES,
PREBEND STREET,
BEDFORD,

and delivered not later than noon on Monday, May 5th, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. DARLOW, Town Clerk.

TOWN HALL, BEDFORD.
April, 1930.

ATHERTON URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply and delivery of five miles of ·06 High Tension, Concentric, Paper Insulated, Lead Sheathed, Served, Steel Taped Armoured, Served and Compounded Cable, suitable for working pressures up to 2 500 V, Centre Point Earthed, and manufactured in accordance with the latest B.E.S.

Sealed Tenders, endorsed "Cable," are to be addressed to the Clerk, Town Hall, Atherton, and must be delivered not later than April 14th, 1930.

A. E. HOPE,
Clerk to the Council.

Town Hall, Atherton.

CITY AND ROYAL BURGH OF DUNDEE.

ELECTRICITY DEPARTMENT.

THE Corporation invites Tenders for the supply, delivery and erection of two electrically-driven Vertical Spindle Main Circulating Water Pumps, etc., in a pump room in connection with their Generating Station at Carolina Port, Dundee.

Specification, drawings, form of tender and general conditions of contract may be obtained from the undersigned on payment of a deposit of £2 2s., which sum will be returned upon receipt of a *bona fide* tender.

Tenders (sealed in envelopes provided) must be lodged with W. H. Blyth Martin, Esq., Town Clerk, City Chambers, Dundee, not later than by Saturday, May 10th, 1930.

The Corporation does not bind itself to accept the lowest or any tender.

D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road,
Dundee.
March 31st, 1930.

BOROUGH OF ILFORD.

ELECTRICITY DEPARTMENT.

THE Corporation are prepared to receive Tenders for the supply, delivery and erection of
CONVERTING PLANT OF 500 kW CAPACITY.

Tenders may be submitted for either:—
(*a*) Rotary Converter Plant with Automatic Control; or
(*b*) Rectifier Plant.

Copy of Specification, Form of Tender, etc., may be obtained on application to the Borough Electrical Engineer, Electricity Works, Ley Street, Ilford.

Tenders enclosed in sealed covers and endorsed "Tender for Converting Plant," must be delivered to the undersigned not later than 12 noon on Monday, April 28th, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ADAM PARTINGTON,
Town Clerk.

Town Hall, Ilford.
April 7th, 1930.

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NOTICES.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

ENGINEER required, preferably having knowledge of electrical communication art, to handle technical literature.—Apply by letter only, stating qualifications and salary desired, to CREED AND CO., LTD., Telegraph Engineers, Croydon.

DRAUGHTSMEN, Senior and Junior, required for Metal Clad Switch Gear. Good mechanical experience essential.—Apply, stating age, full experience and salary required, to SWITCH GEAR DEPARTMENT, General Electric Co., Ltd., Witton, Birmingham.

ELECTRICIAN wanted, used to 'bus lighting and ignition state age, remuneration, and where apprenticeship was served, full details of subsequent experience, and types of electrical equipment used to.—RIBBLE MOTOR SERVICES, LTD., Preston.

MALVERN URBAN DISTRICT COUNCIL.

APPLICATIONS are invited for the position of General Foreman of the Electricity Department.

The post is a designated one under the Superannuation Act.

Salary £250 per annum.

Particulars of duties may be obtained from the undersigned, to whom applications, with copies of testimonials, should be delivered not later than April 23rd, 1930.

E. D. WOOTTEN,
Electrical Engineer.

The Council House,
Malvern.

WANTED for temporary period of about six months, first-class Fitter-Turner. Expert experience in erection and maintenance of large steam turbines and auxiliaries essential.—Apply by letter, not later than first post on Tuesday, April 8th, 1930, to ENGINEER AND MANAGER, Stepney Borough Council Electricity Supply Undertaking, 27, Osborn Street, E.1, endorsed on envelope "Fitter-Turner" and enclosing *copies only* of not more than three recent references.

SALES ENGINEER FOR LONDON.

OLD-ESTABLISHED Manufacturers of Electric Motors have a vacancy for first-class Engineer with connections and experience in the Electric Motor trade. Only applications *with references and testimonials*, which will be treated as confidential, will be considered.—Box A.Q.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ENGINEERS—novice or expert—£300, £400, £500 per year, or more is within your grasp. In our Handbook "ENGINEERING OPPORTUNITIES," Prof. A. M. Low explains where the good posts abound. This Handbook has shown the way to better things to over 20 000 of your fellows. It contains details of A.M.I.Mech.E., A.M.I.E.E., A.M.I.C.E., A.M.I.A.E., A.M.I.Struct.E., Matric., C. and G., G.P.O., etc., exams.; outlines home study courses in all branches of Electrical, Mechanical, Motor and Wireless Engineering, and shows the unique advantages of our Appointments Department. Why stay in the "Hammer and File Brigade"? Send for our free Handbook at once, stating Branch, Post or Exam. which interests you.—BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 43, Shakespeare House, 29-31, Oxford Street, London, W.1.

WANTED, Foreman for Cotton Covering Department.—Apply, giving full particulars, which will be treated in confidence, to Box A.P.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

APPOINTMENT OF DRAFTSMAN.

THE above-named Council invite applications for the appointment of a Draftsman in the Electricity Department, at a commencing salary of £180 per annum, rising, subject to satisfactory service, by annual increments of £10, to a maximum of £240 per annum.

Applicants must be expert Draftsmen, and must have had experience in the service of an Electricity Authority, and be capable of preparing layouts of mains, sub-stations and the records of a Supply Undertaking.

The candidate selected will be required to pass a medical examination, and to contribute to the Council's Superannuation Fund.

Applications, stating age, experience and qualifications, accompanied by copies of three recent testimonials, must reach the undersigned by 12 noon on Saturday, April 26th, 1930.

H. J. BAKER,
Clerk to the Council.

Council House, Hounslow.
April 9th, 1930.

1929 EXAMINATION RESULTS.

THE T.I.G.B. MAINTAINS ITS SPLENDID EXAM.-SUCCESS RECORD.

AT all the 1929 PROFESSIONAL EXAMINATIONS—A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., etc. — the candidates who were trained by The T.I.G.B. obtained a Pass Percentage of over 90%.

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T.I.G.B. TRAINING IS BEING CHOSEN BECAUSE IT IS OBVIOUSLY PRODUCTIVE OF SATISFACTION AND SUCCESS. Therefore, whatever your aim may be—a Recognised Professional Qualification, or the Special Technical Knowledge needed in a responsible post—you can select the appropriate T.I.G.B. course with complete confidence.

WRITE TO-DAY for FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of home-study engineering courses in the world, and mention the branch, post or qualification that interests you, to

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN
(Established 1917),
10, TEMPLE BAR HOUSE, LONDON, E.C.4.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

PATENT AGENTS, &c.

PATENTS, TRADE MARKS.

KINGS PATENT AGENCY, LTD. (B. T. King, Regd. Pat. Agent, G.B., U.S. and Can.), 146A, Queen Victoria Street, London, E.C.4. Phone: Cent. 0682. Advice Handbook and Consultations free. 43 years' refs.

THE Proprietor of British Patent No. 266 608, dated July 31st, 1926, relating to "Improved Method and Apparatus for Testing Electrical Insulators," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

SWITCHGEAR.

THE Bethnal Green Borough Council invites tenders for the supply, delivery and erection of High Tension and Low Tension Switchgear.

Copies of the form of tender, conditions and specification may be obtained from me on payment of two guineas, returnable after receipt of a bona fide tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Switchgear," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Wednesday, April 30th, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

BOROUGH OF ILFORD.

ELECTRICITY DEPARTMENT.

THE Corporation are prepared to receive Tenders for the supply, delivery and erection of

CONVERTING PLANT OF 500 kW CAPACITY.

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Copy of Specification, Form of Tender, etc., may be obtained on application to the Borough Electrical Engineer, Electricity Works, Ley Street, Ilford.

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By order,
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Town Clerk.

Town Hall, Ilford.
April 7th, 1930.

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General Secretary.

102, St. George's Square,
London, S.W.1.

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HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL

ELECTRICITY DEPARTMENT.

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The candidate selected will be required to pass a medical examination, and to contribute to the Council's Superannuation Fund.

Applications, stating age, experience and qualifications, accompanied by copies of three recent testimonials, must reach the undersigned by 12 noon on Saturday, April 26th, 1930.

H. J. BAKER,
Clerk to the Council.

Council House, Hounslow.
April 9th, 1930.

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TRANSFORMER DRAUGHTSMAN required for standardisation purposes by a firm in the Midlands. Previous experience essential. Permanency offered to the right man.—Box A.R.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ELECTRICIAN wanted, used to 'bus lighting and ignition state age, remuneration, and where apprenticeship was served, full details of subsequent experience, and types of electrical equipment used to.—RIBBLE MOTOR SERVICES, LTD., Preston.

DRAUGHTSMEN required by Creed and Co., Telegraph Engineers, Croydon, for development work in connection with high speed electro mechanical instruments for mass production similar to electric typewriters and the like. Must be capable of good clean rapid work. Preference given to young men with sound technical training and designing ability. Write stating age, experience and salary required: application to be marked "Development."

SALES ENGINEER FOR LONDON.

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E. D. WOOTTEN,
Electrical Engineer.

The Council House,
Malvern.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council invites applications for appointment in the department of the Chief Officer of the London Fire Brigade of a technical assistant for inspectorial and advisory duties connected with fire and safety matters in buildings licensed by the Council for public entertainment.

Candidates must be under 26 years of age on May 5th, 1930. They will be required to produce evidence of a thorough training in electrical and mechanical engineering, including practical experience in both, and must be able to write lucid reports. Experience of engineering work under commercial conditions will be an additional qualification.

The commencing salary will be £280 a year, rising to £360 a year.

Applications must be made on the official form, copies of which (with full particulars) may be obtained by sending a stamped addressed foolscap envelope (marked "Technical Assistant, Fire Brigade") to the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1. Forms must be returned by May 5th, 1930. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

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EDUCATIONAL NOTICES.

EXAMINATIONS HELD BY THE INSTITUTION OF ELECTRICAL ENGINEERS.

MR. A. J. ANIDO, B.Sc., A.C.G.I. (late R.E.), specialises in the personal preparation of candidates in all subject. the above examinations. Arrangements are made to suit those engaged in business.

60, Chancery Lane, W.C.2. Telephone: Holborn 5776.

UNIVERSITY OF LIVERPOOL.

SESSION 1930-1931.

PROSPECTUSES and full particulars of the following may be obtained on application to the Registrar:—

UNIVERSITY CALENDAR (price 2s. 6d., post free 3s.).
FACULTIES OF ARTS, SCIENCE, MEDICINE, LAW AND ENGINEERING.
LIVERPOOL SCHOOL OF ARCHITECTURE.
DEPARTMENT OF CIVIC DESIGN.
INSTITUTE OF ARCHAEOLOGY.
DEPARTMENT OF EDUCATION.
LIVERPOOL SCHOOL OF SOCIAL SCIENCES AND ADMINISTRATION (including Economics, Commerce, Geography and Social Science).
SCHOOL OF RUSSIAN STUDIES.
SCHOOL OF LOCAL HISTORY AND RECORDS.
UNIVERSITY EXTENSION BOARD.
DEPARTMENT OF PUBLIC HEALTH.
LIVERPOOL SCHOOL OF TROPICAL MEDICINE.
SCHOOL OF VETERINARY SCIENCE.
SCHOOL OF DENTAL SURGERY.
DOCTORATE IN PHILOSOPHY.
FELLOWSHIPS, SCHOLARSHIPS, STUDENTSHIPS, EXHIBITIONS, SPECIAL GRANTS AND PRIZES.
HALLS OF RESIDENCE.
JOINT BOARD MATRICULATION EXAMINATION.
AWARD OF SCHOOL CERTIFICATES.
AWARD OF HIGHER SCHOOL CERTIFICATES.

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TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

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'Phone: CITY 0244 (10 Lines)

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Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Bembroke, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CENTRAL ELECTRICITY BOARD.

NORTH-WEST ENGLAND AND NORTH WALES ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for 33 kV and other cables.

Copies of Specification No. N.W.E.-G.C.1 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, April 28, 1930, on payment of a deposit of two guineas for the first copy and one guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* Tender.

Tenders on the form supplied endorsed "Tender for Specification N.W.E.-G.C.1" must be delivered to the offices of the Board not later than 12 o'clock noon on Monday, May 12, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CENTRAL ELECTRICITY BOARD.

SOUTH EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite Tenders for the construction of Site Works, Foundation Works and Buildings in the area of the South East England Electricity Scheme (London area).

Copies of the Specification No. S.E.E.-L.F.4 and Form of Tender may be obtained from the Offices of the Board on application to the undersigned on or after Monday, April 28, 1930, on payment of a deposit of two guineas for the first copy and one guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* Tender.

Tenders on the form supplied endorsed "Tender for Specification No. S.E.E.-L.F.4" must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, May 19, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

SWITCHGEAR.

THE Bethnal Green Borough Council invites Tenders for the supply, delivery and erection of High Tension and Low Tension Switchgear.

Copies of the form of tender, conditions and specification may be obtained from me on payment of two guineas, returnable after receipt of a bona fide tender. Technical enquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The Contractor will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Switchgear," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Wednesday, April 30, 1930.

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DAVID J. KEEP,
Town Clerk.

BOROUGH OF ILFORD.

ELECTRICITY DEPARTMENT.

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CONVERTING PLANT OF 500 kW CAPACITY.

Tenders may be submitted for either:—

(*a*) Rotary Converter Plant with Automatic Control; or

(*b*) Rectifier Plant.

Copy of Specification, Form of Tender, etc., may be obtained on application to the Borough Electrical Engineer, Electricity Works, Ley Street, Ilford.

Tenders enclosed in sealed covers and endorsed "Tender for Converting Plant," must be delivered to the undersigned not later than 12 noon on Monday, April 28, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ADAM PARTINGTON,
Town Clerk.

Town Hall, Ilford.
April 7, 1930.

STAFFORDSHIRE EDUCATION COMMITTEE.

INSTALLATION OF ELECTRIC LIGHT.

TENDERS are invited from firms whose names appear on the National Register of Electrical Installation Contractors, for the installation of electric light in the existing Infants' Council School, Pelsall (near Walsall), which is to be enlarged and converted into a Senior Mixed Council School. A specification and drawings may be obtained by application to Messrs. Moffett, Rosher and Mann, Consulting Engineers, Union Chambers, Temple Row, Birmingham, with a cheque for deposit of £5 5s., which will be returned upon the submission of a *bona fide* tender. Tenders endorsed "Lighting Installation—Pelsall Senior Mixed Council School" must be delivered by May 24, 1930, to the undersigned.

F. A. HUGHES,
Director of Education.

County Education Offices,
Stafford.
April 16, 1930.

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EPSOM URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

THE Council are prepared to receive Tenders for the following:—
Section I.—Kiosks and converting plant.
Section II.—E.H.T. and L.T. cable and laying.
Section III.—Supply only L.T. cables.

A Specification and Form of Tender can be seen and afterwards obtained at the offices of H. W. Watts, Electrical Engineer, Electricity Works, Depot Road, for which a fee of two guines will be charged. This fee will be refunded on receipt of a direct *bona fide* tender. Only one copy of the Specification will be issued to any one firm.

Tenders on the form supplied, endorsed "Tender for Section —" "Electricity Department," must be delivered to the undersigned at his offices, 49, Church Street, Epsom, by noon on Monday, May 12, 1930.

P. E. WHITEOAK COOPER,
Clerk and Solicitor.

April, 1930.

APPOINTMENTS VACANT.

TRANSFORMER DRAUGHTSMAN required for standardisation purposes by a firm in the Midlands. Previous experience essential. Permanency offered to the right man.—Box A.R.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

SALES ENGINEER FOR LONDON.

OLD-ESTABLISHED Manufacturers of Electric Motors have a vacancy for first-class Engineer with connections and experience in the Electric Motor trade. Only applications *with references and testimonials*, which will be treated as confidential, will be considered.—Box A.Q.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DRAUGHTSMEN required by Creed and Co., Telegraph Engineers, Croydon, for development work in connection with high speed electro mechanical instruments for mass production similar to electric typewriters and the like. Must be capable of good clean rapid work. Preference given to young men with sound technical training and designing ability. Write stating age, experience and salary required; application to be marked "Development."

CITY OF NOTTINGHAM.

APPOINTMENT OF CHIEF ENGINEER AND GENERAL MANAGER, ELECTRICITY SUPPLY DEPARTMENT.

THE Nottingham City Council invite applications from qualified Electrical Engineers for the position of Chief Engineer and Manager of their Undertaking.

The person appointed will be responsible to the Electricity Committee and the City Council for the control and management of the undertaking, and he will be required to devote his whole time to the duties of the office, and will not be allowed to engage, either directly or indirectly, in private work of any kind. He will be expected to have, in addition to high technical qualifications, a considerable capacity for business and to show proof of an enterprising disposition.

The appointment will be subject to the provisions of the Local Government and other Officers' Superannuation Act, 1922, and the successful candidate will be required to pass a medical examination.

The salary will be £1,750 per annum, subject to the scale of remuneration adopted from time to time by the Standing Joint Committee of the Incorporated Municipal Electrical Association and the Chief Engineers' Association.

Applications, accompanied by copies of three recent testimonials, must be delivered to me in a sealed envelope, endorsed "Chief Engineer, Electricity Department," not later than May 12, 1930. An applicant may, if he so desires, forward to me not more than 20 copies of his application and testimonials for the use of the members of the Committee.

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W. J. BOARD,
Town Clerk.

Guildhall, Nottingham.
April 16, 1930.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council invites applications for appointment in the department of the Chief Officer of the London Fire Brigade of a technical assistant for inspectorial and advisory duties connected with fire and safety matters in buildings licensed by the Council for public entertainment.

Candidates must be under 26 years of age on May 5, 1930. They will be required to produce evidence of a thorough training in electrical and mechanical engineering, including practical experience in both, and must be able to write lucid reports. Experience of engineering work under commercial conditions will be an additional qualification.

The commencing salary will be £280 a year, rising to £360 a year.

Applications must be made on the official form, copies of which (with full particulars) may be obtained by sending a stamped addressed foolscap envelope (marked "Technical Assistant, Fire Brigade") to the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1. Forms must be returned by May 5, 1930. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

1929 EXAMINATION RESULTS.

THE T.I.G.B. MAINTAINS ITS SPLENDID EXAM.-SUCCESS RECORD.

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WRITE TO-DAY for FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of home-study engineering courses in the world, and mention the branch, post or qualification that interests you, to

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN
(Established 1917),
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PATENT AGENTS, &c.

PATENTS, TRADE MARKS.

KINGS PATENT AGENCY, LTD. (B. T. King, Regd. Pat. Agent, G.B., U.S. and Can.), 146A, Queen Victoria Street, London, E.C.4. Phone: Cent. 0682. Advice Handbook and Consultations free. 43 years' refs.

THE Proprietor of British Patent No. 266 608, dated July 31st, 1926, relating to "Improved Method and Apparatus for Testing Electrical Insulators," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois.

THE Proprietor (J. Solomon) of Patent No. 274,536, which relates to automatic cutting in and out of auxiliary transformer stations of supply networks in dependence upon the load without the use of auxiliary transformers, time switches or extra control lines, is desirous of entering into arrangements for commercial exploitation of his invention. Parties interested are requested to communicate with him at 285, High Holborn (1st floor), London, W.C.1.

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MISCELLANEOUS ADVERTISEMENTS

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Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

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Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Bembrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

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INSTALLATION OF ELECTRIC LIGHT.

TENDERS are invited from firms whose names appear on the National Register of Electrical Installation Contractors, for the installation of electric light in the existing Infants' Council School, Pelsall (near Walsall), which is to be enlarged and converted into a Senior Mixed Council School. A specification and drawings may be obtained by application to Messrs. Moffett, Rosher and Mann, Consulting Engineers, Union Chambers, Temple Row, Birmingham, with a cheque for deposit of £5 5s., which will be returned upon the submission of a *bona fide* tender. Tenders endorsed "Lighting Installation—Pelsall Senior Mixed Council School" must be delivered by May 24, 1930, to the undersigned.

F. A. HUGHES,
Director of Education.

County Education Offices,
Stafford.
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D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road, Dundee.
April 28, 1930.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

IRONBRIDGE GENERATING STATION.

TENDERS are invited by the above-named Authority for the supply, delivery and erection at their Ironbridge generating station of Storage Battery Equipment, comprising emergency stand-by lighting storage battery, 15 kW motor generator set, battery-trickle charger, milking booster and spare parts.

Copies of specification (No. 10) and form of tender may be obtained from Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, at the offices of the Authority, on payment of a deposit of one guinea, which will, after the Authority have come to a decision on the tenders received, be returned to the tenderer, providing he shall have sent in a *bona fide* tender and shall not have withdrawn it.

Additional copies of the specification may be obtained on payment of half a guinea per copy, which will not be returned.

Tenders must be forwarded under sealed cover, endorsed "Tender for Contract No. 10, Ironbridge Generating Station," so as to reach the undersigned not later than noon on Wednesday, June 4, 1930.

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H. F. CARPENTER,
Clerk and Treasurer.

Offices of the Authority:
Phœnix Buildings,
Dudley Road,
Wolverhampton.
April 28, 1930.

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Section I.—Kiosks and converting plant.
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Section III.—Supply only L.T. cables.

A Specification and Form of Tender can be seen and afterwards obtained at the offices of H. W. Watts, Electrical Engineer, Electricity Works, Depot Road, for which a fee of two guines will be charged. This fee will be refunded on receipt of a direct *bona fide* tender. Only one copy of the Specification will be issued to any one firm.

Tenders on the form supplied, endorsed "Tender for Section —" "Electricity Department," must be delivered to the undersigned at his offices, 49, Church Street, Epsom, by noon on Monday, May 12, 1930.

P. E. WHITEOAK COOPER,
Clerk and Solicitor.

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SENIOR DRAUGHTSMAN.—Domestic Electrification, Ltd., have a vacancy for a Senior Draughtsman. Must have had previous experience in the design and construction of electric cooking and heating appliances of all types.—Apply, stating age, experience and salary required, to BOX A. T. L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DESIGNERS with experience in the design and construction of light precision mechanical or electrical machinery are required for an Admiralty establishment near London. Workshop experience is essential and should preferably have been in this type of work. Candidates should have a wide interest in Engineering Science.

The duration of these appointments will be for a period not exceeding one year in the first instance, and the posts will be reviewed at the end of that time. The salary will be on the scale of £200–10–£290, plus Civil Service bonus, i.e., at present from £299–13–£410 approximately, inclusive, but the initial rate of remuneration will depend upon the ability of the candidates.

Candidates must be natural-born British subjects.

Candidates should apply, giving full particulars as to age, qualifications, etc., to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1, within ten days of the appearance of this notice. No application forms are required.

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Clerk and Solicitor.

NOTICES.

ELECTRICITY (SUPPLY) ACT, 1926.

EAST ENGLAND ELECTRICITY SCHEME, 1930.

WHEREAS the Electricity Commissioners have prepared and transmitted to the Central Electricity Board a Scheme bearing the above short title and relating specifically to—

The Administrative County of Norfolk:
Parts of the Administrative Counties of East Suffolk and West Suffolk;
The City and County of the City of Norwich; and
The County Borough of Great Yarmouth;

and dealing with the matters mentioned in Section 4 (1) of the Electricity (Supply) Act, 1926.

Notice is hereby given that the Central Electricity Board have caused the said Scheme to be published and that any authorised undertakers or other persons interested in the said Scheme and desiring to make representations thereon may do so by forwarding the same by registered letter addressed to the undersigned and posted not later than the ninth day of June, 1930. Copies of the said Scheme and of a volume of Particulars supplementary thereto may be obtained at the prices of One Shilling and Sixpence and Three Shillings and Sixpence each respectively, or if sent by post One Shilling and Sevenpence and Three Shillings and Eightpence each respectively from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, and 120, George Street, Edinburgh.

Dated this 5th day of May, 1930.

RICHARD H. FOX,
Secretary and Solicitor
to the Central Electricity Board.

Trafalgar Buildings,
1, Charing Cross,
London, W.C.2.

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ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council invites applications for appointment in the department of the Chief Officer of the London Fire Brigade of a technical assistant for inspectorial and advisory duties connected with fire and safety matters in buildings licensed by the Council for public entertainment.

Candidates must be under 26 years of age on May 5, 1930. They will be required to produce evidence of a thorough training in electrical and mechanical engineering, including practical experience in both, and must be able to write lucid reports. Experience of engineering work under commercial conditions will be an additional qualification.

The commencing salary will be £280 a year, rising to £360 a year.

Applications must be made on the official form, copies of which (with full particulars) may be obtained by sending a stamped addressed foolscap envelope (marked "Technical Assistant, Fire Brigade") to the Clerk of the Council, The County Hall, Westminster Bridge, S.E.1. Forms must be returned by May 5, 1930. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS ½d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

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SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

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Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Bembrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

STAFFORDSHIRE EDUCATION COMMITTEE.

INSTALLATION OF ELECTRIC LIGHT.

TENDERS are invited from firms whose names appear on the National Register of Electrical Installation Contractors, for the installation of electric light in the existing Infants' Council School, Pelsall (near Walsall), which is to be enlarged and converted into a Senior Mixed Council School. A specification and drawings may be obtained by application to Messrs. Moffett, Rosher and Mann, Consulting Engineers, Union Chambers, Temple Row, Birmingham, with a cheque for deposit of £5 5s., which will be returned upon the submission of a *bona fide* tender. Tenders endorsed "Lighting Installation—Pelsall Senior Mixed Council School" must be delivered by May 24, 1930, to the undersigned.

F. A. HUGHES,
Director of Education.

County Education Offices,
Stafford.
April 16, 1930.

CENTRAL ELECTRICITY BOARD.

SOUTH EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite Tenders for the Supply, Delivery and Erection of 33 Kilovolt Transformers.

Copies of the Specification No. S.E.E.-G.T.1 and Form of Tender may be obtained from the offices of the Board on application to the undersigned, on or after Wednesday, May 21, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied endorsed "Tender for Specification No. S.E.E.-G.T.1" must be delivered to the Offices of the Board not later than 12 o'clock noon on Wednesday, June 11, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CITY OF GLOUCESTER.

THE Electricity Committee is prepared to receive Tenders for the supply of cooking apparatus from firms with substantial experience in its manufacture, for the purposes of its Hire Purchase Scheme.

Further particulars may be obtained on application to:

THE CITY ELECTRICAL ENGINEER,
Commercial Road,
Gloucester.

APPOINTMENTS VACANT.

DRAUGHTSMAN required with experience of large High Tension Transformers. State age and salary expected, with full particulars of experience.—Apply Box A.U.I., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DESIGNERS with experience in the design and construction of light precision mechanical or electrical machinery are required for an Admiralty establishment near London. Workshop experience is essential and should preferably have been in this type of work. Candidates should have a wide interest in Engineering Science.

The duration of these appointments will be for a period not exceeding one year in the first instance, and the posts will be reviewed at the end of that time. The salary will be on the scale of £200–10–£290, plus Civil Service bonus, i.e., at present from £299–13–£410 approximately, inclusive, but the initial rate of remuneration will depend upon the ability of the candidates.

Candidates must be natural-born British subjects.

Candidates should apply, giving full particulars as to age, qualifications, etc., to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1, within ten days of the appearance of this notice. No application forms are required.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council requires in September, 1930, an instructor in the Electrical Engineering and Physics Department at the School of Engineering and Navigation, High Street, Poplar, E.14. Candidates should have graduate qualifications and should have had both teaching and practical electrical experience. The work includes day and evening classes from junior technical standard to that of advanced national certificates, together with electrical engineering for Engineer Officers of the Mercantile Marine. Graduate scale—£276—£15—£528. In addition to the scale the instructor appointed will receive an allowance in respect of special responsibility. The first increment accrues after two years' teaching service.

Apply Education Officer (T.1), The County Hall, S.E.1 (stamped addressed foolscap envelope necessary) for form to be returned by June 7th, 1930. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

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SENIOR DRAUGHTSMAN.—Domestic Electrification, Ltd., have a vacancy for a Senior Draughtsman. Must have had previous experience in the design and construction of electric cooking and heating appliances of all types.—Apply, stating age, experience and salary required, to Box A. T. L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ENGINEER required for telephone company operating in South America, to take charge of line construction and maintenance. Apply stating age and full particulars of experience in overhead and underground work, to Box A.S.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.—Probationary Assistant Engineers in the Engineering Department of the Post Office (20–25, with extension in certain cases).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, CIVIL SERVICE COMMISSION, Burlington Gardens, London, W.1, *giving the title of the situation*. The latest date for the receipt of application forms is July 10th.

APPLICATIONS are invited for the post of Technical Officer in the Admiralty Technical Pool which is now vacant in an Admiralty establishment in London. Candidates should possess a university degree in Engineering, or its equivalent, with experience in the design of telephones, bells, buzzers and similar electrical instruments used in low power signalling systems. A knowledge of the instruments and circuits employed and of the methods of installing them in ships, is also desirable.

The Admiralty Technical Pool includes the following grades:—
Chief Technical Adviser (£800 by £50 to £1,000 per annum).
Principal Technical Officer (£650 by £25 to £750 per annum).
Senior Technical Officer (£500 by £25 to £600 per annum).
Technical Officer (£250 by £20 to £450 per annum).
Junior Technical Officer (£175 by £15 to £235 per annum).

In addition to the above scales Civil Service bonus is paid. Entry will be made at the bottom of the scale for Technical Officer, the bonus on which at present is approximately £111, making a total initial remuneration of £361 per annum. Promotion to the higher grades is governed entirely by merit and is dependent upon the existence of vacancies.

Candidates, who must be British subjects, should make application, stating their qualifications, etc., within ten days of the appearance of this notice, to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1. No application forms are required.

THE CHINA LIGHT AND POWER COMPANY (1918), LTD., KOWLOON, HONG KONG.

ASSISTANT DISTRIBUTION ENGINEER.

THE China Light and Power Co. (1918), Ltd., require an Assistant Distribution Engineer, who must be unmarried.

Applicants should have a sound technical training and experience in the laying, erection and maintenance of cables and overhead lines (E.H.T. and L.T.), equipping of E.H.T. Sub-stations, preparation of estimates, and designs of cable lay-outs, sub-station switchgear, etc.

The commencing salary will be H.K. Dollars 450.00 (Dollars 450 Hong Kong currency) per month, rising to a maximum of Dollars 550.00 per month, with annual increments of Dollars 25.00 per month. The present sterling value of the Hong Kong Dollar is 1s. 6d.

The first agreement will be for a period of five years. After five years' service, six months' home leave on full pay will be granted, subject to the agreement being renewed.

Second class passage out and home will be provided, and half pay from the date of sailing until arrival in Hong Kong.

The successful candidate will be provided with free medical attendance, quarters, light and fuel.

The selected candidate will be required to pass a medical examination.

Applications, together with full particulars stating age, education, training, subsequent experience and present occupation, together with copies of not more than three recent testimonials, should be forwarded to MESSRS. PREECE, CARDEW AND RIDER, 8, Queen Anne's Gate, Westminster, S.W.1, not later than May 29th.

May 13th, 1930.

DRAUGHTSMEN, Senior, required for metal clad switchgear. Good mechanical experience essential.—Apply, stating experience and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

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THE T.I.G.B. MAINTAINS ITS SPLENDID EXAM.-SUCCESS RECORD.

AT all the 1929 PROFESSIONAL EXAMINATIONS—A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., etc. — the candidates who were trained by The T.I.G.B. obtained a Pass Percentage of over 90%.

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T.I.G.B. TRAINING IS BEING CHOSEN BECAUSE IT IS OBVIOUSLY PRODUCTIVE OF SATISFACTION AND SUCCESS. Therefore, whatever your aim may be—a Recognised Professional Qualification, or the Special Technical Knowledge needed in a responsible post—you can select the appropriate T.I.G.B. course with complete confidence.

WRITE TO-DAY for FREE copy of "The Engineer's Guide to Success," 124 pages, containing the widest selection of home-study engineering courses in the world, and mention the branch, post or qualification that interests you, to

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN
(Established 1917),
10, TEMPLE BAR HOUSE, LONDON, E.C.4.

APPOINTMENT WANTED.

YOUTH (19), requires position as Improver Electrical Draughtsman; 3½ years' factory and technical institute experience.—WHITE, 43, Abbotts Crescent, London, E.4.

PATENT AGENTS, &c.

PATENTS, TRADE MARKS.

KINGS PATENT AGENCY, LTD. (B. T. King, Regd. Pat. Agent, G.B., U.S. and Can.), 146A, Queen Victoria Street, London, E.C.4. Phone: Cent. 0682. Advice Handbook and Consultations free. 43 years' refs.

THE Proprietors of British Patent No. 200 643 are prepared to sell the patent or to licence British manufacturers to work thereunder. It relates to means for telegraphically reproducing stationary or moving pictures, scenes and the like.—Address, BOULT, WADE AND TENNANT, 112, Hatton Garden, London, E.C.1.

THE Proprietor (J. Solomon) of Patent No. 274 536, which relates to automatic cutting in and out of auxiliary transformer stations of supply networks in dependence upon the load without the use of auxiliary transformers, time switches or extra control lines, is desirous of entering into arrangements for commercial exploitation of his invention. Parties interested are requested to communicate with him at 285, High Holborn (1st floor), London, W.C.1.

THE Proprietors of the Patent No. 234 451, for Improved Method and Apparatus for Making Fin Tube Heat Exchangers are desirous of entering into arrangements by way of licence and otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country. All communications should be addressed in the first instance to Haseltine, Lake and Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CORPORATION OF GLASGOW.

ELECTRICITY DEPARTMENT.

THE Corporation invite Tenders for the supply of the undernoted Materials, etc., as may be required by the Electricity Department during the financial year ending May 31, 1931, viz. :—

Cables (Low Tension Paper Insulated One, Two, Three and Four Core and E.H.T.).
Small I.R. Insulated Cables and Flexibles.
Electric Cookers.
Meters.
Electric Kettles.

Specifications and Forms of Tender can be obtained on application to the General Manager, 75, Waterloo Street, Glasgow, C.2.

Sealed Tenders marked outside "Electricity Department, Tender for . . . . . ," must be lodged with the subscriber not later than Monday, June 9, 1930.

The lowest or any offer may not be accepted.

D. STENHOUSE,
Town Clerk.

City Chambers, Glasgow.
May 17, 1930.

CENTRAL ELECTRICITY BOARD.

CENTRAL ENGLAND ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for the supply, delivery and laying of 33 kV and other cables.

Copies of the specification C.E.-G.C. 3 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, May 26, 1930, on payment of a deposit of £2 2s. for the first copy and £1 1s. for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied endorsed "Tender for Specification No. C.E.-G.C. 3" must be delivered to the offices of the Board not later than 12 o'clock noon on Thursday, June 19, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CORPORATION OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SUPPLY OF MOTOR GENERATOR SETS FOR CINEMA ARC WORK.

THE Corporation of Liverpool invite Tenders for the supply of 41 Motor Generator Sets suitable for operation on a 400 volts, three-phase, 50 period supply, and to give a D.C. output of 80 amps at 70 volts.

The sets will require to be fitted with compound wound generators, to be complete with the necessary starting switch gear, fitted with three overload coils and a no-volt release, and also one totally enclosed regulator.

Sealed Tenders endorsed "Tender for Motor Generator Sets" to be addressed to the Town Clerk, Municipal Offices, Liverpool, must be forwarded by post to him so as to be delivered not later than the first postal delivery on Monday, June 2nd, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool.

CENTRAL ELECTRICITY BOARD.

MID-EAST ENGLAND ELECTRICITY SCHEME, 1929.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of 66 000 V and other cables.

Copies of the Specification No. M.E.E.-G.C.1 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, May 26, 1930, on payment of a deposit of £2 2s. for the first copy and £1 1s. for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on a receipt of a *bona fide* Tender.

Tenders on the form supplied, endorsed "Tender for Specification No. M.E.E.-G.C.1," must be delivered to the offices of the Board not later than 12 o'clock noon on Monday, June 23, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.
May 19, 1930.

CITY OF GLOUCESTER.

THE Electricity Committee is prepared to receive Tenders for the supply of cooking apparatus from firms with substantial experience in its manufacture, for the purposes of its Hire Purchase Scheme.

Further particulars may be obtained on application to:

THE CITY ELECTRICAL ENGINEER,
Commercial Road,
Gloucester.

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CENTRAL ELECTRICITY BOARD.

NORTH WEST ENGLAND AND NORTH WALES ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for the construction of Site Works, Foundation Works, and Buildings in the area of the North West England and North Wales Electricity Scheme.

Copies of the Specification N.W.E.-P.F. 2 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, May 26, 1930, on payment of a deposit of £2 2s. for the first copy and £1 1s. for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied, endorsed "Tender for Specification No. N.W.E.-P.F. 2," must be delivered to the offices of the Board not later than 12 o'clock noon on Wednesday, June 11, 1930.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.
May 19, 1930.

APPOINTMENTS VACANT.

ASSISTANT STATION ENGINEER required at Power Station, Royal Arsenal, Woolwich. Experience in running and maintenance of modern power station plant, including water tube boilers, turbine and reciprocating engines with a.c. and d.c. electrical systems essential. Age not exceeding 45. Preference for ex-Service men.

Salary, 60s.-4s.-to 85s. per week plus variable bonus (present total £4 12s. 7d. to £6 5s.). Post will be pensionable, on the usual conditions, if services are satisfactory after a probationary period.

Application forms, returnable by May 30, 1930, from CHIEF SUPERINTENDENT OF ORDNANCE FACTORIES, Royal Arsenal, Woolwich, S.E.18.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council requires in September, 1930, an instructor in the Electrical Engineering and Physics Department at the School of Engineering and Navigation, High Street, Poplar, E.14. Candidates should have graduate qualifications and should have had both teaching and practical electrical experience. The work includes day and evening classes from junior technical standard to that of advanced national certificates, together with electrical engineering for Engineer Officers of the Mercantile Marine. Graduate scale—£276—£15—£528. In addition to the scale the instructor appointed will receive an allowance in respect of special responsibility. The first increment accrues after two years' teaching service.

Apply Education Officer (T.1), The County Hall, S.E.1 (stamped addressed foolscap envelope necessary) for form to be returned by June 7th, 1930. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPARTMENT.

APPOINTMENT OF CHIEF ASSISTANT ELECTRICAL ENGINEER.

APPLICATIONS for the vacant position of Chief Assistant Electrical Engineer are invited from fully qualified electrical engineers who have had experience in the design and operation of large Generating Stations, Extra High Tension Transmission Systems, Substations and Low Tension Distribution Networks.

Salary will be at the rate of £1,200 per annum, payable monthly.

The successful candidate will be required to undergo an approved medical examination and contribute to the Corporation's Superannuation Scheme.

Forms of application and particulars of duties may be obtained from the undersigned and will require to be returned with copies of not more than three recent testimonials by Monday, the 9th June, 1930, endorsed "Chief Assistant Electrical Engineer."

Canvassing either directly or indirectly will disqualify.

E. J. JENNINGS,
Secretary and Commercial Manager.

14, Dale End, Birmingham.
May 16, 1930.

DRAUGHTSMAN required with experience of large High Tension Transformers. State age and salary expected, with full particulars of experience.—Apply BOX A.U.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ENGINEER required for telephone company operating in South America, to take charge of line construction and maintenance. Apply stating age and full particulars of experience in overhead and underground work, to BOX A.S.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.—Probationary Assistant Engineers in the Engineering Department of the Post Office (20–25, with extension in certain cases).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, CIVIL SERVICE COMMISSION, Burlington Gardens, London, W.1, *giving the title of the situation*. The latest date for the receipt of application forms is July 10th.

APPLICATIONS are invited for the post of Technical Officer in the Admiralty Technical Pool which is now vacant in an Admiralty establishment in London. Candidates should possess a university degree in Engineering, or its equivalent, with experience in the design of telephones, bells, buzzers and similar electrical instruments used in low power signalling systems. A knowledge of the instruments and circuits employed and of the methods of installing them in ships, is also desirable.

The Admiralty Technical Pool includes the following grades:—
Chief Technical Adviser (£800 by £50 to £1,000 per annum).
Principal Technical Officer (£650 by £25 to £750 per annum).
Senior Technical Officer (£500 by £25 to £600 per annum).
Technical Officer (£250 by £20 to £450 per annum).
Junior Technical Officer (£175 by £15 to £235 per annum).

In addition to the above scales Civil Service bonus is paid. Entry will be made at the bottom of the scale for Technical Officer, the bonus on which at present is approximately £111, making a total initial remuneration of £361 per annum. Promotion to the higher grades is governed entirely by merit and is dependent upon the existence of vacancies.

Candidates, who must be British subjects, should make application, stating their qualifications, etc., within ten days of the appearance of this notice, to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1. No application forms are required.

THE CHINA LIGHT AND POWER COMPANY (1918), LTD., KOWLOON, HONG KONG.

ASSISTANT DISTRIBUTION ENGINEER.

THE China Light and Power Co. (1918), Ltd., require an Assistant Distribution Engineer, who must be unmarried.

Applicants should have a sound technical training and experience in the laying, erection and maintenance of cables and overhead lines (E.H.T. and L.T.), equipping of E.H.T. Sub-stations, preparation of estimates, and designs of cable lay-outs, sub-station switchgear, etc.

The commencing salary will be H.K. Dollars 450.00 (Dollars 450 Hong Kong currency) per month, rising to a maximum of Dollars 550.00 per month, with annual increments of Dollars 25.00 per month. The present sterling value of the Hong Kong Dollar is 1s. 6d.

The first agreement will be for a period of five years. After five years' service, six months' home leave on full pay will be granted, subject to the agreement being renewed.

Second class passage out and home will be provided, and half pay from the date of sailing until arrival in Hong Kong.

The successful candidate will be provided with free medical attendance, quarters, light and fuel.

The selected candidate will be required to pass a medical examination.

Applications, together with full particulars stating age, education, training, subsequent experience and present occupation, together with copies of not more than three recent testimonials, should be forwarded to MESSRS. PREECE, CARDEW AND RIDER, 8, Queen Anne's Gate, Westminster, S.W.1, not later than May 29th.

May 13th, 1930.

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Bouverie House, 154, Fleet Street, London, E.C.4.

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Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CITY OF GLOUCESTER.

THE Electricity Committee is prepared to receive Tenders for the supply of cooking apparatus from firms with substantial experience in its manufacture, for the purposes of its Hire Purchase Scheme.

Further particulars may be obtained on application to:

THE CITY ELECTRICAL ENGINEER,
Commercial Road,
Gloucester.

THE Commissioners of His Majesty's Works, etc., are prepared to receive Tenders before 11 a.m. on—

(*a*) Monday, June 9, 1930, for the supply of Electrical Accessories.

(*b*) Tuesday, June 10, 1930, for the supply of Fuse Boards and Switches.

Forms of Tenders, etc., may be obtained on application to the CONTROLLER OF SUPPLIES, H.M. Office of Works, King Charles Street, Westminster, London, S.W.1.

CITY OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SALE OF GENERATING SETS AND EVAPORATIVE CONDENSER.

THE Corporation of Liverpool invite Tenders for the sale of One 500 kW Bellis and Morcom Generating Set, One 300 kW Browett-Lindley Generating Set, together with one Evaporative Condenser, all in good running order.

Copies of Tender Form and Specification may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool.

Sealed tenders, endorsed "Tender for Generating Sets and Condenser," to be addressed to the Town Clerk, Municipal Offices, Liverpool, must be forwarded by post to him so as to be delivered not later than the first postal delivery on Monday, June 23, 1930.

The Corporation do not bind themselves to accept the highest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool,
May 20, 1930.

CENTRAL ELECTRICITY BOARD.

CENTRAL ENGLAND ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of Metering Equipment required in the area of the Central England Electricity Scheme.

Copies of the specification C.E.–G.M.1 and form of tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, June 2, 1930, on payment of a deposit of two guineas for the first copy and one guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied, endorsed "Tender for Specification No. C.E.–G.M.1," must be delivered to the offices of the Board not later than 12 o'clock noon on Monday, June 30, 1930.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

OSWESTRY CORPORATION.

ELECTRICITY DEPARTMENT.

THE Corporation of Oswestry invite Tenders for the supply, delivery, erection and testing of:—

(1) Specification No. 1A. E.H.T. 3-core 11 000 volt paper insulated underground cable; L.T. 5-core, 4-core and 2-core, 400 volt, paper insulated cable service material and Link Disconnecting Boxes.

(2) Specification No. 2A. E.H.T. 11 000 volt, Oil Immersed, Truck Type Switchgear and 400 volt Ironclad, Air Break Switchgear.

(3) Specification No. 3A. One or more (not exceeding three) 150 volt K.V.A. Oil Immersed, Self-cooled, three-phase, step down (11 000 to 400 volts) Transformers.

Single copies of any of the above Specifications may be obtained from the Borough Electrical Engineer, Mr. H. W. Edwards, 28, Oswald Road, Oswestry, on the payment by cheque of a deposit of two guineas in respect of each Specification. The deposit will be returnable only after a *bona fide* tender has been received and examined by the Committee. Extra copies of any of the above specifications may be obtained on the payment of five shillings (postal order). This payment is not returnable.

All cable, apparatus and materials shall be of British manufacture, and the cable shall be C.M.A.

Any further technical information may be obtained from the Borough Electrical Engineer, at whose office plans may be inspected. Sealed tenders, endorsed "Cable," "Switchgear" or "Transformer," as the case may be, must be delivered to the undersigned not later than noon, Saturday, the 14th of June, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

H. BIRD JONES,
Town Clerk.

Town Clerk's Office,
Guildhall,
Oswestry.

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CORPORATION OF GLASGOW.

ELECTRICITY DEPARTMENT.

THE Corporation invite Tenders for the supply of the undernoted Materials, etc., as may be required by the Electricity Department during the financial year ending May 31, 1931, viz. :—

Cables (Low Tension Paper Insulated One, Two, Three and Four Core and E.H.T.).
Small I.R. Insulated Cables and Flexibles.
Electric Cookers.
Meters.
Electric Kettles.

Specifications and Forms of Tender can be obtained on application to the General Manager, 75, Waterloo Street, Glasgow, C.2.

Sealed Tenders marked outside "Electricity Department, Tender for . . . . . ," must be lodged with the subscriber not later than Monday, June 9, 1930.

The lowest or any offer may not be accepted.

D. STENHOUSE,
Town Clerk.

City Chambers, Glasgow.
May 17, 1930.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

TENDERS are invited by the above-named Authority for the supply, delivery and erection in their area of a double circuit 33 000 Volt overhead Transmission Line supported by Steel Towers.

Copies of specification (No. 33/T/2) and form of tender may be obtained from Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, at the offices of the Authority, on payment of a deposit of one guinea, which will, after the Authority have come to a decision upon the tenders received, be returned to the Tenderer, provided he shall have sent in a *bona fide* tender, and shall not have withdrawn it. Additional copies of the specification may be obtained on payment of half a guinea per copy, which will not be returned.

Tenders must be forwarded under sealed cover, endorsed "Tender for Contract No. 33/T/2, Overhead Transmission Line," so as to reach the undersigned not later than noon on Tuesday, June 17, 1930.

The Authority do not bind themselves to accept the lowest or any tender.

H. F. CARPENTER,
Clerk and Treasurer.

Offices of the Authority :
Phœnix Buildings,
Dudley Road,
Wolverhampton.
May 26, 1930.

APPOINTMENTS VACANT.

CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPARTMENT.

APPOINTMENT OF MAINS ASSISTANT FOR RURAL AREA.

APPLICATIONS are invited for the appointment of Assistant to the district Mains Engineer in the Corporation's Rural Area. Salary in accordance with Class J, Grade 9, National Joint Board Schedule, present nett amount, £325 per annum. Candidates must have had experience of design of E.H.T. and L.T. distribution networks, surveying of routes and the preparation of estimates of costs. They must have a practical knowledge of Overhead and Underground Construction and Maintenance (including installation of transformers and switchgear) and be capable of negotiating wayleaves and handling men. Applicants must be Corporate Members of the I.E.E., or have the necessary qualifications.

The successful candidate will be required to undergo a medical examination and contribute to the Corporation Superannuation Scheme.

Forms of Application, to be obtained from the undersigned, must be delivered with copies of not more than three recent testimonials by Saturday, June 21, 1930.

E. J. JENNINGS,
Secretary and Commercial Manager.

14, Dale End,
Birmingham.
May 26, 1930.

DRAUGHTSMEN, Senior, required for metal clad switchgear. Good mechanical experience essential.—Apply, stating experience and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

DRAUGHTSMAN required with experience of large High Tension Transformers. State age and salary expected, with full particulars of experience.—Apply Box A.U.L., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ENGINEER required for telephone company operating in South America, to take charge of line construction and maintenance. Apply stating age and full particulars of experience in overhead and underground work, to Box A.S.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ENGINEER with highest qualifications required as Sales Representative for England by one of the largest Manufacturers of Electrical Measuring Instruments. Only those with excellent trade connections and well versed in this class of Engineering need apply. Applications giving full particulars of past experience and salary required, address to Box A.W.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.—Probationary Assistant Engineers in the Engineering Department of the Post Office (20–25, with extension in certain cases).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the SECRETARY, CIVIL SERVICE COMMISSION, Burlington Gardens, London, W.1, *giving the title of the situation*. The latest date for the receipt of application forms is July 10th.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council requires in September, 1930, an instructor in the Electrical Engineering and Physics Department at the School of Engineering and Navigation, High Street, Poplar, E.14. Candidates should have graduate qualifications and should have had both teaching and practical electrical experience. The work includes day and evening classes from junior technical standard to that of advanced national certificates, together with electrical engineering for Engineer Officers of the Mercantile Marine. Graduate scale—£276—£15—£528. In addition to the scale the instructor appointed will receive an allowance in respect of special responsibility. The first increment accrues after two years' teaching service.

Apply Education Officer (T.1), The County Hall, S.E.1 (stamped addressed foolscap envelope necessary) for form to be returned by June 7th, 1930. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

APPLICATIONS are invited for the post of Technical Officer in the Admiralty Technical Pool which is now vacant in an Admiralty establishment in London. Candidates should possess a university degree in Engineering, or its equivalent, with experience in the design of telephones, bells, buzzers and similar electrical instruments used in low power signalling systems. A knowledge of the instruments and circuits employed and of the methods of installing them in ships, is also desirable.

The Admiralty Technical Pool includes the following grades :—
Chief Technical Adviser (£800 by £50 to £1,000 per annum).
Principal Technical Officer (£650 by £25 to £750 per annum).
Senior Technical Officer (£500 by £25 to £600 per annum).
Technical Officer (£250 by £20 to £450 per annum).
Junior Technical Officer (£175 by £15 to £235 per annum).

In addition to the above scales Civil Service bonus is paid. Entry will be made at the bottom of the scale for Technical Officer, the bonus on which at present is approximately £111, making a total initial remuneration of £361 per annum. Promotion to the higher grades is governed entirely by merit and is dependent upon the existence of vacancies.

Candidates, who must be British subjects, should make application, stating their qualifications, etc., within ten days of the appearance of this notice, to the Secretary of the Admiralty (C.E. Branch), Whitehall, London, S.W.1. No application forms are required.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS.

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

REGISTERED ELECTRICAL INSTALLATION CONTRACTORS

TENDERS INVITED.

THE Commissioners of His Majesty's Works, etc., are prepared to receive Tenders before 11 a.m. on—

(*a*) Monday, June 9, 1930, for the supply of Electrical Accessories.

(*b*) Tuesday, June 10, 1930, for the supply of Fuse Boards and Switches.

Forms of Tenders, etc., may be obtained on application to the CONTROLLER OF SUPPLIES, H.M. Office of Works, King Charles Street, Westminster, London, S.W.1.

OSWESTRY CORPORATION.

ELECTRICITY DEPARTMENT.

THE Corporation of Oswestry invite Tenders for the supply, delivery, erection and testing of :—

(1) Specification No. 1A. E.H.T. 3-core 11 000 volt paper insulated underground cable ; L.T. 5-core, 4-core and 2-core, 400 volt, paper insulated cable service material and Link Disconnecting Boxes.

(2) Specification No. 2A. E.H.T. 11 000 volt, Oil Immersed, Truck Type Switchgear and 400 volt Ironclad, Air Break Switchgear.

(3) Specification No. 3A. One or more (not exceeding three) 150 volt K.V.A. Oil Immersed, Self-cooled, three-phase, step down (11 000 to 400 volts) Transformers.

Single copies of any of the above Specifications may be obtained from the Borough Electrical Engineer, Mr. H. W. Edwards, 28, Oswald Road, Oswestry, on the payment by cheque of a deposit of two guineas in respect of each Specification. The deposit will be returnable only after a *bona fide* tender has been received and examined by the Committee. Extra copies of any of the above specifications may be obtained on the payment of five shillings (postal order). This payment is not returnable.

All cable, apparatus and materials shall be of British manufacture, and the cable shall be C.M.A.

Any further technical information may be obtained from the Borough Electrical Engineer, at whose office plans may be inspected. Sealed tenders, endorsed "Cable," "Switchgear" or "Transformer," as the case may be, must be delivered to the undersigned not later than noon, Saturday, the 14th of June, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

H. BIRD JONES,
Town Clerk.

Town Clerk's Office,
Guildhall,
Oswestry.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

TENDERS are invited by the above-named Authority for the supply, delivery and erection in their area of a double circuit 33 000 Volt overhead Transmission Line supported by Steel Towers.

Copies of specification (No. 33/T/2) and form of tender may be obtained from Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, at the offices of the Authority, on payment of a deposit of one guinea, which will, after the Authority have come to a decision upon the tenders received, be returned to the Tenderer, provided he shall have sent in a *bona fide* tender, and shall not have withdrawn it. Additional copies of the specification may be obtained on payment of half a guinea per copy, which will not be returned.

Tenders must be forwarded under sealed cover, endorsed "Tender for Contract No. 33/T/2, Overhead Transmission Line," so as to reach the undersigned not later than noon on Tuesday, June 17, 1930.

The Authority do not bind themselves to accept the lowest or any tender.

H. F. CARPENTER,
Clerk and Treasurer.

Offices of the Authority :
Phœnix Buildings,
Dudley Road,
Wolverhampton.
May 26, 1930.

COUNTY BOROUGH OF SUNDERLAND.

ELECTRICITY DEPARTMENT.

THE Corporation of Sunderland are prepared to receive tenders from ACTUAL MAKERS ONLY, for the supply of the following items for the twelve months ending September 30, 1931.

Specifications and Forms of Tender may be obtained from the General Manager, Electricity Offices, Dunning Street, Sunderland, upon payment of a deposit of ten shillings for each specification and Form of Tender (in duplicate), which deposit will be returned after a *bona fide* tender has been received and adjudicated upon.

In writing for Specifications, applicants should state for which of the following sections they are required, viz. :—

Paper Insulated, Lead Sheathed Cable, for General main-laying requirements.
Rubber Insulated Wire.
Consumers' Meters.
Incandescent Lamps, Gas Filled and Vacuum.

Sealed tenders (which must be made upon the forms provided with the specifications) addressed to the "Town Clerk, Town Hall, Sunderland," and endorsed "Tender for Electricity Supplies," must be delivered at my office not later than first post on Monday, July 7, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

H. CRAVEN,
Town Clerk.

Town Hall,
Sunderland.
May 30, 1930.

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THE ISLE OF THANET JOINT HOSPITAL BOARD.

THANET ISOLATION HOSPITAL, HAINE.
NEAR RAMSGATE.

ELECTRIC LIGHTING.

TENDERS are required for the installation of Electric Light at the above.

A Specification of the work to be done and the General Conditions of Contract can be obtained from the undersigned on payment of £2 2s. in cash, which sum will be returned on receipt of a *bona fide* tender.

SIDNEY SHEA,
Solicitor and Clerk.

19, Cecil Square,
Margate.
June 1, 1930.

CENTRAL ELECTRICITY BOARD.

SOUTH-EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite tenders for the supply delivery and erection of 33 000 V AND OTHER CABLES.

Copies of Specification No. S.E.E.—G.C.2 and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Wednesday, 11th June, 1930, on payment of a deposit of Two Guineas for the first copy and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* Tender.

Tenders on the form supplied, endorsed "Tender for Specification No. S.E.E.—G.C.2" must be delivered to the offices of the Board not later than 12 o'clock noon on Monday, 30th June, 1930. The Board do not bind themselves to accept the lowest or any Tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
Charing Cross,
W.C.2.

CITY AND ROYAL BURGH OF DUNDEE.

ELECTRICITY DEPARTMENT.

THE Corporation invites tenders for the supply, delivery and erection of E.H.T. Switchgear and E.H.T. Bus Bar Reactors in the main Generating Station at Carolina Port, Dundee.

Specification, drawings, form of tender and general conditions of contract may be obtained from the undersigned on payment of a deposit of £2 2s., which sum will be returned upon receipt of a *bona fide* tender.

Tenders (sealed in envelopes provided) must be lodged with Wm. H. Blyth Martin, Esq., Town Clerk, City Chambers, Dundee not later than by Wednesday, 25th June, 1930.

The Corporation does not bind itself to accept the lowest or any tender.

D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road,
Dundee.
2nd June, 1930.

CENTRAL ELECTRICITY BOARD.

CENTRAL ENGLAND ELECTRICITY SCHEME, 1928.

THE Central Electricity Board invite tenders for the supply, delivery and laying of Pilot Cables.

Copies of the specification C.E.—S.C. 1, and form of tender may be obtained from the offices of the Board on application to the undersigned on or after Thursday, 12th June, 1930, on payment of a deposit of two guineas for the first copy and one guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied endorsed "Tender for Specification No. C.E.—S.C. 1" must be delivered to the offices of the Board not later than 12 o'clock noon on Friday, 27th June, 1930.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, W.C.2.

CITY OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SALE OF GENERATING SETS AND EVAPORATIVE CONDENSER.

THE Corporation of Liverpool invite Tenders for the sale of One 500 kW Bellis and Morcom Generating Set, One 300 kW Browett-Lindley Generating Set, together with one Evaporative Condenser, all in good running order.

Copies of Tender Form and Specification may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool.

Sealed tenders, endorsed "Tender for Generating Sets and Condenser," to be addressed to the Town Clerk, Municipal Offices, Liverpool, must be forwarded by post to him so as to be delivered not later than the first postal delivery on Monday, June 23, 1930.

The Corporation do not bind themselves to accept the highest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool,
May 20, 1930.

SALE BY AUCTION.

JUNE 12, at 11.30, WITHOUT RESERVE.
By instructions Messrs. Smith and Hammond, removed from Savoy Street, Strand, owing to demolition of premises, and others
STOCK IN TRADE OF ELECTRICAL GOODS,
motors, conduit fittings, shades, quantities accumulators, bell wire, twin and other cable, fans, cooking utensils, switches, fires, etc. By order firm Electric contractors.
18, 12, 6 and 2 H.P. d.c. motors suitable for showmen, fun fairs, etc., complete with starters and control boards, etc.
Will be sold by Public Auction by
E. FRYETT, F.A.I.,
at the London Trade Sale Rooms, 78 and 81, Fetter Lane, E.C. (opposite Gamage's). Catalogues free. Tel.: 2633-4 Holborn.

NOTICE.

ELECTRICITY (SUPPLY) ACT, 1926.

SOUTH WEST ENGLAND AND SOUTH WALES ELECTRICITY SCHEME, 1930.

NOTICE is hereby given that in exercise of the powers conferred upon them by section 4 of the Electricity (Supply) Act, 1926, the Central Electricity Board have adopted (subject to certain modifications and under the above title) the scheme transmitted to them by the Electricity Commissioners under the title of "South West England and South Wales Electricity Scheme, 1929," and have published the scheme as so adopted.

Copies of the scheme may be obtained at the price of one shilling and sixpence each, or, if sent by post, one shilling and sevenpence each, from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, and 120, George Street, Edinburgh.

Dated this 3rd day of June, 1930.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross, London, W.C.2.

APPOINTMENTS VACANT.

DRAUGHTSMEN, Senior, required for metal clad switchgear. Good mechanical experience essential.—Apply, stating experience and salary required, to SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

ENGINEER with highest qualifications required as Sales Representative for England by one of the largest Manufacturers of Electrical Measuring Instruments. Only those with excellent trade connections and well versed in this class of Engineering need apply. Applications giving full particulars of past experience and salary required, address to Box A.W.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

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TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS

Last day for receiving copy, first post Wednesday morning.

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Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

CENTRAL ELECTRICITY BOARD.

SOUTH-EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite Tenders for the supply, delivery and erection of the 132 kV Transmission Line Crossing of the River Thames.

Copies of the Specification No. S.E.E.-P.L.3, and Form of Tender may be obtained from the offices of the Board on application to the undersigned on or after Monday, June 16, 1930, on payment of a deposit of £2 2s. for the first copy and £1 1s. for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied, endorsed "Tender for Specification No. S.E.E.-P.L.3," must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, July 28, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
Charing Cross, W.C.2.

CITY AND ROYAL BURGH OF DUNDEE.

ELECTRICITY DEPARTMENT.

THE Corporation invites Tenders for the supply, delivery and erection of E.H.T. Switchgear and E.H.T. Bus Bar Reactors in the main Generating Station at Carolina Port, Dundee.

Specification, drawings, form of tender and general conditions of contract may be obtained from the undersigned on payment of a deposit of £2 2s., which sum will be returned upon receipt of a *bona fide* tender.

Tenders (sealed in envelopes provided) must be lodged with Wm. H. Blyth Martin, Esq., Town Clerk, City Chambers, Dundee not later than by Wednesday, 25th June, 1930.

The Corporation does not bind itself to accept the lowest or any tender.

D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road,
Dundee.
2nd June, 1930.

THE ISLE OF THANET JOINT HOSPITAL BOARD.

THANET ISOLATION HOSPITAL, HAINE, NEAR RAMSGATE.

ELECTRIC LIGHTING.

TENDERS are required for the installation of Electric Light at the above.

A Specification of the work to be done and the General Conditions of Contract can be obtained from the undersigned on payment of £2 2s. in cash, which sum will be returned on receipt of a *bona fide* tender.

SIDNEY SHEA,
Solicitor and Clerk.

19, Cecil Square,
Margate.
June 1, 1930.

CITY OF LIVERPOOL.

ELECTRIC SUPPLY DEPARTMENT.

SALE OF GENERATING SETS AND EVAPORATIVE CONDENSER.

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Copies of Tender Form and Specification may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool.

Sealed tenders, endorsed "Tender for Generating Sets and Condenser," to be addressed to the Town Clerk, Municipal Offices, Liverpool, must be forwarded by post to him so as to be delivered not later than the first postal delivery on Monday, June 23, 1930.

The Corporation do not bind themselves to accept the highest or any tender.

WALTER MOON,
Town Clerk.

Town Clerk's Office,
Liverpool,
May 20, 1930.

EPSOM URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

THE Epsom Urban District Council invite tenders for the Sale and Removal of Two Lancashire Boilers by Edwin Danks.

The Boilers are installed at the Generating Station, Church Street, Epsom, and may be inspected by appointment.

Further particulars may be obtained on application to H. W. Watts, M.I.E.E., M.I.Mech.E., Resident Electrical Engineer, The Electricity Works, Church Street, Epsom.

Tenders must be received by the undersigned by 12 noon on July 1, 1930.

P. E. WHITEOAK-COOPER,
Clerk of the Council.

49, Church Street, Epsom.
June, 1930.

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COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

THE Electricity Committee invite Tenders for :—
The manufacture, supply, delivery and erection of :—

(*a*) H.T. Armourclad Switchgear (Specification No. W.108) and the manufacture, supply and delivery of :—

(*b*) Transformer Kiosks with H.T. and L.T. Switchgear (Specification No. W.109)

(*c*) Static Transformers (Specification No. W.110).

Specifications, with Forms of Contract, may be obtained from Mr. F. H. Whysall, City Electrical Engineer and General Manager, East Bridge Street, Belfast, on deposit of Two Guineas for each specification. (Cheques to be made payable to the Belfast Corporation Electricity Department). This deposit will be refunded provided a *bona fide* tender has been sent in and not withdrawn. Extra copies may be obtained at one guinea each, which sum will not be returnable.

Sealed Tenders, endorsed with the name and address of the firm tendering, and marked "Tender for ————, Electricity Department," to be lodged in, or posted so as to arrive at, my office not later than Saturday, 5th July 1930.

The lowest or any tender will not necessarily be accepted.

An official receipt should be obtained for every tender delivered by hand. Tenders sent by post should be registered.

R. MEYER,
Town Clerk.

June 3, 1930.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY COMPANY, LIMITED.

TENDERS are invited for the supply, delivery and erection, at the Company's Power Station, Dunston-on-Tyne, of a complete Boiler Equipment, consisting of 12 Water-tube Boilers, designed for a working pressure of 625 lbs. per sq. in. gauge, complete with Economisers, Air-heaters, Stokers, and Pulverised Fuel Plant.

Copies of the Form of Tender and Specification (No. N.243) may be obtained from the Company, at Carliol House, Newcastle-upon-Tyne, on the payment of a deposit of £2 2s. per copy, but not more than three copies will be supplied to any one applicant.

After a decision has been made with regard to the tenders received, deposits will be returned to those who have submitted *bona fide* tenders and have not withdrawn them.

Tenders, on the forms supplied, contained in envelopes endorsed "Tender for Specification No. N.243," must reach the Secretary of the Company at Carliol House, Newcastle-upon-Tyne, not later than 12 o'clock noon on Monday, the 14th July, 1930.

The Company does not bind itself to accept the lowest, or any tender.

C. SKIPSEY,
Joint Secretary.

Carliol House,
Newcastle-upon-Tyne.
June 6, 1930.

COUNTY BOROUGH OF SUNDERLAND.

ELECTRICITY DEPARTMENT.

THE Corporation of Sunderland are prepared to receive Tenders from ACTUAL MAKERS ONLY, for the supply of the following items for the twelve months ending September 30, 1931.

Specifications and Forms of Tender may be obtained from the General Manager, Electricity Offices, Dunning Street, Sunderland, upon payment of a deposit of ten shillings for each specification and Form of Tender (in duplicate), which deposit will be returned after a *bona fide* tender has been received and adjudicated upon.

In writing for Specifications, applicants should state for which of the following sections they are required, viz. :—

Paper Insulated, Lead Sheathed Cable, for General main-laying requirements.
Rubber Insulated Wire.
Consumers' Meters.
Incandescent Lamps, Gas Filled and Vacuum.

Sealed tenders (which must be made upon the forms provided with the specifications) addressed to the "Town Clerk, Town Hall, Sunderland," and endorsed "Tender for Electricity Supplies," must be delivered at my office not later than first post on Monday, July 7, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

H. CRAVEN,
Town Clerk.

Town Hall,
Sunderland.
May 30, 1930.

APPOINTMENTS VACANT.

DRAUGHTSMAN required immediately, with experience of switchboard design, layout and wiring. State age and salary expected with full particulars of experience.—Box A. X. L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

BOROUGH OF EAST RETFORD.

APPLICATIONS are invited for the post of Manager of the Corporation's Electricity Department. Applicants should have knowledge of generation and distribution and special experience of the commercial side. Salary £350 per annum. The person appointed will be required to devote the whole of his time to the duties.

Applications, stating age, qualifications and previous employment with not more than three recent testimonials, to be sent to me not later than Saturday the 21st June 1930, endorsed "Manager."

Canvassing strictly prohibited.

Dated this 4th day of June 1930.

W. PERCIVAL JONES,
Town Clerk.

Town Clerk's Office,
East Retford,
Notts.

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY

(Faculty of Technology in the University of Manchester.)

APPOINTMENT OF LECTURER IN ELECTRICAL ENGINEERING.

THE Governing Body invites applications for a Lectureship in Electrical Engineering in the College of Technology. Applicants should possess special qualifications in the subjects of Wireless Telegraphy and Telephony, and Line Telegraphy and Telephony.

Salary : £400-£500 per annum, according to qualifications.

Conditions of appointment and Form of Application may be obtained from the Registrar, College of Technology, Manchester. The last day for the receipt of applications is June 28, 1930.

Canvassing, either directly or indirectly, will disqualify a candidate for appointment.

B. MOUAT JONES,
Principal of the College.

TEST ROOM ASSISTANTS required for factory in S.E. London. Must be thoroughly conversant with mounting and calibrating a.c. and d.c. instruments.—Apply by letter only, stating full particulars and experience, to Box A.Z.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

APPLICATIONS are invited for Junior Assistantships at the National Physical Laboratory. Candidates should have a good honours degree in Metallurgy, Engineering or Physics, preferably with some technical or research experience. The scale of pay for a Junior Assistant is £175–15–£235, plus Civil Service Bonus (total at present rates £266–£342). There are prospects of promotion to higher grades. Superannuation provision is made under the Federated Superannuation System for Universities.

Application must be made on a form to be obtained from the DIRECTOR, National Physical Laboratory, Teddington, to whom it should be returned not later than June 30, 1930.

ADVANCEMENT Professionally, also earliest success at A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.C.E., B.Sc.Eng., C. & G., G.P.O. Exams, etc., is what "U.E.C." spare time training offers you ! (Many thousands successful. Estd. 1906).—Advice, PROSPECTUS, and full particulars of Individualised Correspondence Courses FREE from ADVISORY BUREAU, UNIVERSITY ENGINEERING COLLEGE, Westgate-on-Sea, Kent.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

SITUATIONS WANTED—PENNY PER WORD.

TENDERS INVITED, SALES BY AUCTION, LEGAL NOTICES, PARTNERSHIPS, AGENCIES, BUSINESSES FOR SALE & WANTED, PREMISES FOR SALE, TO LET AND WANTED, FOR SALE, APPOINTMENTS VACANT & WANTED, EDUCATIONAL ANNOUNCEMENTS, PATENTS, PATENT AGENTS, PLANT & MACHINERY FOR SALE & WANTED, MISCELLANEOUS

Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

ELECTRICAL INSTALLATION WORK.

THE Bethnal Green Borough Council invites Tenders for Electric Lighting Installation at a block of tenement dwellings in Bethnal Green.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* tender. Technical inquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The contractors will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Wiring Scheme—Rutherford House," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Thursday, July 3, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

LOUTH CORPORATION.

ELECTRIC SUPPLY.

THE Corporation invites Tenders for:—
The Electric Lighting and
Power Installation at the
Town Hall.

General Conditions, Specification, Prints of Drawings and Forms of Tender may be obtained from
Messrs. Burstall and Monkhouse,
Consulting Engineers,
14, Old Queen Street,
Westminster, S.W.1.
on and after the 20th day of June, 1930, on making a deposit of Three Pounds in cash, which sum will be refunded on receipt of a *bona fide* tender after the tenders have been adjudicated upon.

Extra copies of the Specification may be obtained by *bona fide* Tenderers at a charge of ten shillings per copy, which sum will not be refunded.

Tenders in sealed envelopes, and endorsed "Tender for Contract No. 3," must be delivered to the TOWN CLERK, Louth, not later than 12 noon on July 4th, 1930.

COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

THE Electricity Committee invite Tenders for:—
The manufacture, supply, delivery and erection of:—

(*a*) H.T. Armourclad Switchgear (Specification No. W.108) and the manufacture, supply and delivery of:—

(*b*) Transformer Kiosks with H.T. and L.T. Switchgear (Specification No. W.109)

(*c*) Static Transformers (Specification No. W.110).

Specifications, with Forms of Contract, may be obtained from Mr. F. H. Whysall, City Electrical Engineer and General Manager, East Bridge Street, Belfast, on deposit of Two Guineas for each specification. (Cheques to be made payable to the Belfast Corporation Electricity Department). This deposit will be refunded provided a *bona fide* tender has been sent in and not withdrawn. Extra copies may be obtained at one guinea each, which sum will not be returnable.

Sealed Tenders, endorsed with the name and address of the firm tendering, and marked "Tender for ————, Electricity Department," to be lodged in, or posted so as to arrive at, my office not later than Saturday, 5th July 1930.

The lowest or any tender will not necessarily be accepted.

An official receipt should be obtained for every tender delivered by hand. Tenders sent by post should be registered.

R. MEYER,
June 3, 1930. Town Clerk.

COUNTY BOROUGH OF SUNDERLAND.

ELECTRICITY DEPARTMENT.

THE Corporation of Sunderland are prepared to receive Tenders from ACTUAL MAKERS ONLY, for the supply of the following items for the twelve months ending September 30, 1931.

Specifications and Forms of Tender may be obtained from the General Manager, Electricity Offices, Dunning Street, Sunderland, upon payment of a deposit of ten shillings for each specification and Form of Tender (in duplicate), which deposit will be returned after a *bona fide* tender has been received and adjudicated upon.

In writing for Specifications, applicants should state for which of the following sections they are required, viz.:—

Paper Insulated, Lead Sheathed Cable, for General main-laying requirements.
Rubber Insulated Wire.
Consumers' Meters.
Incandescent Lamps, Gas Filled and Vacuum.

Sealed tenders (which must be made upon the forms provided with the specifications) addressed to the "Town Clerk, Town Hall, Sunderland," and endorsed "Tender for Electricity Supplies," must be delivered at my office not later than first post on Monday, July 7, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

H. CRAVEN,
Town Clerk.

Town Hall,
Sunderland.
May 30, 1930.

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EPSOM URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

THE Epsom Urban District Council invite Tenders for the Sale and Removal of Two Lancashire Boilers by Edwin Danks.

The Boilers are installed at the Generating Station, Church Street, Epsom, and may be inspected by appointment.

Further particulars may be obtained on application to H. W. Watts, M.I.E.E., M.I.Mech.E., Resident Electrical Engineer, The Electricity Works, Church Street, Epsom.

Tenders must be received by the undersigned by 12 noon on July 1, 1930.

P. E. WHITEOAK-COOPER,
Clerk of the Council.

49, Church Street, Epsom.
June, 1930.

THE ISLE OF THANET JOINT HOSPITAL BOARD.

THANET ISOLATION HOSPITAL, HAINE, NEAR RAMSGATE.

ELECTRIC LIGHTING.

TENDERS are required for the installation of Electric Light at the above.

A Specification of the work to be done and the General Conditions of Contract can be obtained from the undersigned on payment of £2 2s. in cash, which sum will be returned on receipt of a *bona fide* tender.

SIDNEY SHEA,
Solicitor and Clerk.

19, Cecil Square,
Margate.
June 1, 1930.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY COMPANY, LIMITED.

TENDERS are invited for the supply, delivery and erection, at the Company's Power Station, Dunston-on-Tyne, of a complete Boiler Equipment, consisting of 12 Water-tube Boilers, designed for a working pressure of 625 lbs. per sq. in. gauge, complete with Economisers, Air-heaters, Stokers, and Pulverised Fuel Plant.

Copies of the Form of Tender and Specification (No. N.243) may be obtained from the Company, at Carliol House, Newcastle-upon-Tyne, on the payment of a deposit of £2 2s. per copy, but not more than three copies will be supplied to any one applicant.

After a decision has been made with regard to the tenders received, deposits will be returned to those who have submitted *bona fide* tenders and have not withdrawn them.

Tenders, on the forms supplied, contained in envelopes endorsed "Tender for Specification No. N.243," must reach the Secretary of the Company at Carliol House, Newcastle-upon-Tyne, not later than 12 o'clock noon on Monday, the 14th July, 1930.

The Company does not bind itself to accept the lowest, or any tender.

C. SKIPSEY,
Joint Secretary.

Carliol House,
Newcastle-upon-Tyne.
June 6, 1930.

BOROUGH OF BEDFORD.

ELECTRICITY DEPARTMENT.

TENDERS are invited from British manufacturers in the United Kingdom for the supply and erection of Coal Handling Plant and Extension of Sidings at the Bedford Electric Generating Station.

Copies of the Specification and Form of Tender may be obtained from the Borough Electrical Engineer, Electricity Offices, Prebend Street, Bedford, if application is made on or before June 27, on payment of two guineas for the first copy, which will be returned on receipt of a *bona fide* tender from a qualified firm. Additional copies of the Specification, etc., will be provided at a cost of 5s. per set and will not be returnable.

Tenders on the form supplied, endorsed "Tender for Coaling Plant," must be sealed and addressed to "The Chairman, Electricity Committee, Electricity Offices, Prebend Street, Bedford," and delivered not later than noon on July 10, 1930.

The Corporation do not bind themselves to accept the lowest or any tender.

H. DARLOW,
Town Clerk.

Town Hall, Bedford.
June, 1930.

APPOINTMENTS VACANT.

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY

(Faculty of Technology in the University of Manchester.)

APPOINTMENT OF LECTURER IN ELECTRICAL ENGINEERING.

THE Governing Body invites applications for a Lectureship in Electrical Engineering in the College of Technology. Applicants should possess special qualifications in the subjects of Wireless Telegraphy and Telephony, and Line Telegraphy and Telephony.

Salary: £400-£500 per annum, according to qualifications.

Conditions of appointment and Form of Application may be obtained from the Registrar, College of Technology, Manchester. The last day for the receipt of applications is June 28, 1930.

Canvassing, either directly or indirectly, will disqualify a candidate for appointment.

B. MOUAT JONES,
Principal of the College.

WANTED.—Supervising Electrical Engineer for large A.C. insulation. Capable of doing own installing and maintenance in rapidly enlarging plant. Excellent opportunities for advancement.—Write, stating age, education, experience and salary to "A. O," c/o J. W. Vickers and Co., Ltd., 24, Austin Friars, E.C.2.

TEST ROOM ASSISTANTS required for factory in S.E. London. Must be thoroughly conversant with mounting and calibrating a.c. and d.c. instruments.—Apply by letter only, stating full particulars and experience, to Box A.Z.L., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

APPLICATIONS are invited for Junior Assistantships at the National Physical Laboratory. Candidates should have a good honours degree in Metallurgy, Engineering or Physics, preferably with some technical or research experience. The scale of pay for a Junior Assistant is £175-15-£235, plus Civil Service Bonus (total at present rates £266-£342). There are prospects of promotion to higher grades. Superannuation provision is made under the Federated Superannuation System for Universities.

Application must be made on a form to be obtained from the DIRECTOR, National Physical Laboratory, Teddington, to whom it should be returned not later than June 30, 1930.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.—Probationary Assistant Engineers in the Engineering Department of the Post Office (20-25, with extensions in certain cases).

Regulations and particulars, together with the forms on which applications must be made, will be sent in response to requests (preferably by postcard) addressed to the Secretary, Civil Service Commission, Burlington Gardens, London, W.1, *giving the title of the situation*. The latest date for the receipt of application forms is July 10.

BOROUGH OF WATFORD.

ELECTRICITY DEPARTMENT.

APPOINTMENT of Mains Assistant.—Applications are invited for the vacant position of Mains Assistant at a salary in accordance with Class F, Grade 8a, N.J.B. Scale of Salaries, plus 5% (approximately £330 per annum). Candidates should have a thorough knowledge and experience of E.H.T. and L.T. three-phase distribution and the construction and maintenance of Static Transformer sub-stations. Successful candidates will be required to pass a medical examination by the Corporation's Medical Officer, and undertake to contribute to the Corporation's Superannuation Fund. Applications, giving full particulars of training, experience and qualifications, together with three copies of recent testimonials, to be addressed to

A. W. BARHAM,
Borough Electrical Engineer.

Electricity Works,
Cardiff Road,
Watford.
June 16, 1930.

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MISCELLANEOUS ADVERTISEMENTS

ALL CLASSIFIED ADVERTISEMENTS 3d. PER WORD FOR FIRST TWELVE WORDS, 2d. EVERY WORD USED AFTERWARDS

SEMI-DISPLAY, 12s. per Column inch.

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'Phone: CITY 0244 (10 Lines)

"THE ELECTRICIAN" ADVERTISING DEPARTMENT.

Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

PLACE YOUR INSTALLATION WORK WITH FIRMS ON THE NATIONAL REGISTER OF ELECTRICAL INSTALLATION CONTRACTORS.

THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

ELECTRICAL INSTALLATION WORK.

THE Bethnal Green Borough Council invites Tenders for Electric Lighting Installation at a block of tenement dwellings in Bethnal Green.

Copies of the Form of Tender, Conditions and Specification may be obtained from me on payment of two guineas, returnable after receipt of a *bona fide* tender. Technical inquiries may be made of Mr. Harold W. Couzens, M.I.E.E., of 9, Old Queen Street, S.W.1.

The contractors will be required to pay such rates of wages and observe such hours of labour as are recognised by the trade unions in the locality where the work is done.

Tenders, endorsed "Wiring Scheme—Rutherford House," must be addressed to me and reach my office at the Town Hall, Cambridge Road, Bethnal Green, E.2, before noon on Thursday, July 3, 1930.

The Council does not bind itself to accept the lowest or any tender.

DAVID J. KEEP,
Town Clerk.

LOUTH CORPORATION.

ELECTRIC SUPPLY.

THE Corporation invites Tenders for:—
The Electric Lighting and Power Installation at the Town Hall.

General Conditions, Specification, Prints of Drawings and Forms of Tender may be obtained from
Messrs. Burstall and Monkhouse,
Consulting Engineers,
14, Old Queen Street,
Westminster, S.W.1.
on and after the 20th day of June, 1930, on making a deposit of Three Pounds in cash, which sum will be refunded on receipt of a *bona fide* tender after the tenders have been adjudicated upon.

Extra copies of the Specification may be obtained by *bona fide* Tenderers at a charge of ten shillings per copy, which sum will not be refunded.

Tenders in sealed envelopes, and endorsed "Tender for Contract No. 3," must be delivered to the TOWN CLERK, Louth, not later than 12 noon on July 4th, 1930.

CENTRAL ELECTRICITY BOARD.

SOUTH EAST ENGLAND ELECTRICITY SCHEME, 1927.

THE Central Electricity Board invite Tenders for the construction of Foundation Works for Special Towers carrying 132 kV Transmission Lines over the River Thames near Dagenham and Cross Ness.

Copies of the Specification No. S.E.E.-P.F.6 and Form of Tender may be obtained from the Offices of the Board on application to the undersigned on or after Monday, June 30, 1930, on payment of a deposit of Two Guineas for the first copy, and One Guinea for each subsequent copy.

Sums paid for any number of copies up to three will be refunded on receipt of a *bona fide* tender.

Tenders on the form supplied endorsed "Tender for Specification No. S.E.E.-P.F.6." must be delivered to the Offices of the Board not later than 12 o'clock noon on Monday, July 28, 1930. The Board do not bind themselves to accept the lowest or any tender.

RICHARD H. FOX,
Secretary and Solicitor.

Trafalgar Buildings,
1, Charing Cross,
London, W.C.2.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

SHROPSHIRE DISTRIBUTION SCHEME—SECONDARY TRANSMISSION AND LOW TENSION DISTRIBUTION (FIRST STAGE).

TENDERS are invited by the above-named Authority for the execution of any one or more of the following sections of work:—

A. Supply and delivery, and/or installation, of 400/230 volt disconnecting boxes, cable and service components.
B. Supply and delivery, and/or installation, of 400/230 volt consumers' house services.
C. Supply, delivery and laying of 400/230 volt three-phase underground cable.
D. Supply, delivery, erection and laying of 11 000 volt overhead and underground mains.

Copies of specification (No. 11 000-440/D/1), form of tender and drawings, may be obtained from Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, at the offices of the Authority, on payment of a deposit of one guinea, which will, after the Authority have come to a decision upon the tenders received, be returned to the tenderer, provided he shall have sent in a *bona fide* tender and shall not have withdrawn it. Additional copies of the specification may be obtained on payment of half a guinea per copy, which will not be returned.

Tenders must be forwarded under sealed cover endorsed "Tender for Contract No. 11 000-440/D/1," so as to reach the undersigned not later than noon on Monday, the 14th day of July, 1930.

The Authority do not bind themselves to accept the lowest or any tender.

H. F. CARPENTER,
Clerk and Treasurer.

Offices of the Authority:
Phœnix Buildings,
Dudley Road,
Wolverhampton.

23rd June, 1930.

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WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

SHROPSHIRE DISTRIBUTION SCHEME—SUB-STATION SWITCHGEAR.

TENDERS are invited by the above-named Authority for the supply, delivery and erection of either or both of the following sections of work:—

I. 33 000 volt transmission switchgear.
II. 11 000 volt distribution switchgear.

Copies of specification (No. S/S-1) and form of tender may be obtained from Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, at the offices of the Authority, on payment of a deposit of one guinea, which will, after the Authority have come to a decision on the tenders received, be returned to the tenderer, provided he shall have sent in a *bona fide* tender and shall not have withdrawn it.

Additional copies of the specification may be obtained on payment of half a guinea per copy, which will not be returned.

Tenders must be forwarded under sealed cover endorsed "Tender for Sub-Station Switchgear, Contract No. S/S-1," so as to reach the undersigned not later than noon on Monday, 14th July, 1930.

The Authority do not bind themselves to accept the lowest or any tender.

H. F. CARPENTER,
Clerk and Treasurer.

Offices of the Authority:
Phœnix Buildings,
Dudley Road,
Wolverhampton.
23rd June, 1930.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

SHROPSHIRE DISTRIBUTION SCHEME—SUB-STATION TRANSFORMERS.

TENDERS are invited by the above-named Authority for the supply, delivery and erection of the following static step-down transforming plant:—

Two 1 000 kVA 33 000/11 000 volt, three-phase, 50 cycle, outdoor type transformers, complete with off-load tap-changing switches.

Four 25 kVA 11 000/440/250 volt, three-phase, 50 cycle, outdoor type transformers, complete with off-load tap-changing switches.

One 10 kVA 11 000/440/250 volt, three-phase, 50 cycle, outdoor type transformer, complete with off-load tap-changing switches.

Copies of specification (No. S/T-1) and form of tender may be obtained from Mr. E. F. Hetherington, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, at the offices of the Authority, on payment of a deposit of one guinea, which will, after the Authority have come to a decision on the tenders received, be returned to the tenderer, provided he shall have sent in a *bona fide* tender and shall not have withdrawn it.

Additional copies of the specification may be obtained on payment of half a guinea per copy, which will not be returned.

Tenders must be forwarded under sealed cover endorsed "Tender for Sub-Station Transformers, Contract No. S/T-1," so as to reach the undersigned not later than noon on Monday, 14th July, 1930.

The Authority do not bind themselves to accept the lowest or any tender.

H. F. CARPENTER,
Clerk and Treasurer.

Offices of the Authority:
Phœnix Buildings,
Dudley Road,
Wolverhampton.
23rd June, 1930.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY COMPANY.

THE Directors are prepared to receive up to noon on Wednesday, July 16, Tenders for the Supply of

SIGNALLING CABLES.

Tenders must be made on forms, copies of which, with specification, can be obtained at these offices on payment of £1 each (which will not be returned).

The Directors do not bind themselves to accept the lowest or any tender.

S. G. S. YOUNG,
Secretary.

Offices: The White Mansion, 91, Petty France,
Westminster, S.W.1,
June 23, 1930.

SALE BY AUCTION.

17, WHITECROSS STREET, LONDON, E.C.1.

SALVAGE.

STOCK OF A.E.G. PRODUCTS
IN PRACTICALLY PERFECT CONDITION.
250 MOTORS AND DYNAMOS, A.C. AND D.C.
ALL VOLTAGES, FROM 1–17 H.P.
350 SMALL MOTORS AND SEWING MACHINE MOTORS, TRANSFORMERS,
100 MOTOR STARTERS, VARIOUS; 1 000 PULLEYS, 750 ELECTRIC HEATERS; 400 ELECTRIC FANS,
500,000 YDS. CABLE, SINGLE, TWIN AND TRIPLE CORD.
200 VAMPIRE ELECTRIC VACUUM CLEANERS, 100 HOBBY FLOOR POLISHERS, 75 LARGE AND MEDIUM SIZE "DANDY" FLOOR POLISHERS, 350 ELECTRIC BEDWARMERS, 250 ELECTRIC HOT WATER BOTTLES, 200 ELECTRIC HAIR DRYERS, 500 ELECTRIC TONG HEATERS.
50 ELECTRIC VIBRO MASSAGE SETS, 500 ARMATURES, QUANTITY EBONITE PANELS, PLUGS, ROSES, SWITCHES, RESISTANCES.

FRANK G. BOWEN, LTD.,
will sell by Auction on the Premises, as above, on WEDNESDAY, July 2, 1930, at 11 o'clock.

On View two days prior. Catalogues may be had of the Auctioneers, 62A, Aldersgate Street, London, E.C.1.

APPOINTMENTS VACANT.

DRAUGHTSMEN, Senior and Junior, required for high and low tension switchboards, cubicles, etc. Apply, stating age, full experience and salary required to SWITCHGEAR DEPARTMENT. GENERAL ELECTRIC CO., LTD., Witton, Birmingham.

WANTED.—Supervising Electrical Engineer for large A.C. insulation. Capable of doing own installing and maintenance in rapidly enlarging plant. Excellent opportunities for advancement.—Write, stating age, education, experience and salary to "A. O," c/o J. W. Vickers and Co., Ltd., 24, Austin Friars, E.C.2.

ADMINISTRATIVE COUNTY OF LONDON.

THE London County Council requires in September, 1930, at the Hackney Technical Institute, Dalston Lane, E.8, visiting teachers of electrical engineering for two evenings weekly.

Fee for an attendance of about three hours will be 16s. or 22s., according to the standard of the class to which the teacher is assigned.

Apply Education Officer (T.1) The County Hall, S.E.1 (stamped addressed foolscap envelope necessary) for form to be returned by July 18. Canvassing disqualifies.

MONTAGU H. COX,
Clerk of the London County Council.

BOROUGH OF WATFORD.

ELECTRICITY DEPARTMENT.

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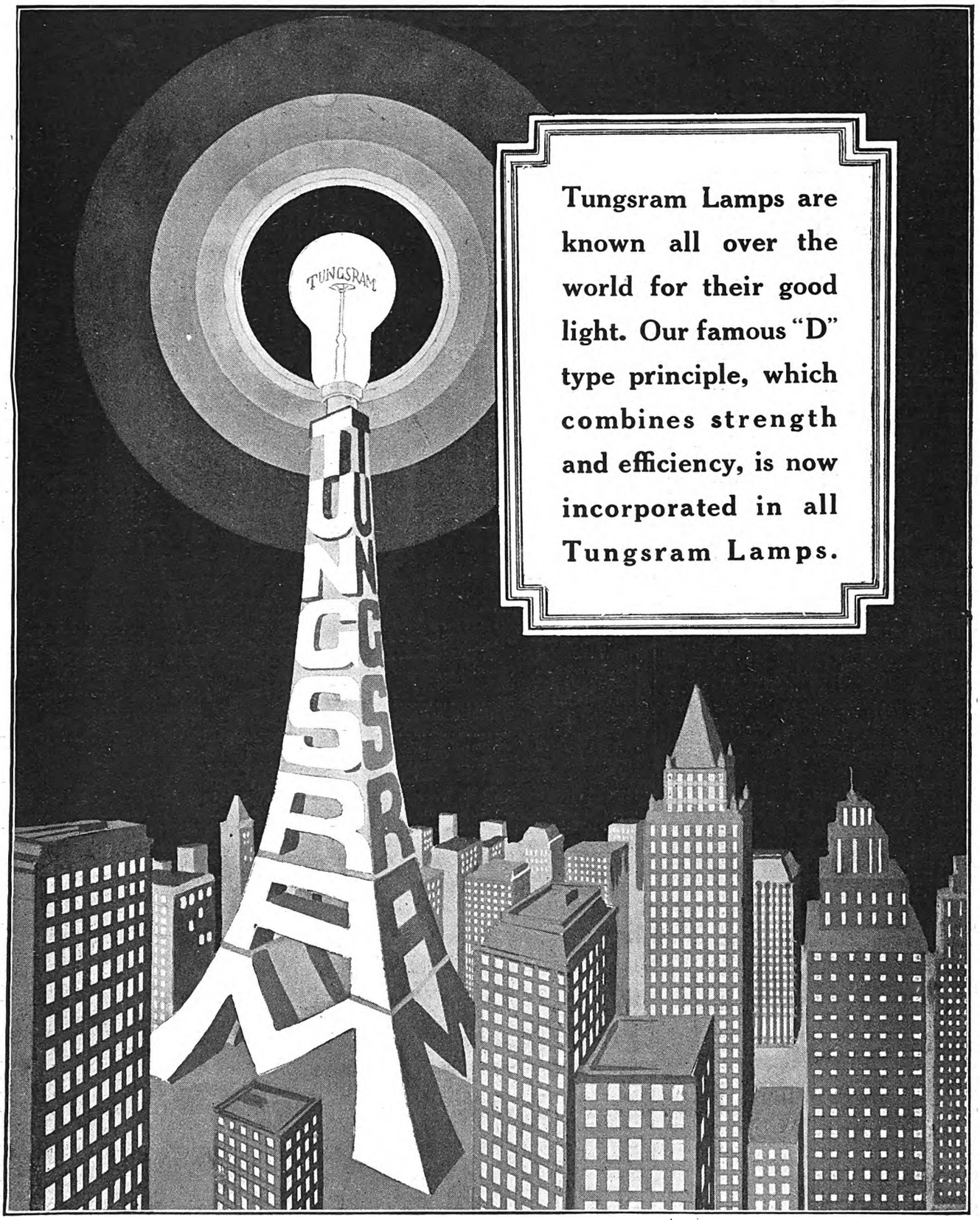

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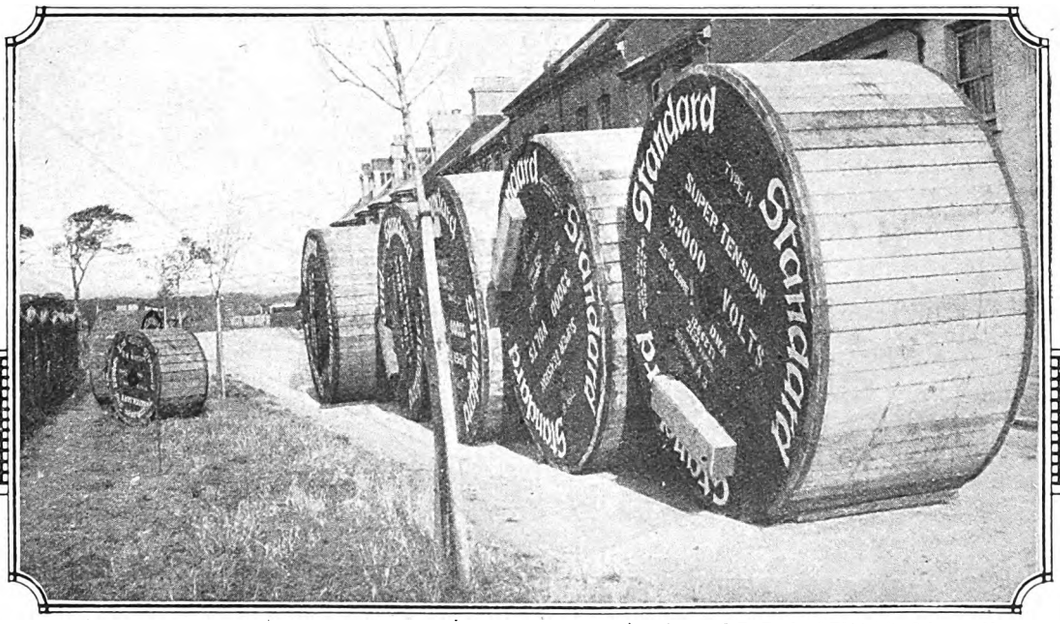

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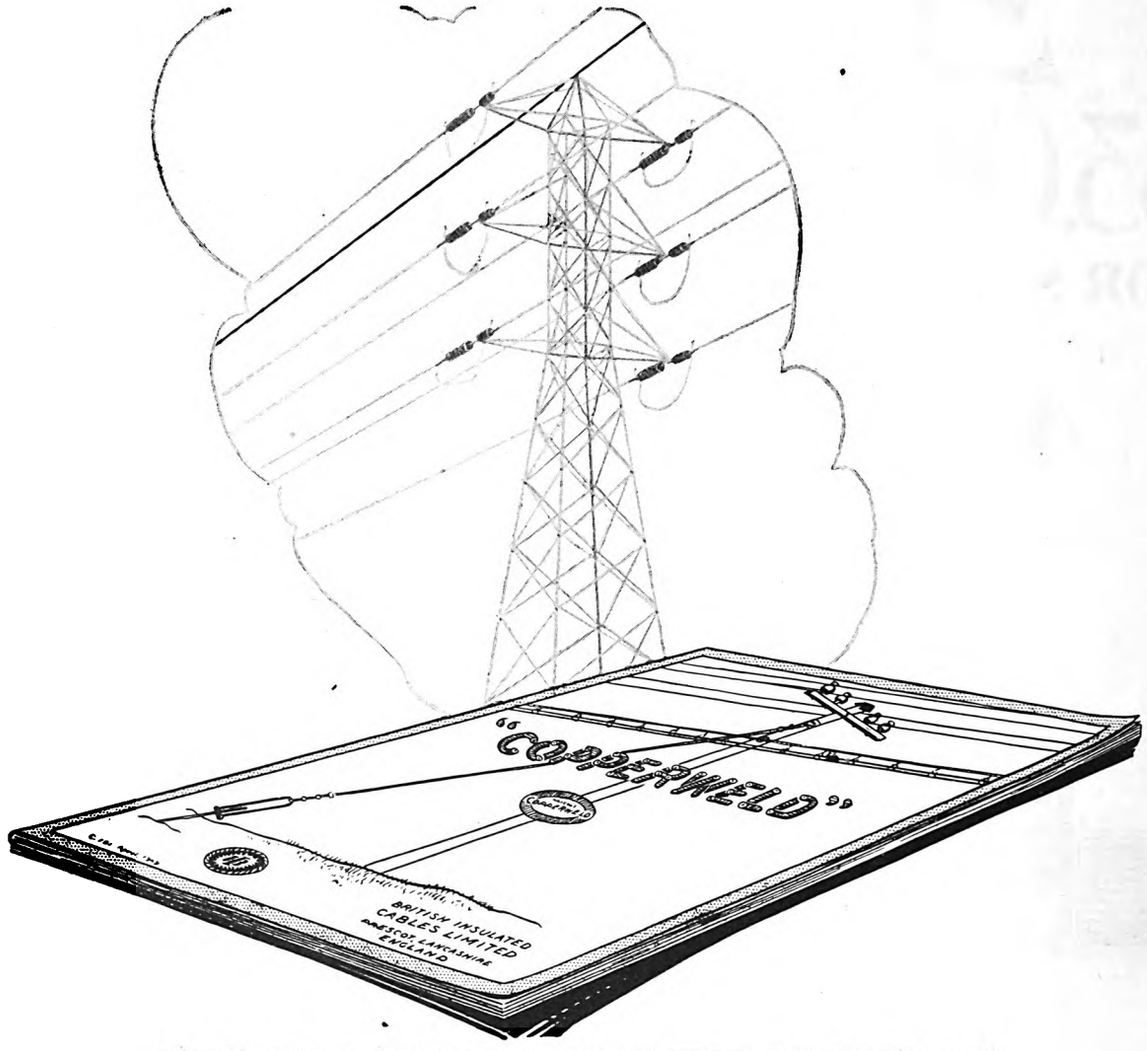

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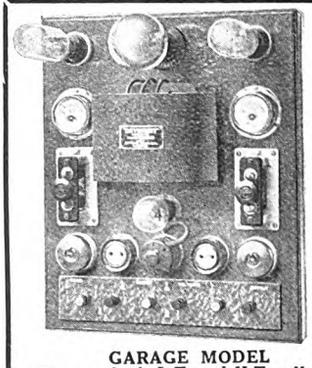

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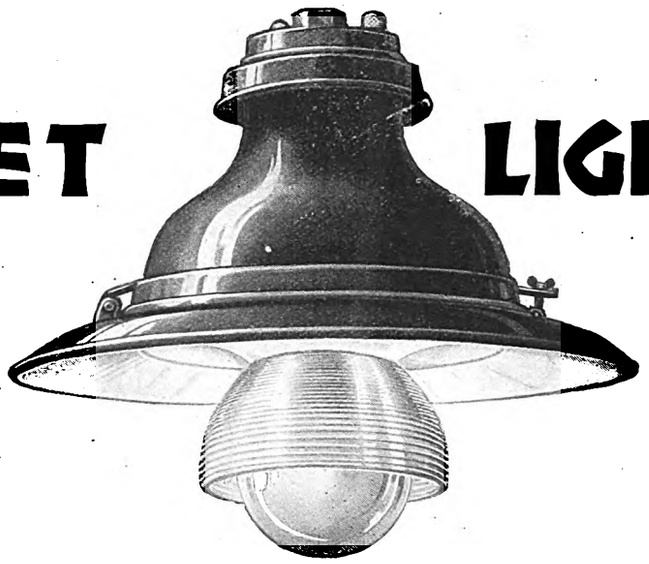

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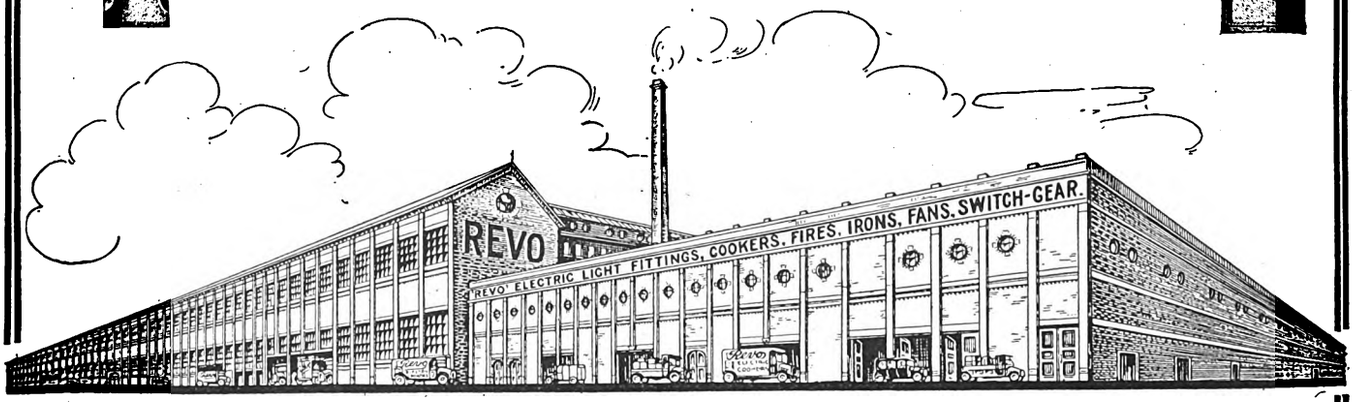

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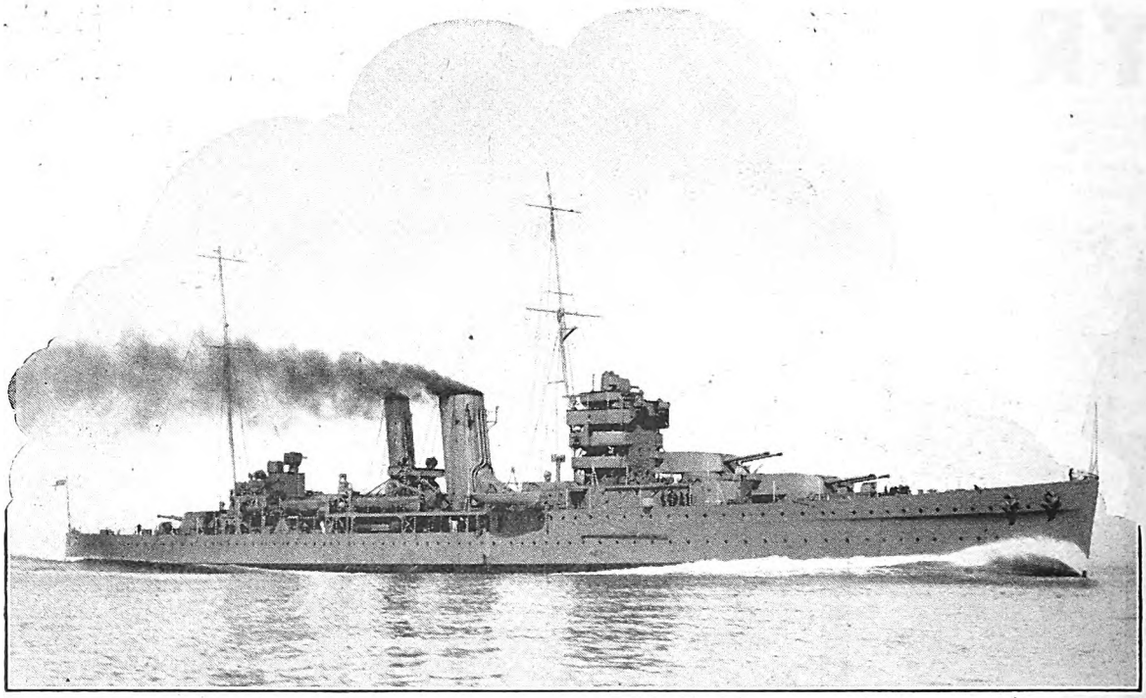
ONE OF THE J.&P. PAGES



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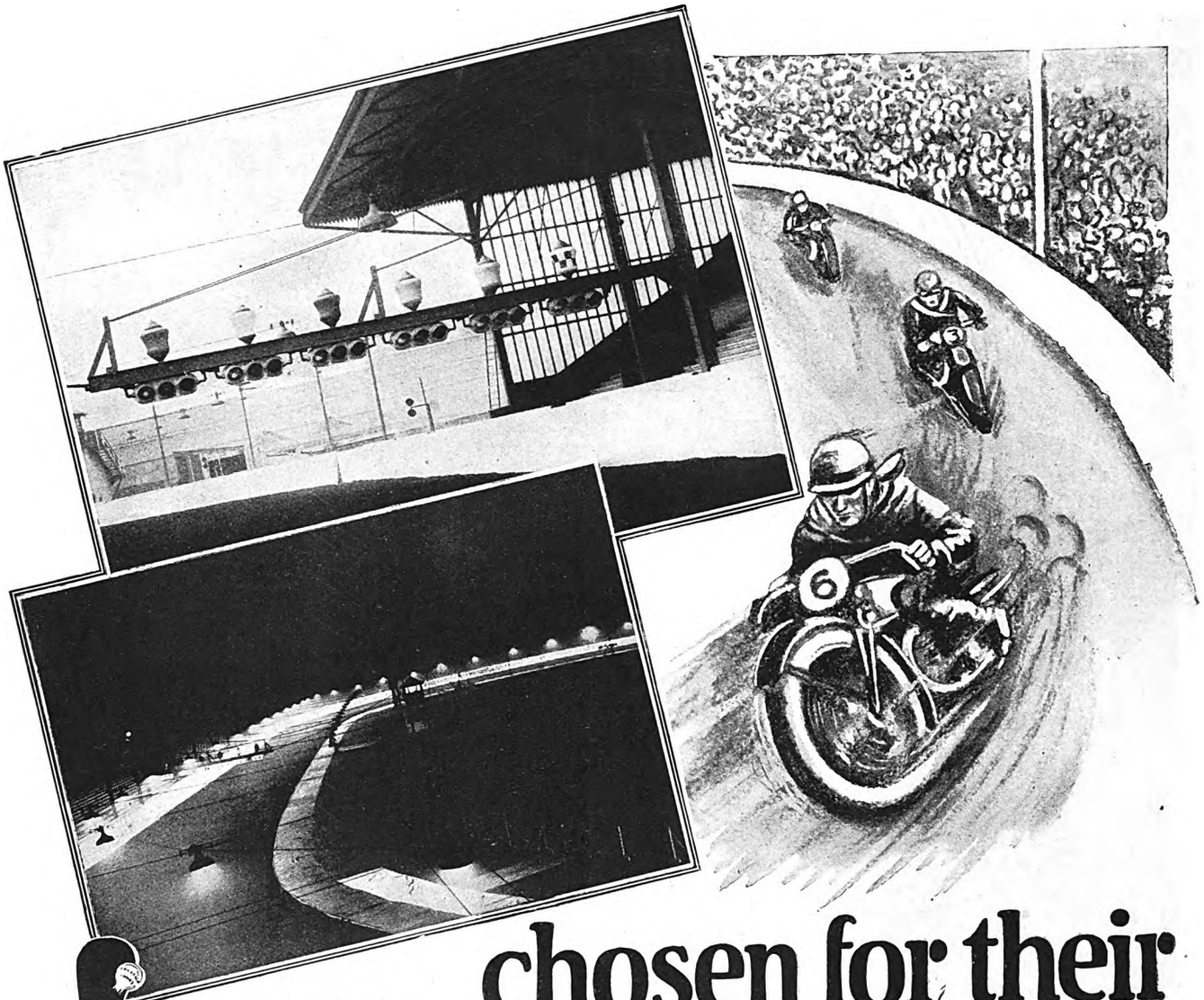

The top photograph shows the new automatic starting system, Six Wardle Avenue lighting Units with 1000 watt Cryselco Lamps are fitted to a girder across the track. Coloured lights corresponding with riders' colours signalise their progression round the track.

The lower photograph shows the brilliant illumination over the Dirt Track. Note the automatic Starting System in the middle left of the photograph.

chosen for their reliability.....

All lamps used in the Wardle Reflectors (by the Wardle Engineering Co.) at the White City, Manchester, are CRYSELCO Lamps. 1500 watt CRYSELCO Lamps every 15 feet apart and 15 feet high illuminate the Dirt Track, whilst 1000 watt CRYSELCO Lamps 30 feet apart and 30 feet high light up the Dog Track. The work of installation on England's latest dual track was carried out by Messrs. Henry Tattersall Ltd., Spotland Bridge, Rochdale.

CRYSELCO OPAL LAMPS ARE KNOWN AS *The Ultimate in Glareless Lighting*

CRYSELCO LAMPS

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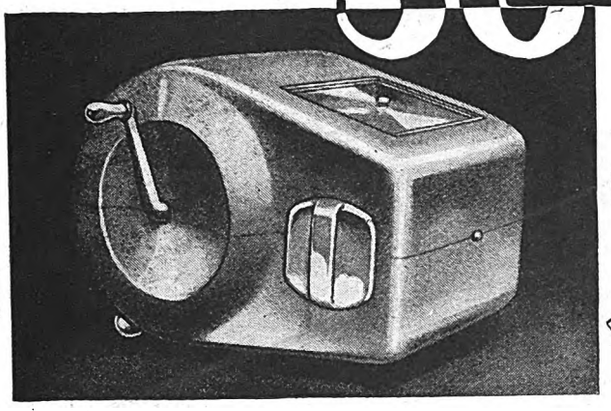
ICE CREAM in 30 SECONDS



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A pint of delicious ice cream in 30 seconds or a gallon in 4 minutes with one filling of ice and freezing salt.

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Price £4.19.6

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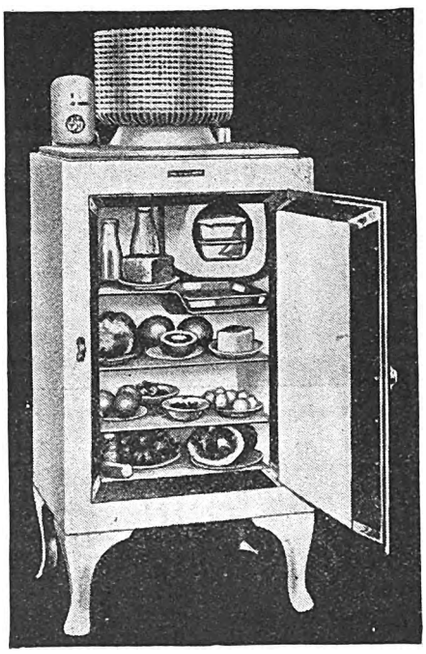
An ideal accessory of the incomparable

AUTOMATIC B T-H ELECTRIC REFRIGERATORS



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Tell them this

Of the hundreds of thousands of owners of these Refrigerators not ONE has spent a penny for service or repairs.

Write for literature giving full particulars and prices, and ask for details of terms and of our "deferred payment" scheme which enables you to supply B.T.H. Refrigerators on "easy terms" at our risk.

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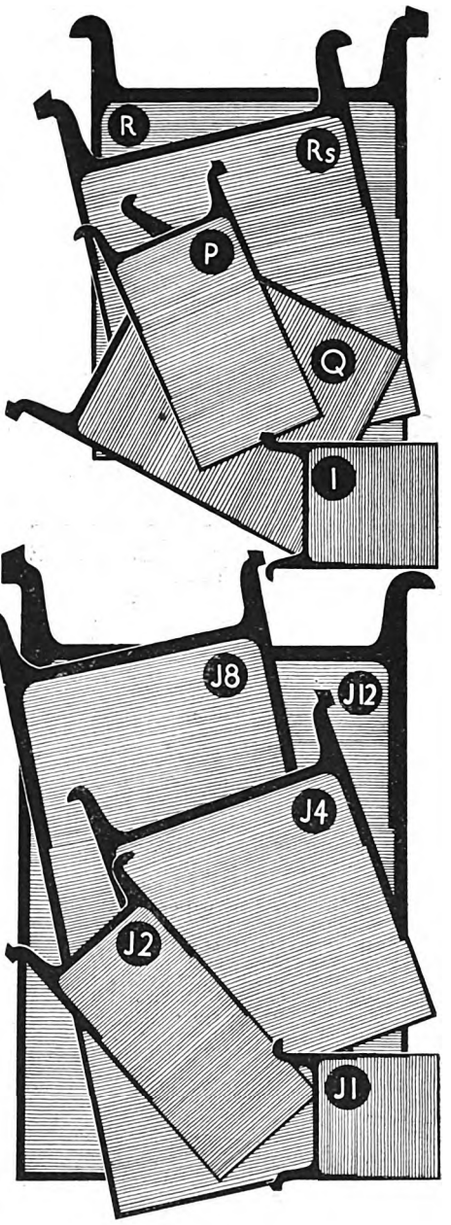

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Ask us to quote—you will find our prices lower than those you have been accustomed to pay.

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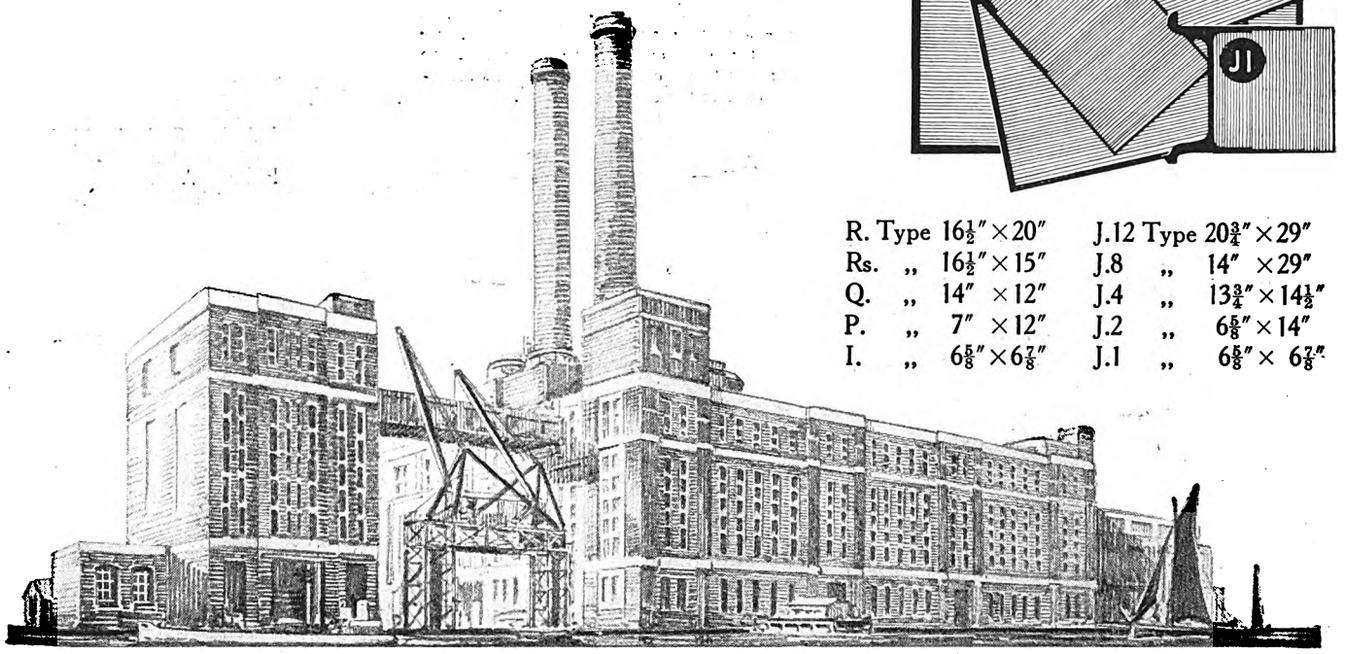
Rs. ,,	$16\frac{1}{2}'' \times 15''$	J.8 ,,	$14'' \times 29''$
Q. ,,	$14'' \times 12''$	J.4 ,,	$13\frac{3}{4}'' \times 14\frac{1}{2}''$
P. ,,	$7'' \times 12''$	J.2 ,,	$6\frac{5}{8}'' \times 14''$
I. ,,	$6\frac{5}{8}'' \times 6\frac{7}{8}''$	J.1 ,,	$6\frac{5}{8}'' \times 6\frac{7}{8}''$



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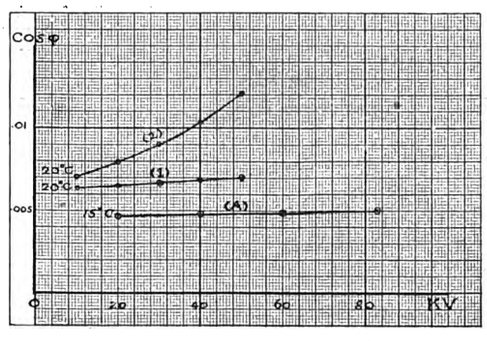

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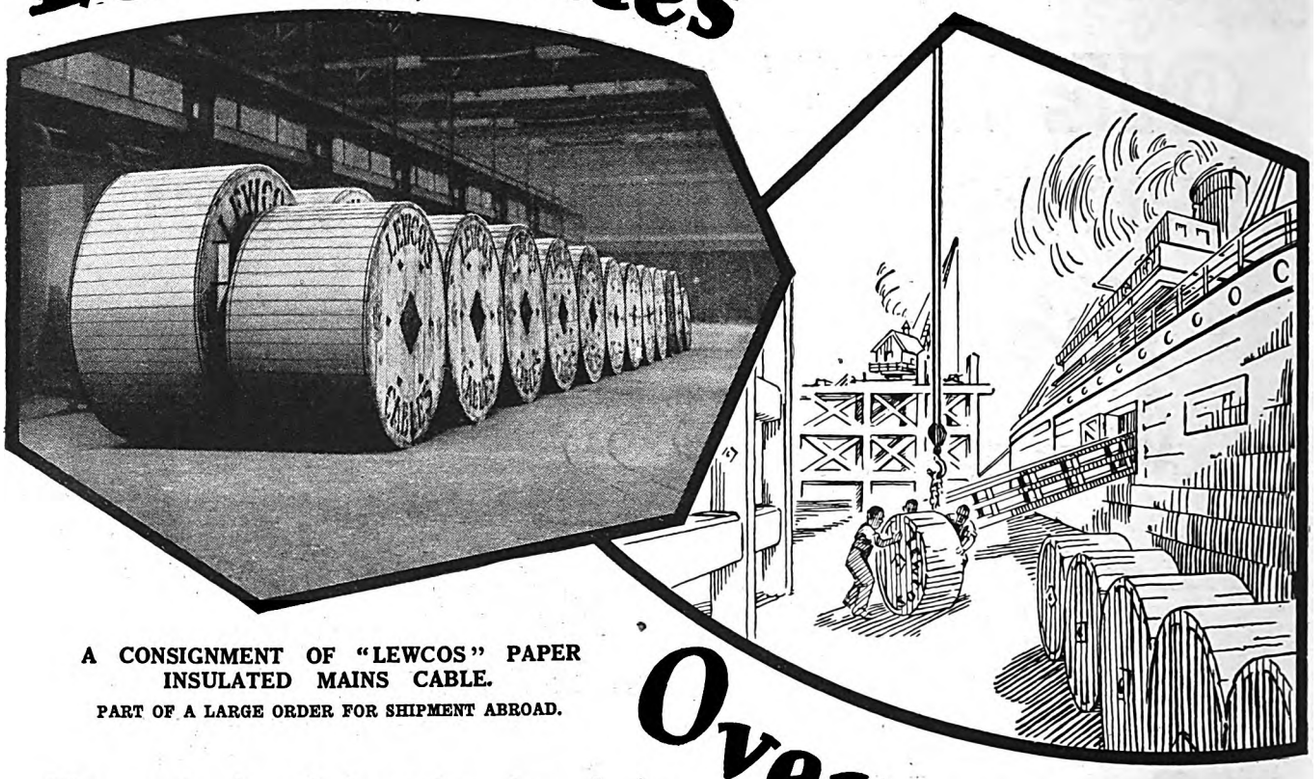

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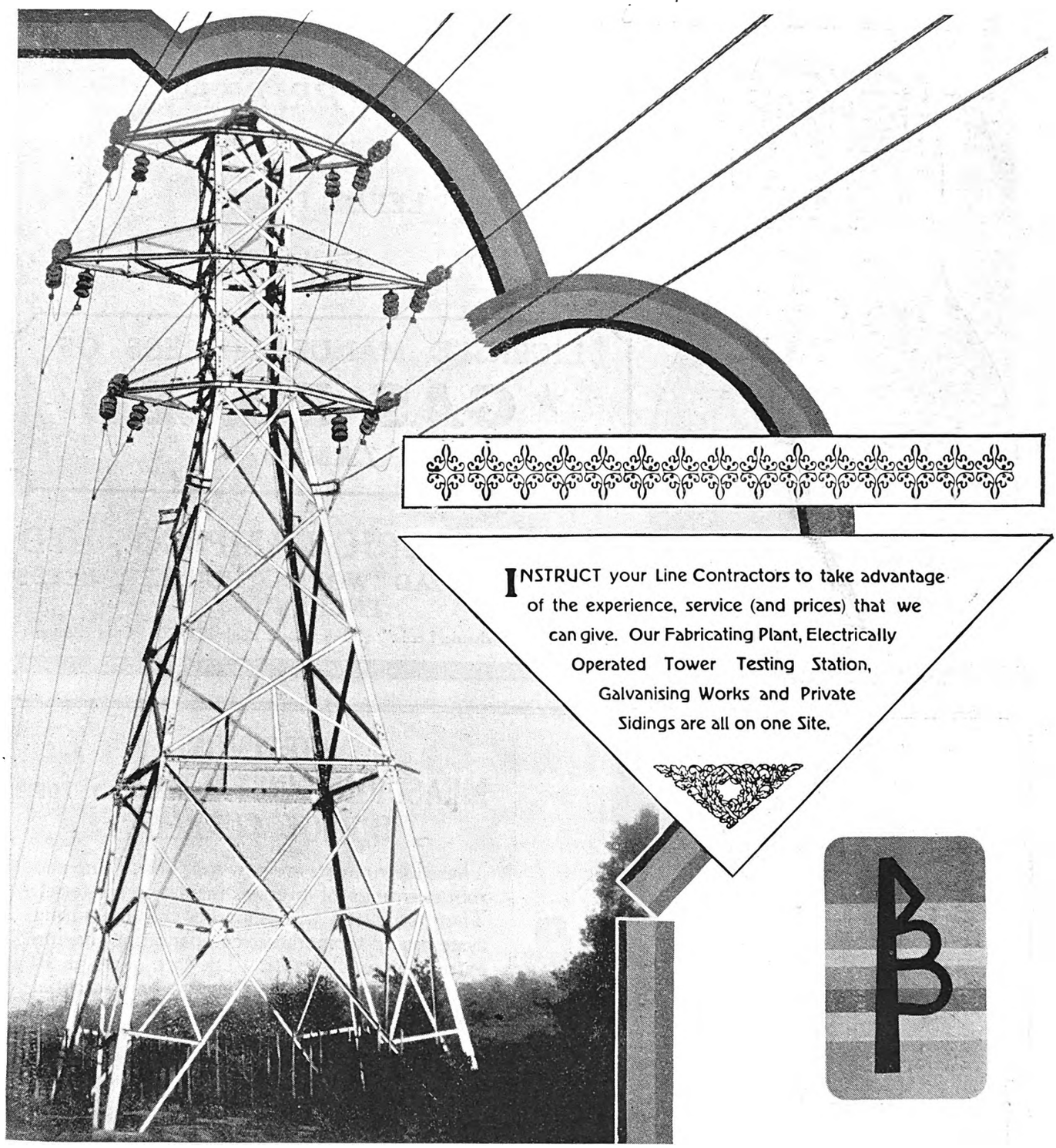

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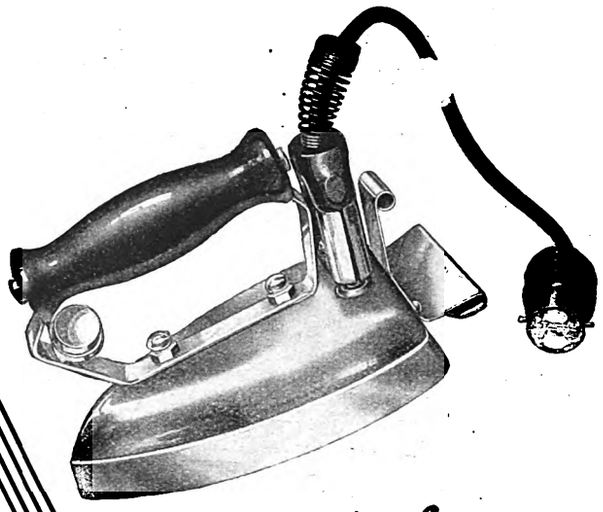

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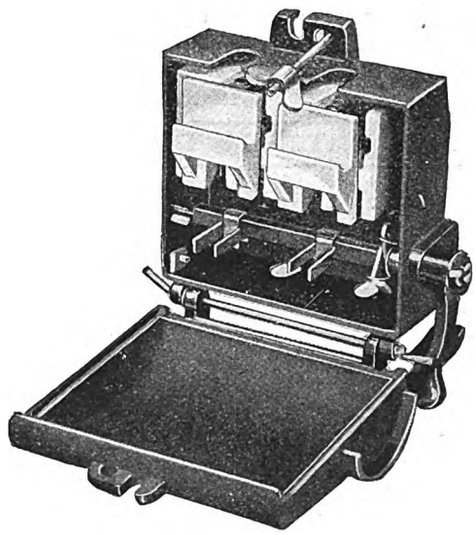

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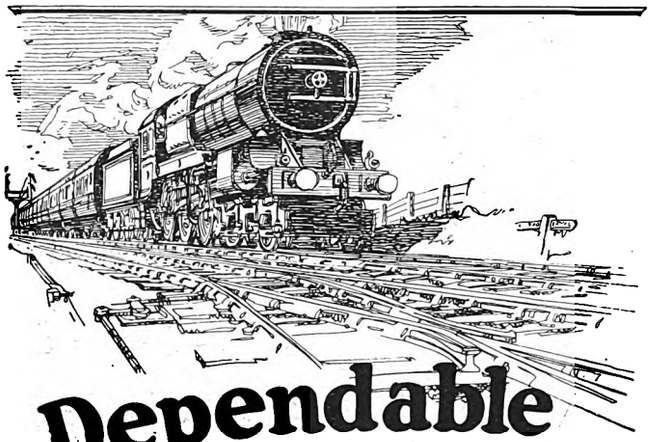

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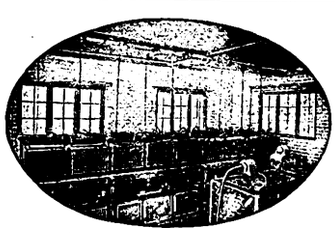

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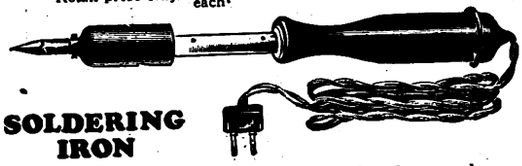

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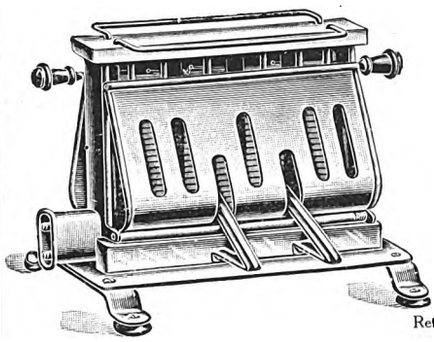

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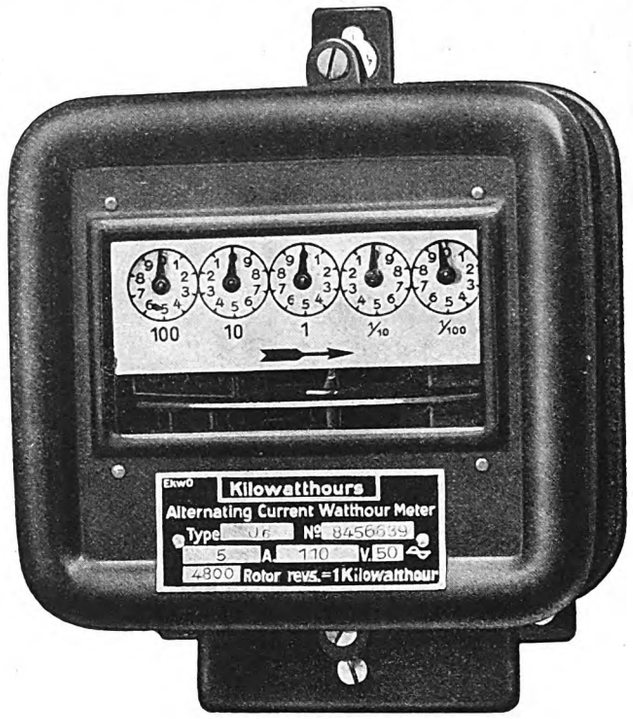

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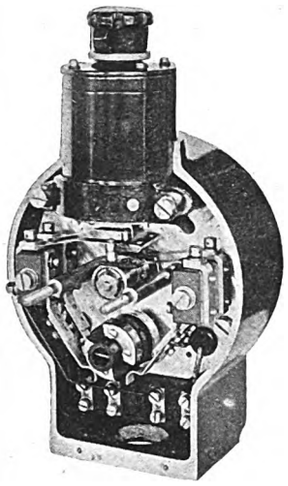

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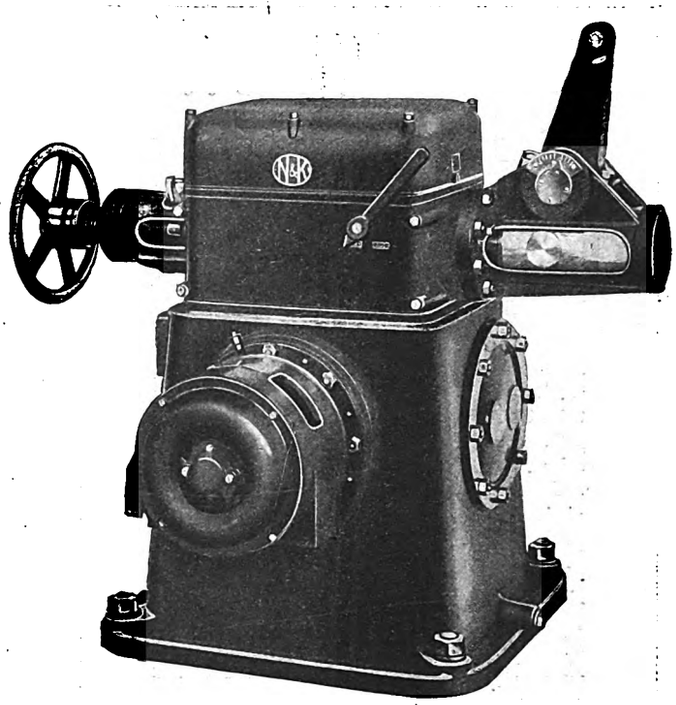

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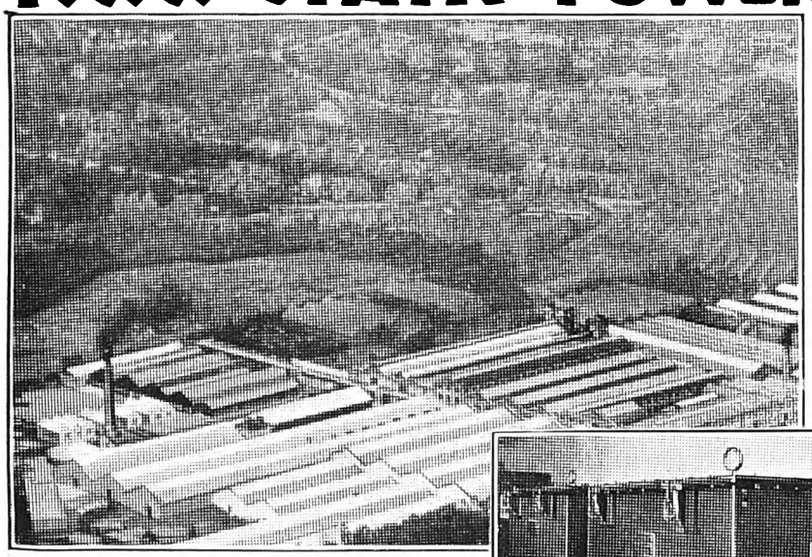

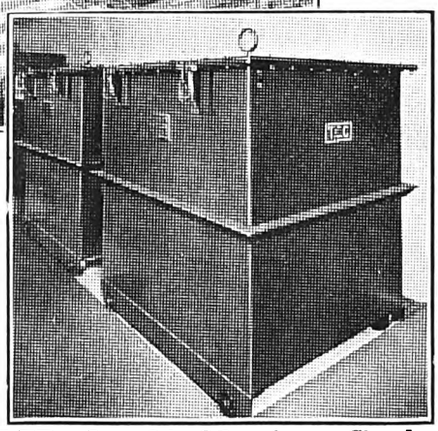

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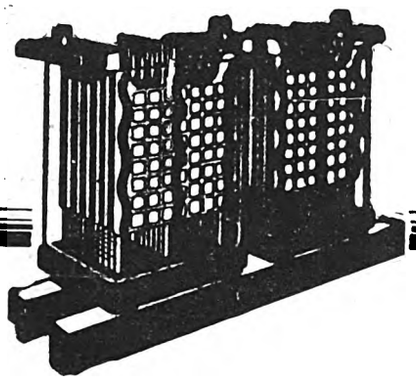

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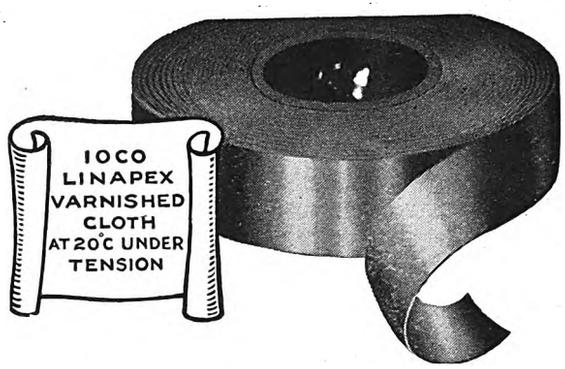

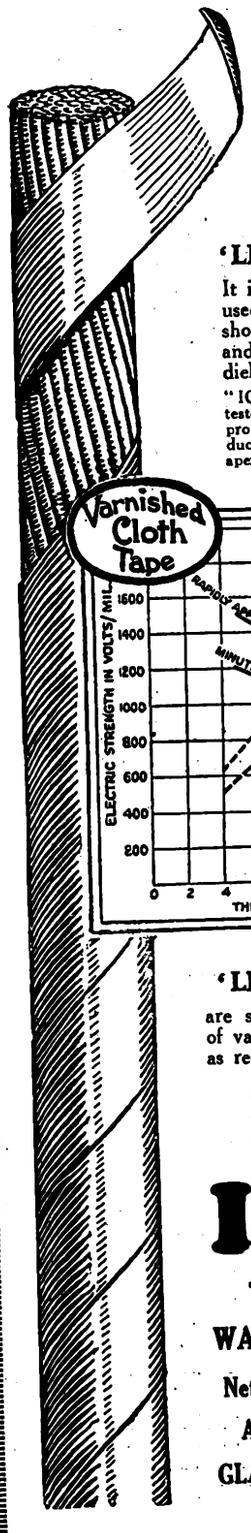

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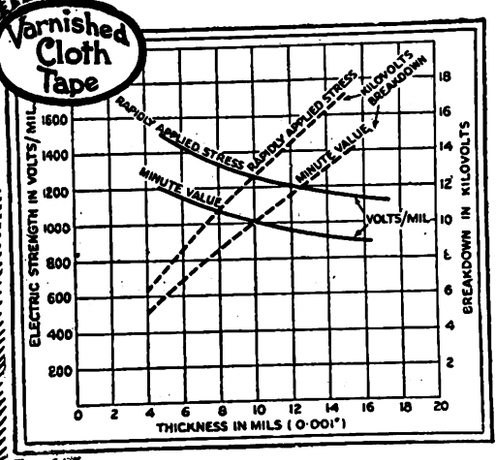

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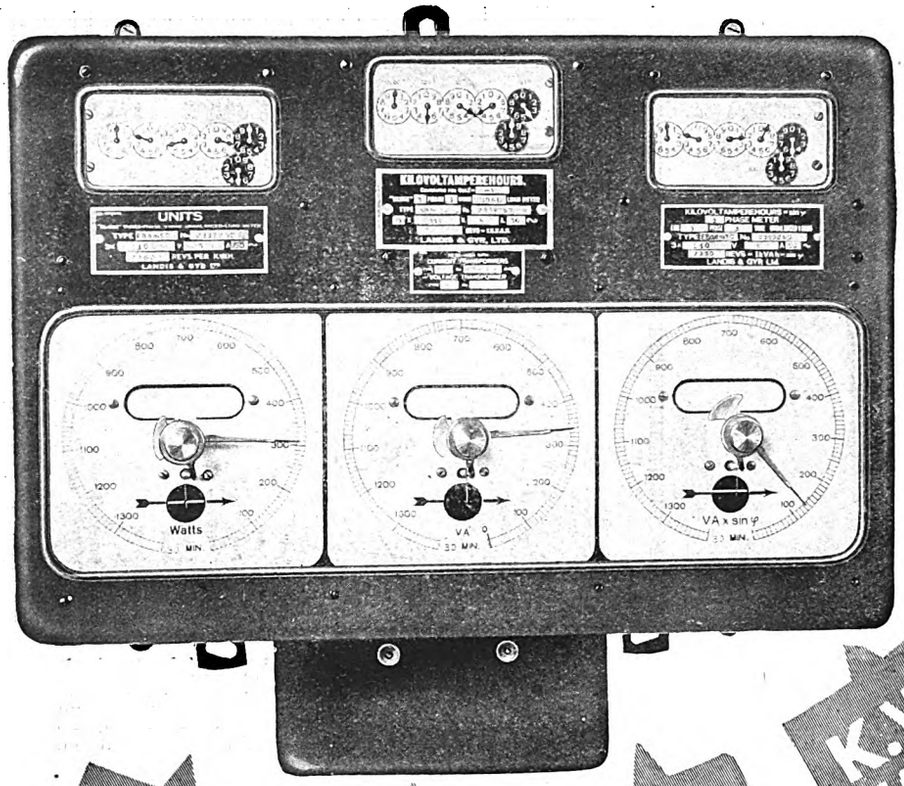

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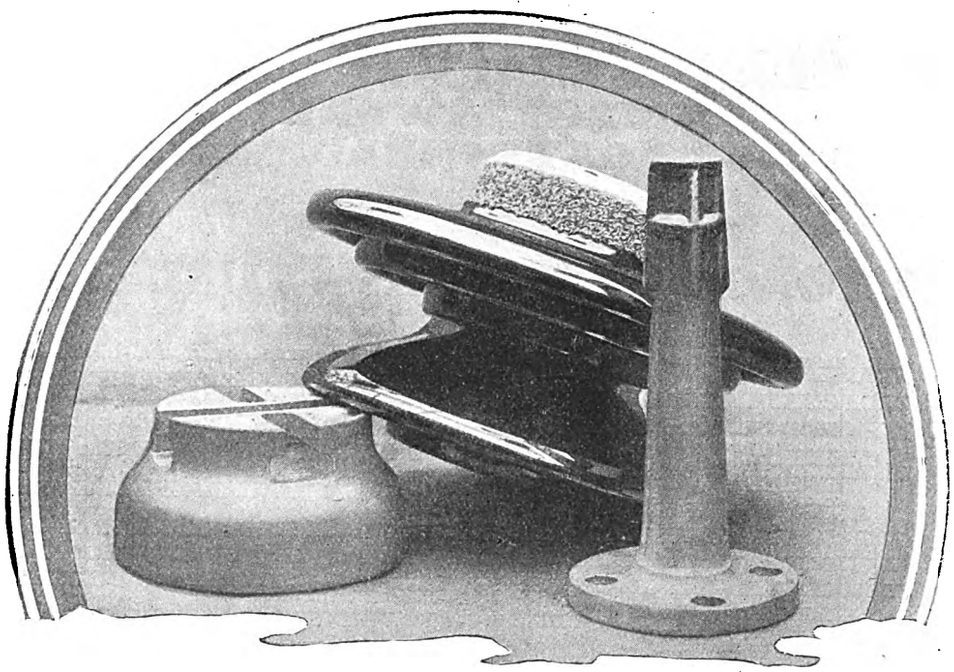

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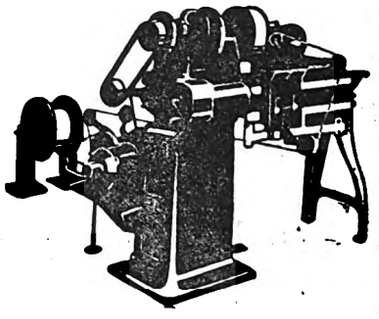

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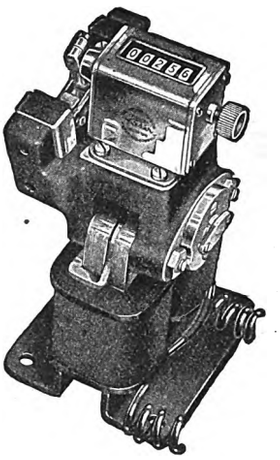

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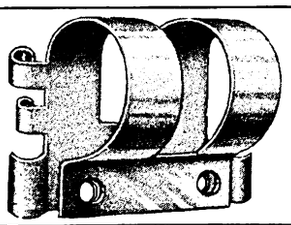

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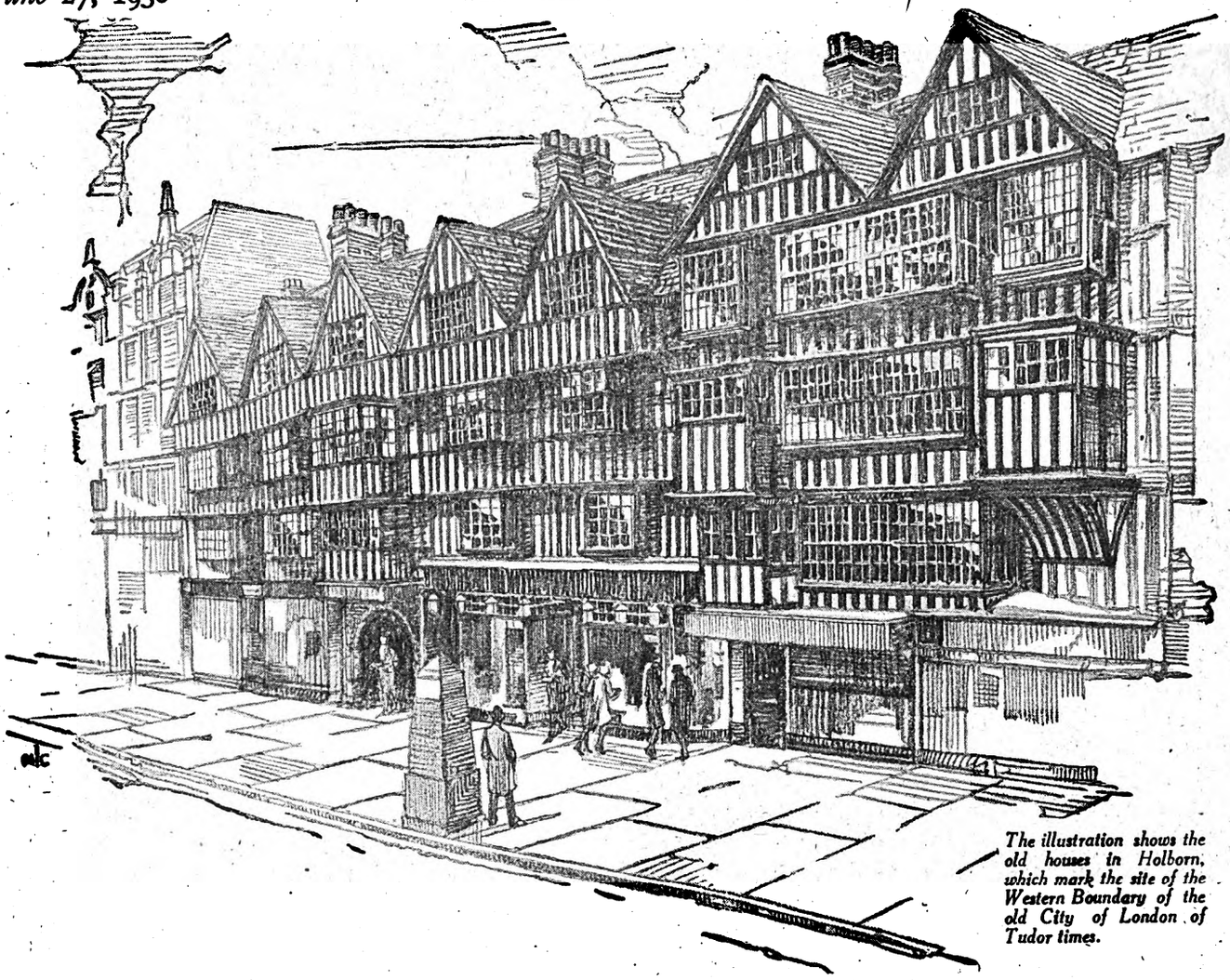
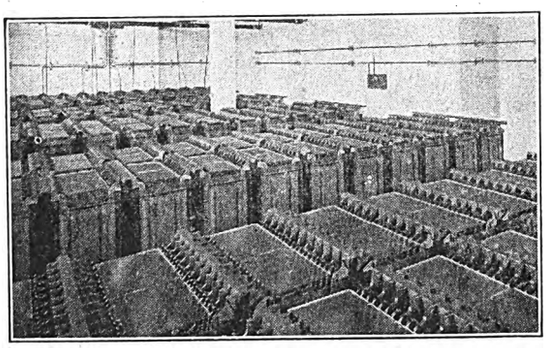


The illustration shows the old houses in Holborn, which mark the site of the Western Boundary of the old City of London of Tudor times.

Craftsmanship...



A Tudor Installation at Portishead, 1929.

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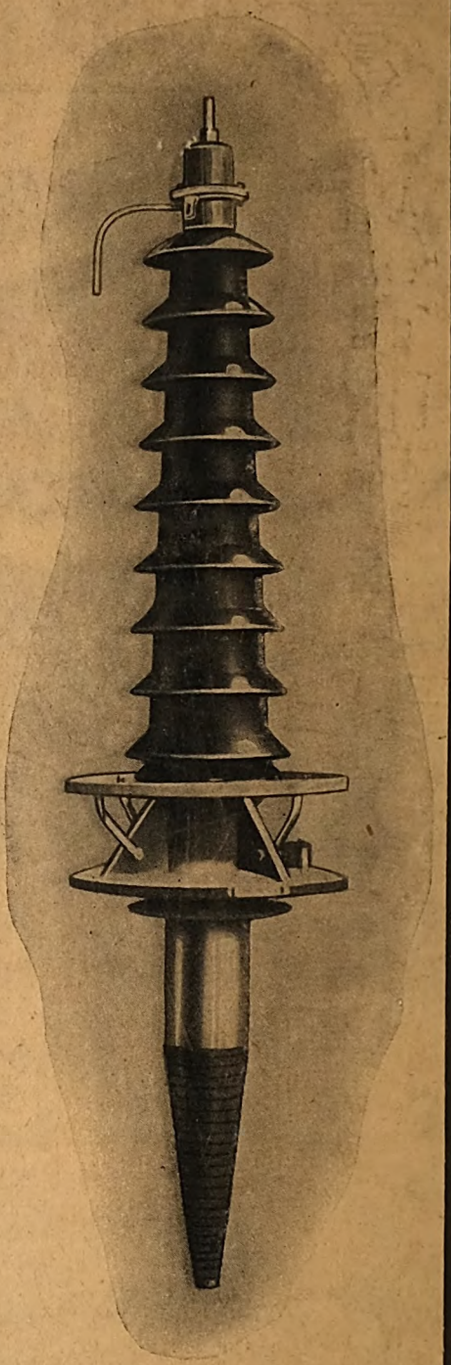

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